MEDICAL GYMNASTICS AND MASSAGE

IN

GENERAL PRACTICE

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BY

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SECOND EDITION

PHILADELPHIA
P. BLAKISTON'S SON & CO.
1012 WALNUT STREET
1926

Printed in Great Britain.

PREFACE

TO SECOND EDITION

THE second English edition of Dr. J. Arvedson's "Anteckningar i Sjukdomslära" has been carefully revised even to its title, which was criticised as clumsy. It has also been further edited with a view to bringing it up to date. In so doing some new matter has been added.

The First Edition has been widely used in Great Britain, America, Australia and New Zealand, and it is hoped the Second Edition will also have a useful career.

M. L. DOBBIE.

TRANSLATOR'S PREFACE

TO FIRST EDITION

A BOOK of this kind in English has long been wanted by students of medical gymnastics. Its primary aim is to describe those morbid conditions, both medical and surgical, which may be treated, with sufficient detail to enable the medical gymnast to handle them intelligently. The aims and methods of treatment according to the Swedish system are described. This part of the book will also be of interest to practitioners and students of medicine.

Dr. Arvedson's book is the text-book used in Scandinavia, and has been the standard work on the subject for twenty years. It has been recently enlarged and brought up to date.

The various remedial exercises are not described in detail. For this the reader is referred to Kleen's "Massage and Medical Gymnastics."

The short chapter on Fractures gives the method of early treatment of recent fractures by massage and movements commonly used in Sweden, and increasingly used in this and other countries. It does not describe the immediate treatment of individual fractures as practised by Dr. Lucas Championnière, Sir William Bennett and Dr. J. B. Mennell.

I have added a few subjects to Dr. Arvedson's book, and for some of the notes on disease I am indebted to Taylor's "Practice of Medicine," Osler's "System of Medicine," and to Hey Groves' "Synopsis of Surgery."

MINA L. DOBBIE.

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MEDICAL GYMNASTICS AND MASSAGE IN GENERAL PRACTICE

Chapter I

GENERAL PATHOLOGY, METHODS OF EXAMINATION AND PRINCIPLES OF TREATMENT.

By *health* we mean that condition of the body in which all the organs function normally.

Disease arises when disturbance of function occurs in one or more organs.

Death takes place by cessation of function.

Disturbance of function in an organ, *e.g.*, limitation of movement in a joint, palpitation, heart-weakness, indigestion, is generally connected with some morbid change, such as inflammation, degeneration, disturbance of circulation or innervation in that organ, or even with changes in other organs, *e.g.*, paralytic contracture in a joint after infantile paralysis. These morbid changes are the essential part of the disease, and are spoken of as the *pathological anatomy of the disease.*

In every case of disease we must first form as clear an idea as possible of the underlying morbid changes, and then consider by what treatment we can influence and improve these conditions, or when possible restore the organs and tissues to normal, and so restore the health of the patient by removing the cause of the disease.

The commonest pathological changes are :—

1. **Disturbances of circulation.**

2. **Disturbances of nutrition.**
3. **Degeneration of the cells and tissues.**
4. **Inflammation.**
5. **Tumours.**

1. **Disturbances of the circulation** may be *general*, when the whole systemic circulation is affected, *e.g.*, in heart disease ; or *local*, when one or more organs only are affected, *e.g.*, in congestion of the brain, the circulation in the rest of the body being normal.

Local disturbances of circulation may be in the direction of *congestion* (hyperæmia) or *poverty of blood* (anæmia).

Hyperæmia may depend on an excessive flow of blood to the part, *arterial or active hyperæmia*, *e.g.*, reddening of the skin due to heat. But hyperæmia may also depend on hindrance to the flow of blood from the part, *venous or passive hyperæmia*, congestion, *e.g.*, blueness of the skin beyond a tight garter.

2. The most important **disturbances of nutrition** are :—

(*a*) *Hypertrophy*, *i.e.*, overgrowth of an organ, tissue or certain cells. This may depend on increased supply of nutriment, on congenital predisposition, or on faulty development.

(*b*) *Atrophy*, *i.e.*, decrease or wasting of an organ or tissue. This may depend on diminished supply of nutriment, *e.g.*, due to pressure of a bandage, or upon the incapacity of the cells to assimilate the nutriment owing to disease, nervous disturbances, etc.

Hypertrophy, as well as atrophy, may be associated with changes in the activity of the glands of internal secretion, *e.g.*, increase of fatty tissue in women at the climacteric.

3. **Degeneration** is a morbid change with deterioration of the cells and tissues of the body, so that these become more or less unfit for work. Degenerations arise as the result of

certain poisons such as alcohol and bacterial poisons, *e.g.*, in diphtheria and other infectious diseases, or as the result of changes in circulation and nutrition, producing a diminished supply of oxygen, or as the result of nervous influences, *e.g.*, in infantile paralysis.

There are several different kinds of degeneration. The most important are :—

(1) *Granular or parenchymatous degeneration*, which consists of a granular clouding of the cell substance. This is the mildest form of degeneration, and is often a stage on the way to fatty degeneration.

(2) *Fatty degeneration*, in which the cell substance becomes more or less completely changed into fat. *N.B.*—This degeneration must be distinguished from the fatty deposit which takes place in otherwise healthy organs and cells with unaltered protoplasm, as the result of over-nutrition.

(3) *Pigmentary degeneration, i.e.*, atrophy with simultaneous deposit of brown pigment in the cells, common in old age.

(4) *Amyloid degeneration*, which commonly takes place in cases of long-continued suppuration.

(5) *Mucous degeneration* may also be mentioned.

Complete death of the tissues is called *necrosis*.

4. **Inflammation** is "the succession of changes which occur in a living tissue when it is injured, provided that the injury is not of such a degree as at once to destroy its structure and vitality."

Inflammation may also be considered as a "*reaction of the tissues*" to harmful or irritating influences, *i.e.*, as a protective measure by which the body tries to counteract the irritation and its effects, as shown in the healing of wounds.

With regard to the course of the inflammation we distinguish between *acute* and *chronic*. Inflammation is

called *acute* when it runs a rapid course, and is accompanied by severe symptoms. It is always caused by strong irritation. Inflammation is called *chronic* when it runs a slow course, and is accompanied by less severe symptoms.

The **Morbid Changes** produced by acute inflammation are :—

(1) Dilatation of the small arteries, capillaries and veins with increased rapidity of blood flow.

(2) Slowing of the blood flow, which may go on to stasis.

(3) *Increased permeability* of the vessel walls, with consequent *increased exudation of serum*, and *increased migration of white corpuscles*, in severe cases, even of red.

(4) The serum often contains fibrin, which is then deposited in the tissues.

(5) *Multiplication of the migrated white corpuscles and of the tissue cells.*

Causes.—*Irritation of the tissues* by (*a*) *mechanical*, (*b*) *thermal*, (*c*) *chemical action*, or by (*d*) *bacteria*. For the production of inflammation the irritation must be fairly strong. Slight irritation only causes increased activity in the cells. For practical purposes we divide inflammation into two varieties, bacterial and non-bacterial.

Symptoms.—The cardinal symptoms of inflammation, whether bacterial or non-bacterial, have long been recognised as :—

1. *Redness.* 2. *Swelling.* 3. *Heat.* 4. *Pain.* 5. *Impairment of function.*

Redness is due to dilatation of blood vessels ; *heat* to increased blood flow and increased metabolism ; *swelling* to increased exudation of blood serum ; *pain* to stretching of and pressure upon the fine nerve endings, owing to distension of the lymph spaces by the exuded fluid.

Loss of functional power is due to changes in circulation

and nutrition, frequently also to morbid changes in the tissue cells which hinder their normal function.

Morbid Changes.—The morbid changes in chronic inflammation are like those of acute inflammation, but less marked. The characteristics of chronic inflammation are as follows :—

1. *Greater multiplication of the migrated white corpuscles* and of the tissue cells.

2. *Deposit of intercellular substance between the new cells, and consequent formation of new connective tissue.*

3. *Growth of blood vessels* from the surrounding parts into the newly-formed tissue, *i.e.*, granulation and organisation.

4. This results in thickening and fibrosis.

Causes.—The causes of inflammation becoming chronic are :—

1. *The continuation or repetition of the original irritation, e.g.*, the pressure of a foreign body, or a recurring sprain.

2. An *irritation sufficiently severe to destroy the vitality of a large number of cells*, which when dead remain in the tissues as foreign bodies, causing irritation which keeps up the inflammation, *e.g.*, a severe bruise or sprain.

3. In bacterial inflammation when the strength of the bacteria and of the opposing white corpuscles is fairly equal, so that the result of the contest between them is undecided, *e.g.*, in chronic rheumatism of joints.

Terminations of inflammation may be :—

1. *Resolution or absorption, i.e.*, the inflammation ceases and the tissues again become normal. The dilated blood vessels contract to normal size, exudation of serum and migration of white corpuscles cease ; if fibrin has been deposited in the tissues it is carried away along with the

serum by the lymphatics. This takes place in the healing of wounds by "first intention."

2. *The inflammation may become chronic* (see above).

3. *Suppuration* may take place. This can only take place in *bacterial inflammations*, or if *bacteria by some means have got into the focus of inflammation*. But pus is not always formed in bacterial inflammations. This depends on the *degree of virulence of the bacteria*, and on the resistive power of the white corpuscles and tissue cells. In bacterial inflammation a battle takes place between the white corpuscles and the bacteria, and upon the result depends the issue of the inflammation. *If the white corpuscles conquer*, the bacteria are destroyed and normal conditions are restored, *e.g.*, in an ordinary pimple or pustule which subsides. If *the battle is undecided* the irritation continues and the inflammation becomes chronic, because neither the white corpuscles nor the bacteria are destroyed, *e.g.*, in mild cases of phthisis, chronic rheumatism of joints, etc. Finally, if *the bacteria conquer*, pus is formed, the white corpuscles being killed and remaining in the tissues, and new ones coming up to meet the same fate, so that the lymph spaces become greatly distended and finally rupture. In this way a cavity is formed filled with blood serum and dead white corpuscles, *i.e.*, pus. Unless the pus be evacuated this cavity enlarges until it reaches the surface or opens into one of the cavities of the body.

The process of suppuration taking place on the surface and resulting in the loss of skin or mucous membrane is called *ulceration*.

Bacterial inflammation, especially when pus is formed, gives rise to general symptoms with a rise of temperature. The condition must not be treated by massage.

Healing after suppuration cannot, as a rule, take place

until the *pus* is evacuated. *The contents of the cavity press upon its walls* so that circulation and nutrition in the surrounding parts are impeded, and the resistive power of the tissue-cells is diminished. As soon as the cavity is opened *these conditions disappear. The white corpuscles and tissue-cells are now able to overcome the remaining bacteria,* aided probably by the anti-toxins formed in the body, and so the inflammation is brought to an end.

In the healing of an abscess cavity new connective tissue is formed. This has the appearance of small raised red dots, called granulations. These by degrees fill up the cavity, after which the skin grows over it from the edges and covers the wound. This newly-formed connective tissue shrinks, *scar tissue* thus being formed. Such a scar often causes considerable limitation of movement, partly by binding down the tendons to their surroundings, partly by lessening the elasticity of the tissues.

Healing of wounds. (For classification of wounds see "First Aid" books.)

1. A simple adhesive inflammation results in healing by "*first intention.*" In order to heal by first intention the wound must be clean, its edges at rest and in contact. No appreciable scar is formed.

2. When there is loss of substance, the edges of the wound not being in contact, or when the wound is infected, healing takes place by the formation of granulation tissue. This is sometimes called healing by "*second intention.*" Scar formation results.

Catarrh is inflammation in a mucous membrane. It is characterised by the ordinary inflammatory changes, by increased discharge of mucus, and increased shedding of epithelium.

A **tumour** is a local growth of new tissue, in structure more

or less resembling normal tissues, non-inflammatory in origin, living a parasitic life at the expense of its host. Tumours can generally be felt more or less distinct from their surroundings. They are divided into *innocent and malignant*. The innocent cause no danger to life and do not return if removed by operation. To this class belong fatty tumours (*lipomata*), and connective tissue tumours (*fibromata*).

The *malignant* (cancerous) tumours are generally fatal and if operated upon often recur. This is probably due to some part of the tumour being left behind. *The growth of these tumours is hastened by massage,* which may even cause secondary growths or metastases, by small parts of the tumour being carried into the lymphatics, and so to the lymphatic glands, where they develop.

N.B.—Massage can never remove a simple tumour, but may possibly cause it to become malignant. *Massage is therefore absolutely contra-indicated in the case of tumour* of whatever kind.

Diseases may be divided into organic and functional.

An **organic disease** is one in which morbid changes are present in one or more organs.

A **functional disease** is one in which no pathological changes have been found in any organ, so far as our present medical knowledge goes, but illness is manifested by functional changes (symptoms). Such diseases are also called *neuroses, e.g.*, neurasthenia, hysteria.

Diseases may also be divided into local and general.

A *local disease* is one in which a single organ or a certain number of organs are attacked, the rest of the body remaining unaffected, *e.g.*, sprain of a joint, contusion, fracture.

There are, however, not many diseases which can be called local, because all the organs of the body are so

closely connected with and dependent upon each other that disease in one organ generally causes disturbances in the others not directly affected. Kidney disease, for example, affects the whole body, because the poisonous products of metabolism, which normally are excreted by the kidneys, cannot be excreted in sufficient quantity, but accumulate in the body, and poison it. In the same way disease of the alimentary canal causes lowering of nutrition of the whole body.

General or *constitutional* diseases are those in which the whole body is affected. To this class belong all *morbid changes in the blood*, such as anæmia, *all forms of poisoning*, all *disorders of metabolism*, diabetes, obesity, gout, etc., and finally, all *fevers* or infectious diseases.

By *fever* is meant a disturbance of metabolism in the body as a whole, with rise of temperature and simultaneous quickening of the pulse and heart rate. The patient is said to have fever if the morning temperature is over 99 degrees. The pulse rate is then generally increased to over eighty to the minute. A pulse of 100 corresponds to a temperature of about 100 degrees.

The rise of temperature depends partly on increased metabolism and combustion, partly on disturbance of the heat-regulating mechanism. Fever is specially characterised by increased metabolism of protein, which may reach two or three times the normal. In most cases fever is caused by the entry into the blood of some harmful substance, frequently bacteria or their products. Besides the rise of temperature and increased pulse rate, fever causes general malaise, headache, drowsiness, mental cloudiness, weakness, loss of appetite and thirst. Long-continued fever produces also a marked lowering of strength, by the increased combustion of the protein of the body.

Fever may be regarded as the reaction of the organism, or its attempt to free itself from the harmful substances which have entered the blood. Anti-toxins are formed in the body against these poisons, and when this has taken place to a sufficient extent, and the bacteria have been overcome by the anti-toxin, either produced by the body or introduced into it, the fever ends and the poisonous substances are carried off to a large extent by the copious perspiration which takes place.

The treatment of febrile diseases aims at placing the body under the most favourable conditions possible, so that all its strength may be available for fighting the harmful substances. The patient should be in bed, so that no strength may be wasted. Fresh air is necessary, and the food should be easily digested and as nourishing as possible. Quinine and other bactericidal remedies are used with the aim of overcoming the bacteria or preventing their development. We make no attempt to lower the temperature if it does not rise so high as to be dangerous in itself (103 degrees).

Fever is considered a contra-indication to mechano-therapeutic treatment, except by Kjellgren and his pupils.

Disease may spread in the body in several different ways, viz. :—

1. By continuity, *i.e.*, by immediate connection between organs and tissues. Cold in the head or inflammation of the mucous membrane of the nose may spread directly to the middle ear by the Eustachian tube, to the pharynx, larynx or trachea.

2. By contact, *i.e.*, by the proximity of tissues and organs without direct connection. *Appendicitis* may spread to the peritoneum over neighbouring coils of intestine, *pleurisy*

may spread from the inner to the outer layer of the pleura.

3. By the blood and lymph, *e.g.*, in blood poisoning and fevers. Bacteria enter the lymph and blood at the infected point, are carried by the circulation, and settle down where they find the most suitable soil for further development. Acute rheumatism in most cases begins by a bacterial inflammation in the mucous membrane of the throat.

The bacteria, having thus gained entrance into the blood, settle down and develop in the synovial membrane of the joints, in many cases also in the valves of the heart.

The **Causes** of disease may be divided into two main groups :—

A. **Predisposing,** or internal.

B. **Exciting,** or external.

To the **predisposing causes** belong :—

1. *Heredity.* 2. *Age.* 3. *Sex.* 4. *Constitution.*

As regards *heredity*, a disease may be directly inherited, *e.g.*, colour-blindness, hæmophilia, but more often heredity produces diminished resistive power to certain diseases ; thus it often happens that in one family there is a tendency to *tuberculosis*, in another a tendency to *nervous disease*, and so on.

As regards *age*, certain diseases occur more at one age than another. This is due to various reasons, viz. :—

1. *Varying characteristics of the body at different ages.*

Rickets, for example, arises usually *in the first year of life*, but there is a form which arises at puberty. This disease is characterised by certain irregularities in the formation of bone, and its appearance is probably associated with the more active growth of bone at these periods.

In the *middle period of life* the resistive power of the organism is greatest, and the tendency to disease least.

In *old age*, on the contrary, vital force is diminished, the cells and tissues are weaker, and succumb to certain changes and degenerations, and hence diseases peculiar to old age occur, *e.g.*, *hardening of the arteries* (arterio-sclerosis), which predisposes to rupture of the blood vessels (cerebral hæmorrhage, etc.); *emphysema*, due to diminished elasticity in the lung tissues with distension of the alveoli; *cancer*, which seldom arises in young people; *senile degeneration of heart muscle*.

2. The influence of age as a cause of disease is connected also with the different conditions of life at different ages. *Children are apt to suffer from chills* because they run about actively and get overheated. Also their skin surface is large in comparison to their body volume, so that heat is lost more rapidly. *Injuries due to accident are more frequent in adult life*, which is more exposed to such dangers. *Old people* move about less, and are therefore less liable to accidents, but as their circulation and respiration are less active they are liable to inflammation of the lungs and circulatory changes.

3. The so-called *diseases of childhood*, measles, whooping-cough, diphtheria, etc., have a connection with age, as their name implies. The *resistive power to bacteria* is less in childhood (diphtheria and scarlet fever are less common and distinctly less dangerous after ten years of age). Moreover, many of these illnesses, especially measles, are so infectious that most people are attacked by them in childhood, while *those who have once had them are less liable to them again*. This does not apply to diphtheria.

The influence of *sex* as a predisposing cause of disease is due partly to *anatomical and physiological differences*, especially as regards family life, partly to *differences in the mode of life*.

Women's work is largely connected with the home, where constant occupation with innumerable small things may not require so much strength, but tells upon the nervous system, so that neuroses are more common in women. But women who do nothing may also become nervous through pure indolence and lack of satisfying occupation. Those women who go out into the world and earn their living, live, on the whole, under somewhat similar conditions to men, and for them, therefore, the influence of sex as a predisposing cause of disease is only due to anatomical and physiological differences.

As regards constitution, or the condition of the body, it is obvious that a strong, well-developed body is less likely to fall a prey to disease than one that is weak, pampered, or badly developed.

The exciting, determining, or external causes of disease include the following :—

(*a*) The hygienic conditions under which we live.
(*b*) Climate.
(*c*) The effect of very high or low temperatures.
(*d*) Chills.
(*e*) Mechanical injuries (traumata).
(*f*) The effect of chemical irritants or poisons.
(*g*) Bacteria (infectious diseases, suppuration).

(*a*) By "*hygienic conditions*" we mean the conditions under which a person lives in regard to *dwelling, clothing, food* and *work*. If these are not good, they may cause disease in many ways, either directly, by overstrain, *e.g.*, anæmia, or indirectly, by lowering the resistive power of the body, *e.g.*, tuberculosis.

In regard to *dwelling*—

1. It should be *roomy and well ventilated*. A cramped house means an insufficient supply of air, and therefore

poisoning of the body by accumulation of carbonic acid, and by the organic poisonous material excreted. The body is thereby weakened, and its resistive power lessened.

2. The dwelling-place should also be light, because daylight, and still more, sunlight, destroys bacteria. A light dwelling is always cleaner and better cared for than a dark one. Bacteria are got rid of and prevented from multiplying and causing disease. *Light* has, moreover, a cheering effect, and so increases the vitality of the whole body, thus raising its resistive power. It has also been found that tuberculosis is more often present in cramped, dark dwellings.

3. It is also important that the dwelling should be *dry*, because damp causes rheumatism and promotes the growth of bacteria. Arsenical poisoning is also produced more readily in a damp than in a dry house.

4. Lastly, the dwelling should also be *warm*, otherwise the body loses too much heat and its vitality is lowered; but it should not be too warm, or the individual becomes over-sensitive.

Clothing should be such as to *prevent too great loss of heat*, and should, on the whole, be evenly distributed, but the more sensitive organs should be more protected, especially the lungs and the organs of digestion. *Clothes should not impede respiration* or *circulation*, as do tight bodices and garters. They must be *pervious to perspiration*.

Food should be sufficient, not only in quantity, but in quality. It should contain all the food substances required by the body in proper proportion—protein, carbohydrate, fat, salts, water. It should be taken in three or four meals a day, as otherwise the digestive organs are apt to be overworked. *Fresh air* may also be reckoned as food.

Work promotes health and well-being, but too much work

causes overstrain and general weakness, anæmia, etc. If one leads a life as hygienic as possible in other respects, especially as regards plenty of sleep and easily digested food, one can increase one's power of endurance and stand a very large amount of work. Work should not be forced beyond the point of fatigue, but fatigue and indolence must not be confounded.

A good rule for general hygiene is to live *above* one's income as regards house, *according to* one's income as regards food, *below* one's income as regards dress.

(*b*) By **climate** is meant the combination of conditions and atmospheric changes characteristic of a locality, *i.e.*, conditions of temperature, rainfall, humidity, average sunshine and cloudiness, and atmospheric pressure. Climate may cause disease by :—

(*a*) *The temperature conditions.* Too high a temperature may cause general debility and, in extreme cases, *sunstroke ;* too low a temperature may cause *frost-bite ;* marked sudden changes of temperature may cause *chill.*

(*b*) *Dampness,* causing rheumatism.

(*c*) *Encouraging the development of micro-organisms,* which, in turn, cause tropical fevers, ague, etc. Infection is also frequently carried to man by mosquito bites, especially yellow fever and ague.

(*d*) Making open-air life difficult.

(*e*) The influence of atmospheric pressure on the heart and lungs.

(*c*) **The accidental effect of very high or low temperature** may cause injury to organs or tissues, *e.g.*, burns, scalds, frostbite.

(*d*) **Chill** is caused by rapid alternations of heat and cold, or by the effect of cold or draught when the individual is

overheated and perspiring. This may cause illness directly due to the injurious effect of the changes of temperature, or indirectly due to the resistive power of the body being lowered.

(*e*) **Traumata** produce pathological changes, partly by stretching the soft parts beyond their limits of elasticity, partly by severe mechanical irritation due to compression or crushing of the tissues and their cells. Severe mechanical irritation commonly causes inflammation.

(*f*) **Corrosive substances** may destroy the tissues and cells or may produce severe chemical irritation, and consequent inflammation.

Poisons which come into direct contact with the skin or mucous membrane, or which enter the blood, generally produce chemical irritation of the cells and tissues, and produce morbid changes in them, as inflammation and degeneration, in severe cases even destruction (necrosis). Certain cells are more sensitive to certain poisons, *e.g.*, morphia and opium have most effect on the nerve cells. Some poisons, such as phosphorus, arsenic, and bacterial poisons, cause widespread fatty degeneration.

(*g*) **Bacteria** are the cause of the so-called infectious diseases. As a rule they settle in some part where the resistive power of the cells for some reason is lowered. There they multiply and form poisonous substances, which enter the lymph and blood, and are spread over the whole body. The bacteria themselves frequently enter the blood. Sometimes bacteria may enter the blood without causing illness, if the blood serum and cells are sufficiently healthy to prevent their development. But it may happen later that an injury or some harmful condition lowers the resistive power of the cells in some part, and then the bacteria settle there and develop, so that disease results.

Tuberculosis often arises in this way after an injury. The mucous membrane of the nose and throat is a common point of entry for bacteria.

Symptoms.—The functional disturbances which arise as a result of the morbid changes are called the symptoms of the disease, and from these we infer the morbid changes.

Symptoms may be divided into *subjective*, which are experienced by the patient, *e.g.*, pain, fatigue, malaise, nausea, and *objective* (signs), which may also be observed by others, and are discovered on examination of the patient, *e.g.*, swelling, thickening, reddening of the skin, heat, rapidity of the pulse, alterations in the heart sounds or respiration, atrophy due to paralysis, etc.

Examination

Examination aims at discovering all the symptoms. From consideration of these, with the help of experience, the morbid changes may be inferred. We must bear in mind that the patient may be suffering from more than one disease, in which case the symptoms may be complicated and the diagnosis difficult. A fracture, for example, is frequently complicated by a dislocation produced at the same time.

In examining, the following points should first be noted : the patient's name, age, occupation and address. The patient should then be encouraged to relate the history of his illness from the beginning, being helped by questions to remember what he may have forgotten or does not realise ought to be told. By this history one learns the subjective symptoms, and even some of the objective (signs), and finds out what part of the body should be specially examined.

In examination of the organs of locomotion the following procedure is adopted. The part of the body to be examined must be uncovered, and also as a rule, for the

purpose of comparison, the corresponding healthy side. Without touching the patient one begins with *inspection*, observing (*a*) *colour* (redness, bruises, scars, etc.); (*b*) *form* and change of outline (dislocation, fracture, tumour, etc.); (*c*) *swelling* (œdema, effusion, etc.); (*d*) *atrophy* (most frequent in the muscles).

If there is any suspicion of fracture, one examines for the characteristic line of *tenderness on pressure*. If this is found, and the injury is recent, the gymnast should not continue the examination, but send the patient at once to a doctor. Otherwise the degree of functional power may be examined. A gymnast has especially to examine the power of movement in muscles and the mobility of joints. Any limitation must be noted, and whether pain is felt on passive or active movement, or whether cramp or trembling arises. The strength of the muscles should be tested. Finally one examines by *palpation* (touch), and discovers whether the *temperature* of the affected part is normal or raised, whether there is *tenderness* on pressure, whether the *consistence* of the tissues is altered, whether *thickenings* are present. The affected side must be *compared* with the healthy side throughout. Measurements are taken if necessary.

Testing function.—In diseases of the *nervous system* we examine especially the condition of *sensibility*, touch, localisation, pain, temperature and muscle sense, also whether tenderness and thickenings can be found over the nerve trunks. Power and strength of movement are also examined. Every joint of each limb is tested in regard to the movements round the different axes. Movements of the trunk are also examined. The most important *reflexes* are tested, especially the pupillary and the patellar reflexes.

In diseases of the *digestive organs* we feel whether *cellu-*

litis is present in the abdominal walls, whether the *abdominal muscles* are tender and thickened in any part, whether they are relaxed or tense to protect underlying tender parts. We notice whether there is *tenderness to deep pressure*, especially in the region of the stomach, the appendix and in the true pelvis. We also aim at finding whether any *lump or thickening can be felt* in any part of the abdomen. The conditions of *defæcation* are inquired into, especially whether the fæces contain mucus, blood or undigested particles. In *constipation* we note the average interval between the acts of defæcation, and whether the patient needs enemata or other remedies.

In diseases of the *respiratory organs* we inquire whether the patient has a cough, whether this is associated with expectoration, and what is the character of the expectoration. The *shape of the chest* (rachitic changes, long flat shape, etc.) and the *respiratory movements* are also observed, noting especially whether the two sides of the chest take part equally in respiration. The *circumference of the chest* is measured in inspiration and expiration, generally just below the breasts.

In *heart patients* we notice the *colour of the skin*, especially of the face, hands and feet. We watch *respiration* and inquire whether the patient readily becomes short of breath and suffers from palpitation on going upstairs. The *heart's action* is carefully examined, especially the apex beat and the pulse, noting its rate and whether it is weak or irregular. The *patient's general condition* is inquired into, especially whether he feels tired and weak, and whether the feet and legs are swollen by the evening.

In examining the internal organs, a doctor uses many other methods of examination, but for gymnasts the abovementioned are the most important.

The consideration of the symptoms leads us to form a general picture of the disease, which distinguishes it from others. This is to form the *diagnosis.*

The *prognosis* is the estimation of the course and termination of the disease, and is founded on experience. It should always be given with caution, but it is often wiser for the gymnast to avoid the subject.

When the diagnosis is certain the *treatment* is next considered, and it must be decided :—

1. What changes one aims at producing in the body, *e.g.*, improving the circulation in heart disease, breaking down thickenings in chronic muscular inflammation, etc.

2. How these aims can best be accomplished or, if they are impossible, how the symptoms may be relieved.

General Rules for the Arrangement of a Gymnastic Table

First those movements are chosen which have a direct effect on the pathological changes present, *i.e.*, *special exercises.*

In many cases treatment must include the whole body, *i.e.*, a *general strengthening treatment.*

In this we aim at increasing the vitality of the body as a whole, and for this we make use of means—

(*a*) To *increase the supply of oxygen,* and so to increase general metabolism.

(*b*) To *aid the work of the digestive organs*, and thus help the digestion and absorption of food, so that nutrition is improved.

(*c*) To *help the general circulation*, and thus promote the distribution of nourishment to the various parts of the body.

(*d*) To *produce a general increase of activity in the cells*, either by directly stimulating the organs and tissues, by hacking, clapping, stroking, kneading, and such manipu-

lations, or by means of reflex action, by suitable stimulation of sensory nerves, *e.g.*, by back-hacking, general nerve pressures, etc. If the patient's strength allows, active movements are especially effective in promoting metabolism. They should be so chosen that the chief muscles of both extremities and of the trunk are all used in each day's treatment.

When both special and general exercises have been chosen, they are combined to form a table for treatment. The following scheme, drawn up by L. G. Branting, may be used with advantage :—

1. Respiratory movement.
2. Limb movements.
3. Movements for neck and head.
4. Movements affecting the abdominal organs.
5. Movements for chest and back.
6. Limb movements.
7. Respiratory movement.

N.B.—One or two limb movements are often introduced in the middle of the table, so that too many trunk movements do not come together.

N.B.—Each group of limb movements should include movements for the upper and lower limbs.

Both in the choice of exercises and in the arrangement of the table it should be noticed :—

1. That the movements and their strength are *adapted to the strength of the patient.*

2. That the easier movements are placed at the beginning and end of the table, the stronger in the middle.

3. That any *movement or manipulation should not immediately follow one having the same effect.* A common transgression of this rule is to put Stretch-sitting double-Arm-bending - and - stretching immediately after the initial respiratory exercise.

4. That a movement or manipulation designed to act upon the nervous system, or to produce a certain effect by reflex action, *should not be followed immediately by an active movement of the same part of the body.* The desired effect may in this way be partly annulled. Back-hacking or spinal nerve pressures should not be followed immediately by an active back movement, nor stomach-pit-shaking by an active abdominal movement.

5. In the treatment of paralysis, kneading, nerve massage and passive movements precede active movements, in order to increase as much as possible the functional power of the muscles and joints.

6. Special *massage treatment, but not kneading and nerve pressures, should be followed immediately by gentle active movements* of the part treated, in order to increase the supply of fresh blood and nourishment to replace the fluids which have been removed by massage.

7. In the treatment of scoliosis and deformities in general *passive corrective movements should be followed immediately by an active movement,* with as complete a contraction as possible of those muscles which maintain the correct position.

8. The same table should not be used too long without change, but should be varied from time to time, and increased in strength as the patient's strength increases.

Nor should the treatment be suddenly stopped, but should be gradually lessened, so that the patient is gradually accustomed to do without it.

Chapter II

CONDITIONS AFFECTING THE SKIN

Contusion

By contusion or bruise is meant an injury produced by a knock or blow, the skin being unbroken, although the organs and tissues underneath are damaged.

Morbid Changes.—1. More or less complete crushing of the tissues lying under the skin, with consequent rupture of blood vessels and infiltration of blood in the lymph spaces.

2. Acute inflammatory changes owing to the strong mechanical irritation. If the tissues have been severely damaged chronic inflammatory changes frequently arise with thickening and formation of new connective tissue.

Symptoms.—1. Discoloration of the skin, caused by subcutaneous hæmorrhage.

2. Swelling.

3. Heat and pain.

4. Tender thickenings, partly due to infiltration of blood, partly to the products of inflammation.

5. Functional disturbances in the affected organs. Since muscles and joints are most often affected, motor changes, such as limitation of movement, pain on movement, etc., are the commonest result of injury.

Treatment.—1. *Ice* or *cold compresses* frequently changed to promote cooling. These are used so long as the pain is severe; later a *cold compress, which is allowed to become warm*, may be used. The part should be kept at rest.

Ice and *cold compresses* are used because of their soothing effect on sensory nerves, thus relieving pain, and because of their effect in contracting the blood vessels and thus limiting the escape of blood and diminishing congestion and tension in the tissues. A *cold compress which is allowed to become warm* causes expansion of the blood vessels, especially the arteries, so that the arterial blood-stream is increased and the healing process thereby promoted. Hot fomentations may also be used to relieve pain.

2. *Massage* used at once often prevents development of the bruise. At first *effleurage* only is given, preferably two or more times a day; later, when the tenderness has diminished, kneading and *friction* are used. (*N.B.*—If the periosteum is injured, producing periostitis, very light massage is given.)

If the tissues are severely crushed or torn, it is better to wait for a few days before giving massage.

3. Gentle active movements for the part treated, to increase the arterial blood supply.

Chronic Cellulitis or Panniculitis
(Or Chronic Infiltration of the Subcutaneous Tissue)

The **Morbid Changes** in this disease are very little known, but they may be considered as a kind of inflammatory process in the subcutaneous connective tissue, with the changes usually accompanying inflammation.

Causes.—Really unknown. The disease has appeared sometimes after a *chill or shock*, sometimes in *conditions which impair the circulation*. Chronic infection may also be a factor.

This disease is specially common in people who suffer from :—

(*a*) *General debility and anæmia.*

(*b*) In very *fat* people.

(*c*) In persons who wear *tight-fitting garments*, tight bodices, tightly-laced stays, etc.

(*d*) In conjunction with varicose veins.

Symptoms.—1. *Pain and a sense of weight* in those parts of the body where cellulitis is present. The patients are generally sensitive to cold and cannot easily get warm.

2. *A sense of numbness* and cold, sometimes also a feeling of " pins and needles," and other abnormal sensations, so-called paræsthesia, caused by irritation of the cutaneous nerves by the cellulitis.

3. *Tenderness to pressure.* Sometimes the patients cannot bear their clothes.

4. *Tender thickenings in the subcutaneous tissue are common.*

5. Cellulitis is most frequently to be found in the abdominal wall, over the hip, the lower part of the leg and upper arm.

Treatment.—1. Massage and kneading of the skin (*pétrissage*). If there is great tenderness, light effleurage only is given to begin with, and when the tenderness has diminished *pétrissage* is added.

2. Movements to promote the general circulation.

Scars

As already mentioned in Chapter I, all wounds which heal by second intention, do so by the formation of new connective tissue, known as scar tissue. While this tissue is being laid down it may become adherent to deeper structures and is liable to cause pain, limitation of movement, and even deformity.

Scar tissue gradually shrinks and becomes less vascular. The scar, therefore, becomes paler and firmer.

Treatment.—If it is necessary to flex the limb in order to allow the wound to heal, this position should not be maintained too long, or permanent contracture may arise.

Adhesions may frequently be prevented by giving massage and manipulations in the neighbourhood of the wound as soon as possible after healing.

Every effort must be made to loosen the adhesions if the scar has already become fixed to deeper structures, by frictions round the scar and by moving it from side to side, also by muscle contractions performed by the patient while the gymnast controls the scar.

If contracture is already established frequent or continuous passive stretching by means of some surgical appliance will be necessary. The application of heat in any form is helpful. In hard resistant scars massage with oil may be of use.

Ulcer of the Leg

On the lower leg ulcers often arise which will not heal, but instead show a tendency to spread. They are usually found in persons suffering from *varicose veins* or from some constitutional disorder such as diabetes or syphilis, and are caused by slight injuries to the skin, which *do not heal* owing to the *bad circulation and nutrition*, but become *infected* by bacteria, and then go on spreading.

Treatment will consist of measures to improve the circulation, general and local, and to encourage the formation of healthy granulation tissue. Skin grafting may be necessary in very large ulcers. The following local treatment is helpful.

1. *Rest in bed with the leg raised* to help the return of venous blood and to diminish tension in the tissues. The application of hot fomentations helps to promote healing by

producing dilatation of the small arteries and so improving the circulation.

2. To promote circulation and nutrition and thus hasten healing, *effleurage* should be given over the parts immediately around the ulcer.

3. To stimulate the cells and produce a *healing reaction*, gentle *friction* has been given with benefit on the edges of the ulcer, as well as very *fine vibration* directly over the ulcer, the latter being covered by a clean gauze dressing.

4. *Bandaging the feet and legs*, as for varicose veins, has also been effective.

Chronic Eczema

This is sometimes successfully treated by massage, especially effleurage. In each case definite instructions should be given by the doctor. Abdominal massage is indicated.

Frostbite

As the result of *severe cold* (in some people only a few degrees of cold), *cramp arises in the blood vessels of the skin*, so that the supply of blood ceases, and *a white patch* appears. The fluid in the tissues and cells *may actually freeze*. If a patient in this condition goes into a warm room, *the blood vessels dilate suddenly* and marked redness appears. The cells and tissues are damaged first by the chill ; great tension is then produced by the increased blood flow to the tissues while they are only half thawed. The result is mechanical injury, especially to the delicate cells in the capillaries. The irritation is so great that *inflammation*, with all its accompanying changes, is produced *in the frostbitten part*. If the frostbite is severe and of long duration, *gangrene* is often produced, *i.e.*, death of the frostbitten part.

Treatment.—If frostbite is noticed at once, *the frostbitten*

part should be thawed by the application of melting snow, when the tissues will soften gradually. No damage then arises in the capillary walls, and the part quickly becomes normal again.

If frostbite has lasted several hours, the treatment is on the same principles. *The patient should not be taken into a warm room*, but should be treated in a cold hall or outhouse *with melting snow and by cautious kneading*, and *when the tissues begin to soften, by effleurage.* Only when the circulation has been completely restored can the patient be brought into a warm room and put to bed. By such treatment gangrene can often be prevented.

The infiltrations and thickenings in the skin, with consequent redness and tenderness, which arise after mild frostbite, are treated by *effleurage, light friction* and vibration. By the same treatment we try to overcome the sensitiveness and weakness of the blood vessels, with consequent tendency to redness and swelling, which result from frostbite.

Œdema and Lymph-stasis

In connection with *the formation of scars, tumours*, particularly after *operations for cancer of the breast*, and with *great callus formation* after fractures, considerable swelling and œdema often arise in the peripheral parts. This is caused by compression of the lymphatics and obstruction of the flow, so that the lymph spaces become over-filled with lymph.

The **Symptoms** consist of *swelling and œdema*, also of a *sense of weight* in the swollen part of the body, and *limited power of movement.*

Treatment consists chiefly of *effleurage*, which presses the lymph onward towards the heart, and gradually opens up new paths. *Passive and active movements* should also be

given, to promote the circulation and exercise the power of movement. Should scars be the cause of the trouble they ought, as far as possible, to be softened by frictions. If the scar is the result of an operation for cancer, one must remember the possibility of its recurrence in the scar.

Chilblains

Changes.—A superficial dermatitis, generally affecting the toes, the sides of the feet, the fingers or ears.

Causes.—Defective circulation and chill. Common in childhood.

Symptoms.—Patches of dusky redness with itching, tingling, and pain. Begin in winter, and often last till spring. If irritated, skin may break.

Treatment.—Preventive. Warm, loose clothing. Avoid tight boots and gloves. Active exercise, such as running, skipping, dancing. Hand and foot movements frequently repeated are effective. Electricity in various forms has also given good results.

Chapter III

FRACTURES

Morbid Changes.—The continuity of a bone is broken either by force or by crushing.

Causes.—Generally trauma, direct or indirect.

Symptoms.—In a recent fracture :—

1. *Violent pain and rapid swelling of the injured part,* due to bleeding from the ruptured blood vessels of the periosteum, bone substance and bone marrow.

2. *Deformity* of the injured part, generally caused by muscular action on the fragments.

3. More or less complete *inability to use the damaged part.*

4. Linear *tenderness over the seat of fracture* round the bone.

5. *Grating* or crepitation, when the ends of the bones are moved.

6. *Abnormal mobility.*

7. *Shock,* and sometimes even unconsciousness, due to over-stimulation of the nervous system. It is often accompanied by vomiting.

In doubtful cases examination by X-rays should always be employed.

Healing of a fracture takes place in the following way :—

The fracture itself, and the consequent bleeding, produces a persistent irritation in the surrounding tissues, so that a form of chronic inflammation is set up. The bone cells, the cells of the periosteum and neighbouring connective tissue, multiply and lay down intercellular substance, so

that a loose connective tissue, rich in cells, is formed, uniting the broken ends. This is called "*granulation tissue.*" In this process the cells of the periosteum are particularly active. After little more than a week the loose connective tissue becomes firmer, and is then known as "*provisional callus.*" *At the end of the second week, bone salts begin to be deposited* in the form of small granules in the newly-formed tissue, so that it becomes harder. During the third and fourth weeks *it becomes transformed into bone substance*, the new tissue becoming impregnated with bone salts. The central part is gradually absorbed, but the seat of fracture remains surrounded and united by a ring of newly-formed bone, known as "permanent callus," although a great part of it is gradually reabsorbed. In the neighbourhood of the fracture the tissues are infiltrated with blood and thickened as the result of chronic inflammation.

For healing to take place satisfactorily the fractured ends of the bones must be in close proximity, with no intervening tissue, and *must be kept as immovable as possible.* This is secured by fixation in plaster or splints, but as this fixation usually includes one at least of the nearest joints, all movement in it is prevented. The natural condition, however, of a joint is movement, and if this is prevented irritation results, leading to chronic inflammation.

Thus a form of chronic inflammation arises in the joints that are fixed, with consequent thickening of the capsule, and adhesions between the folds of synovial membrane. If the fracture lies close to the fixed joint the inflammation is more severe, owing to irritation from the seat of fracture. The inflammation of the joint may be associated with a dislocation produced at the same time as the fracture.

A *similar inflammation* often arises *in the tendon sheaths*, so that the tendons become fixed. This so-called passive

inflammation produces the *stiffness* and *immobility* in joints so common after fractures.

Muscle atrophy is produced by interference with circulation and nutrition by the pressure of the bandage on the muscles and by their immobility.

To minimise these inconveniences nowadays we try to shorten the time of complete fixation and begin treatment by massage and cautious movements as soon as they can be given without fear of altering the relative position of the bone ends. There is still much difference of opinion among surgeons as to when this treatment should begin.

Treatment should consist of :—

1. Fixation for about eight to fourteen days. Later a movable splint is applied, which is removed daily to allow—

2. *Massage and movements.*

Effleurage is given over the seat of fracture to promote circulation and healing of bone (not to diminish formation of callus).

Friction is also given *in the immediate neighbourhood* of the fracture, to get rid of infiltration of blood and inflammatory products in the soft tissues.

Effleurage and friction are also given *over the stiffened joints and over tendon sheaths*, to counteract the chronic inflammation in them and to get rid of inflammatory products.

Movements are given to *prevent the formation of adhesions, and to stretch adhesions already formed* in the joints and between tendons and their surroundings, both passively and actively and with great caution, the fracture being fixed by the gymnast's hand. The movements should be so given that pain is not produced at the seat of fracture.

If massage and movements are given earlier than fourteen days after the occurrence of the fracture, it is often

advisable that only active movements without resistance should be performed at first, and not to the extent of producing pain, the fracture meanwhile being firmly fixed. Pain prevents the patient performing too large movements.

Lastly, muscle massage (all manipulations) and active movements are given *to strengthen the muscles and to counteract atrophy.*

Incomplete and Greenstick Fracture

An incomplete fracture is one in which the break does not go quite across the bone, one side of it remaining whole.

A greenstick fracture only occurs in the soft bones of children. The bone is partly broken and partly bent.

Causes.—The *healing process* and *symptoms* resemble those of fracture, but the symptoms are less severe. It may be noted specially that—

1. The *tenderness does not extend all round the injured bone*, or at least is less marked on one side.
2. *The functional power is greater.*
3. *There is no crepitus or deformity.*

Healing takes place in the same way as in a fracture, but more quickly, in about fourteen days.

The **Treatment** is like that of fracture, but massage and movements may begin immediately or almost immediately after the injury. Fixation is generally unnecessary.

Delayed Union or Non-union,

owing to absence of reaction to the injury, may be caused by—

1. *General weakness*, old age, anæmia, etc.

2. *Wasting diseases*, as cancer, tuberculosis, etc.
3. *Alcoholism*.

The result is either "fibrous union," when the bone ends are bound together by a mass of connective tissue, or the condition of *pseudarthrosis* or *false joint* may arise, *i.e.*, the two bone ends are united by a ring of connective tissue, but no joint cartilage, synovial membrane, or ligaments are present.

Chapter IV

DISEASES AND INJURIES OF MUSCLES AND JOINTS

OR

Diseases of the Organs of Locomotion

Muscle Inflammation, Myositis, Fibro-myositis.

Morbid Changes.—The usual inflammatory changes are present. In recent and mild cases a serous exudation in the muscle tissue occurs, in more serious cases a sero-fibrinous. In old chronic myositis the connective tissue between the muscle fibres is increased.

Causes.—1. *Rheumatic* influences such as chill, draughts, etc.

2. *Trauma,* such as a *knock, blow, or sprain.*

3. *Over-fatigue of muscle,* probably because the products of combustion accumulate to an extent sufficient to produce irritation and inflammation.

4. *Strong and sudden contraction of muscle,* causing partial rupture of fibres and over-stretching of muscle, with strong mechanical irritation.

Symptoms.—1. *Pain and aching* in the affected muscles. Sometimes there is aching in other parts due to irritation of a nerve by the swollen and inflamed muscle, so that pain (neuralgia) arises over the region supplied by the nerve, *e.g.,* sciatica caused by inflammation in the hip muscles. The inflammation may also *extend to the nerve,* and cause a true *neuritis.*

2. *Swelling of muscles.*

3. *Diminished elasticity*, so that all movements, both active and passive, which stretch the affected muscles are painful and limited, *e.g.*, pain and difficulty in bending forward when there is inflammation in the gluteal or back muscles.

4. *Tenderness on pressure.*

5. *Altered consistence.* In recent myositis the consistence is doughy, in other cases it is firmer.

6. *Functional disturbances :—*

(*a*) *Diminished power* and pain on those active movements in which the damaged muscles take part.

(*b*) *Irritative symptoms*, as *cramp* or *tremors*, *e.g.*, writer's cramp.

Treatment.—1. *Massage.* In recent cases rest and light massage, consisting chiefly of effleurage. In more chronic cases stronger massage is given, using all manipulations, especially frictions. This aims directly at breaking up the products of inflammation, and at producing a reaction which promotes the healing process.

2. *Gentle active movements*, to produce an increased supply of blood to the muscles treated, and so to replace the lymph removed by massage.

Dupuytren's Contracture

Chronic inflammation of the palmar fascia, which becomes thickened and contracted, causing deformity of the hand. The contraction most commonly affects the ring and little fingers, which may become so strongly flexed that the fingers are pressed into the palm.

The **causes** are uncertain. Men are affected more often than women, and it is said to be associated with rheumatism and gout. Repeated hard pressure with tools or other

objects pressed against the palm appears to be responsible in some cases.

Treatment.—Operative treatment is generally necessary, and should be followed by massage, passive stretchings and active movements for the extensors of the fingers to prevent relapse.

Inflammation of Joints

Inflammation of joints may from a practical point of view be divided into two main groups :—

A. *Traumatic.*—Caused by external injury, blows, knocks, sprains.

B. *Bacterial.*—Caused by bacteria.

A further division may be made according to the extent of the inflammation into :—

A. *Synovitis.*—Inflammation of the synovial membrane.

B. *Arthritis.*—Inflammation in all parts of the joint.

Traumatic Synovitis

Morbid Changes.—The usual changes of acute inflammation occur, but since the inflammation is in a synovial membrane the exuded fluid collects partly in the lymph spaces of the capsule, partly in the synovial cavity, which becomes distended. The exuded fluid is, as a rule, *purely serous, i.e.*, clear, resembling blood serum, and without fibrin. In more severe cases it may even contain *blood* from ruptured blood vessels.

Causes.—1. *Contusion, i.e.*, a *blow or knock* on a joint.

2. *Severe over-stretching of the capsule and ligaments* by a *sprain* or *dislocation.*

In a **sprain** the articular surfaces of the joint are momentarily separated by some injury, but immediately return to

their normal position, as in a sprained ankle. The capsule and many of the ligaments on one side of the joint are, of course, more or less severely over-stretched, and if the force is great the blood vessels are often ruptured.

In a **dislocation** the articular surfaces are separated and remain in the bad position. In this case, besides the severe over-stretching of the capsule and ligaments, there is deformity of the joint.

Symptoms.—In a traumatic synovitis, as in any inflammation of joints of whatever kind, certain symptoms occur which may be called the "*general symptoms of inflammation in a joint.*" These are :—

1. *Pain and aching* in the affected joint.

2. *Swelling.*

3. *Limitation of movement.*

4. *Pain both on active and passive movement*, at least towards the limit of the movement.

N.B.—If the muscles only in the neighbourhood of a joint are affected, and not the joint itself, the pain will be greatest in active movements in which the affected muscles work, and in those movements, both active and passive, which stretch them, but not in those passive movements which produce no stretching of the damaged muscles, so long as they are not pressed upon. Sprain of a joint is often accompanied by sprain of the muscles. If active movements are much more limited and painful than passive movements, the seat of injury is generally in the muscles.

5. The *temperature* over a joint is often raised, sometimes even the skin is more or less red.

6. *Tenderness and thickening* in the joint capsule and soft parts around the joint.

7. *Fluctuation* is often observed. It is caused by distension of the joint cavity by the exuded fluid.

Fluctuation is most easily demonstrated by pressing lightly with the thumb and forefinger of one hand on the joint, while the fingers of the other hand alternately press and relax on another part of the joint. The movement of the fluid can be felt by the fingers of the resting hand, which are often lifted by it. This is most readily felt in effusion into the knee joint.

8. *Atrophy of muscle* appears as a rule if the inflammation lasts a couple of weeks or more.

The symptoms specially characteristic of traumatic synovitis are :—

1. The *pain* in the joint and other symptoms often *do not arise immediately,* but frequently an hour or more after the injury. This is especially the case in sprains, and is due to the inflammation taking some time to develop.

2. *Bruising,* due to hæmorrhage.

3. *Deformity* of the joint in *dislocations.*

4. *Tenderness* is greatest over the parts directly injured, or over the ligaments and part of the capsule which have been most severely stretched.

If the injury is not treated, or badly treated, or is very severe, the acute synovitis becomes **chronic,** and the following **morbid changes** arise :—

1. *Thickening of the capsule and roughening of the inner surface of the synovial membrane.* The latter is the result of the increase of the connective tissue and cells of the synovial membrane, which accompanies chronic inflammation. The roughening of the synovial membrane often increases so as to form fringe-like projections, " fringing of the synovial membrane."

2. *The exudation in a joint often becomes chronic, i.e.,* it persists obstinately (hydrarthrosis).

The symptoms of chronic inflammation of a joint are like

those of acute inflammation, but less severe. The most distinctive are :—

1. *Weakness in the joint*, which becomes easily tired, and *pain* starting after the joint has been moved for a short time.

2. *Stiffness in the joint*, when it has been at rest for some time.

3. *Thickenings in the capsule and synovial membrane.*

4. *Atrophy of muscles.*

5. Frequently *creaking in the joint on movement.*

Capsulitis is a more or less *limited thickening* in a joint capsule. It is a *chronic inflammation without exudation*, and is, as a rule, *the remains* of some joint trouble. It has the same symptoms as chronic inflammation of a joint, but these and the functional disturbances, especially *weakness in the joint*, are usually *very marked in proportion to the changes which can be felt.* Capsulitis often arises two to three weeks or more after an injury to a joint. The patient has therefore frequently forgotten the injury, and so can assign no cause for his trouble. This adds to the difficulty of diagnosis.

By suitable massage treatment capsulitis is cured with comparative ease, if it is discovered, which is not very difficult if the possibility of its presence is borne in mind and the joint is carefully examined.

The **Treatment of acute traumatic synovitis** consists of :—

1. *Icebags or cold compresses* during the first twenty-four hours to limit effusion. *When the pain has disappeared*, the cold compress is allowed to remain on till it becomes warm. After four or five days this latter compress is used only at night, and the joint is bandaged by day.

Hot fomentations may be used from the beginning to promote circulation and relieve pain.

N.B.—A dislocation must first be reduced and the part suitably supported for one or two weeks.

2. *Massage.* If *severe* crushing or tearing of soft parts has occurred, or if there is any damage to bone, effleurage only should be given until recovery is so far advanced that the worst pain and tenderness has disappeared. In such cases it is often an advantage to keep the joint fixed for a week by a splint or bandage. Later, as the marked tenderness diminishes, *friction* is also given, first very lightly, then more strongly.

3. *Movements* are not given during the first three or four days if the injury is very severe, because they increase the flow of blood and the tension in the damaged tissues, and because by stretching they may interfere with the healing process. But later gentle active and passive movements are given. (*N.B.*—The movements are always given *within* the limit which would cause pain, and in cases of dislocation that movement is given last which would tend to reproduce the deformity.)

Chronic synovitis and capsulitis are treated *by deep massage, friction and tapôtement* being the most important manipulations. Passive and active movements are also given, and massage of the atrophied muscles. If improvement is slow and there is little or no tenderness, one may try *to make the inflammation more acute* by strong tapôtement, and so aid the breaking down and absorption of thickenings.

Passive movements have a special value. They perform an internal massage of the joints, and of many parts which are not directly accessible to the ordinary massage manipulations.

Bacterial Synovitis

Morbid Changes.—1. The changes are *like those found in traumatic synovitis* (see p. 37), if the bacteria are *not*

highly virulent, e.g., in a mild form of acute rheumatic inflammation.

If the inflammation becomes chronic, thickenings in the capsule and synovial membrane arise, like those in traumatic synovitis, but usually more marked.

2. If the bacteria are of a *more virulent type*, the inflammatory changes are more severe, and the exuded fluid becomes, according to their kind and degree of virulence, more or less *mixed with fibrin*, so that it is cloudy, and fibrin is deposited on the inside of the capsule. In a *highly virulent bacterial, i.e., septic*, inflammation, *pus* is formed in the joint. According to the character of the exuded fluid the synovitis is then called :—

(1) *Serous*, when the exudation is clear and without fibrin.

(2) *Sero-fibrinous*, when the exudation is mixed with fibrin.

(3) *Fibrinous*, when the exudation contains much fibrin.

(4) *Sero-purulent*, when the exudation contains a little pus.

(5) *Purulent*, when the exudation contains much pus.

When the exudation is sero-purulent or purulent, it always contains fibrin.

If the condition becomes chronic the fibrinous deposit on the inner surface of the capsule becomes organised by the growth into it of endothelial cells and blood vessels from the synovial membrane. White corpuscles wander out from these blood vessels, and along with the endothelial cells multiply and lay down intercellular substance, so that the fibrin becomes transformed into connective tissue. This contracts later, and binds together the folds of the capsule and the ends of the bones, so that the joint may become quite immovable, "anchylosed."

Symptoms.—Acute rheumatism or rheumatic fever is a

good example of a comparatively mild bacterial synovitis and its symptoms. It is caused by bacteria which gain entrance to the body by the mucous membrane of the throat and there produce inflammation. They are thence carried into the blood and establish themselves preferably in the synovial membranes of joints and in similar tissues, such as the pleura or pericardium, which seem to afford them a suitable culture ground.

They produce first an acute inflammation in the synovial membrane and capsule, but they are not generally sufficiently virulent to overcome the white corpuscles, and these are often unable to overcome the bacteria. In this case neither resolution nor pus formation takes place, but after a longer or shorter time the inflammation becomes *chronic.*

The characteristic symptoms of rheumatic synovitis are :—

1. *The general symptoms of inflammation of a joint* (see "Traumatic Synovitis," p. 37). But these symptoms are *very acute,* and as a rule attack sveral joints.

2. The skin over the affected joints is generally red.

3. Fever is present, and is generally moderate, about 101 degrees. In other bacterial inflammations it may be high, 104 degrees or more.

Treatment.—1. As long as there is inflammation and fever no massage or movements must be given.

2. If the inflammation becomes chronic, *i.e.*, when the fever is over and the symptoms have lessened, *massage and movements* are given on the same principle as in chronic traumatic synovitis. The strength of the treatment is regulated by the degree of tenderness.

After a severe rheumatic inflammation, when the changes in the joint, and more particularly the thickenings around it, are marked, intensive and long-continued treatment is necessary. This requires great patience both on the part

of the gymnast and of the patient. In such cases other methods of treatment are often necessary, such as hot air treatment, orthopædic apparatus, forced correction, etc.

If true anchylosis has taken place, *i.e.*, if the ends of the bone have grown together, massage and gymnastics need not be attempted. But if there is so-called "false anchylosis," *i.e.*, immobility produced by muscular action to avoid the pain of movement, the prognosis is better. The slightest movement in a joint, or even pain on attempted movement, denotes that true anchylosis is *not* present.

Chronic Rheumatism of Joints

Morbid Changes.—1. *Chronic inflammatory changes in the capsule like those found in chronic traumatic synovitis, i.e.*, exudation into the joints, generally definite thickening of the synovial membrane, capsule and soft parts round the joint. These changes in the capsule are generally more prominent than the changes in bone and cartilage.

2. *Chronic inflammatory changes may occur also in the ends of the bones and the cartilages*, consisting partly of increase of cells, thickening and formation of connective tissue, partly also of destruction of cartilage in small areas. The greatest changes are usually found at the edges of the cartilages.

Causes.—A preceding acute rheumatism which has become chronic and has extended to the ends of the bones and cartilages.

Symptoms.—The "general symptoms of inflammation of a joint" (see "Acute Traumatic Synovitis," p. 37).

The special symptoms characterising chronic rheumatic arthritis are :—

(*a*) *Several joints* are usually affected.

(*b*) The soft parts round the affected joints are definitely thickened.

(*c*) *The joints ache even when at rest*, therefore also at night. In fact, it is often worst then.

(*d*) *Sensitiveness to bad weather*, especially to changes in the weather.

(*e*) *Recurrences* of the *acute* attack may occur.

Treatment.—Treatment is the same as in chronic traumatic synovitis (see p. 41), but the result is always uncertain. The trouble can, however, generally be relieved, and sometimes the result is excellent. The best result is obtained by combining with massage and gymnastic treatment hot baths, or better still, hot air baths. If recurrence of the acute attack takes place treatment is left off till it again becomes chronic.

Arthritis deformans

(*Osteo-Arthritis, Rheumatoid Arthritis*)

Morbid Changes.—1. At first similar to those in chronic rheumatism of a joint, namely, thickenings in the joint capsule and ends of the bones.

2. It is, however, specially characteristic of the disease that *the greatest changes are found in the ends of the bones and cartilages.* The ends of the bones as a whole are noticeably thickened and roughened by formation of new tissue, while the joints become *deformed* by the processes of destruction and new formation taking place simultaneously in different parts.

3. The synovial membrane and ligaments are thickened.

4. The muscles are wasted.

5. There may be complete anchylosis.

Causes.—1. Middle age.

2. Fracture and other injury of the joint or in its neighbourhood.

3. Cold and damp.

4. Poor food.

5. More common in women.

6. Sepsis, especially of teeth.

7. Chronic constipation and other digestive disturbances.

Symptoms.—1. The "general symptoms of inflammation of joints" (see "Traumatic Synovitis," p. 37), especially pain, stiffness, creaking, or even grating on movement.

2. The symptoms are *worst in the morning*, getting better as the day goes on and the joints are moved.

3. Recurrent acute attacks may occur.

4. *Thickening of the ends of the bones.*

5. *Deformity of the joints.*

6. Wasting of muscles.

7. Digestive disturbances and constipation.

Two chief varieties are found. In the commoner form chiefly the small joints, especially the metacarpo-phalangeal joints of the hands and feet, are affected. This sometimes develops from chronic rheumatism.

In the other the large joints are chiefly affected, especially the hips and shoulders.

Treatment.—1. Massage, especially friction *over the thickenings in the joint capsule* and its surroundings.

2. Muscle-massage (all manipulations) of the weak and atrophied muscles.

3. It is especially important to improve and *maintain mobility of the joints* by passive and active movements, especially pendulum movements, as leg or arm swinging, which the patient is taught to do alone several times a day,

partly to produce internal massage of the joint, partly to stretch the soft parts. Treatment cannot usually accomplish much, but the symptoms can at least be relieved and the progress of the disease delayed.

4. Abdominal massage promotes nutrition and delays the progress of the disease.

N.B.—The prognosis is better in the early stages of the disease.

Dry Arthritis of the Knee Joint (*Arthritis Sicca*).

In elderly women, most frequently in those who are stout, a characteristic arthritis is often met with in the knee joint, which demands a special name. Since it is not generally associated with exudation, it has been called "*Arthritis sicca.*" Creaking is nearly always felt on passive movement.

Morbid Changes.—1. Chronic inflammatory changes, *i.e.*, thickening of the capsule and synovial membrane, generally roughening and fringing of the latter, and *no* exudation into the joint. The marked fringing along with the absence of exudation are specially characteristic.

2. Similar changes to those of chronic rheumatoid arthritis in the ends of the bones and cartilages, but less marked.

Causes.—Not rheumatism, but probably a *disturbance of nutrition in the joint due to bad circulation.* It is found most in stout elderly women, especially in those who also suffer from cellulitis, or varicose veins, or both. A source of sepsis should always be looked for.

Symptoms.—1. The trouble generally begins with *aching*, first in one knee, then in both, but in no other joints.

2. *Stiffness in the affected joints*, especially when the patient has been sitting still for some time.

3. *Pain* after continued walking.

4. Sometimes *sudden pain with temporary locking of the joint*, as in the case of a foreign body, due to a piece of the fringed synovial membrane being caught between the joint surfaces.

5. The joints often look thick and clumsy, due to thickening of the skin (especially of the fatty layers), and of the other soft parts round the joint.

6. *Fine creaking* in the joints on passive movements.

7. *Mobility* of the joint is only very slightly limited, but its *strength* is often impaired.

8. Thickenings in the capsule and roughening of the synovial membrane.

Treatment.—*Massage over the joint*, preceded by local application of heat. Effleurage, and especially deep friction, combined with *passive and active movements*, knee-pumping, flexion and extension. Prolonged knee-pumping is given to produce " internal massage " of the joint.

If necessary, *massage for cellulitis* is also given, and cautious effleurage over any varicose veins which may be present ; also *kneading of thigh muscles*.

These patients usually require *general treatment* which aims at *improving the general circulation and metabolism*. It is better that they should become thinner.

The result is usually *distinct improvement*, but the treatment is long, eight to ten weeks, and has to be repeated, as a rule, every year.

Tuberculosis of Joints

This is a chronic inflammation of a joint due to the presence of the tubercle bacillus.

Morbid Changes.—1. As in other chronic inflammations of joints, there is thickening and roughening of the synovial

membrane, but it is *characteristic* of tuberculous inflammation that the roughening of the synovial membrane makes it thick, slack and spongy. These are sometimes called *fungoid* granulations.

2. There is often chronic inflammation of the ends of the bones which does not generally lead to new formation of bone, but to *destruction of bone substance*, caries.

3. Destructive processes also take place in the articular cartilages.

4. Pus is sometimes formed, either in the joint or in the ends of the bones. The pus generally finds its way to the surface, so that long sinuses are formed.

5. The soft parts around the joint are often thick and firm (white swelling).

Causes.—1. Tubercle bacilli, which generally come from some other part of the body, as a tubercular focus in a lymphatic gland, get into the circulation, and owing to some special condition settle down in a joint to multiply.

2. Lowered resistive power, often due to injury, such as fracture, contusion, sprain.

Symptoms.—The "general symptoms of inflammation of a joint." See "Traumatic Synovitis" (p. 37).

The characteristic symptoms of a tuberculous joint are :—

1. It *arises insidiously*, and generally affects only *one* joint.

2. *Pain and aching* come on after movement, but *not when the joint is at rest.*

3. *Tubercle* is often present *in other parts of the body.*

4. *The tenderness is generally greatest in the plane of the joint.*

5. Pain on tapping the ends of the affected bones.

6. The early appearance of marked atrophy of muscle.

7. *It is not improved by massage.*

8. *Fever*, generally slight, is often but not always present.

Treatment.—Tuberculous joint affections should not be treated by massage and gymnastics. They are generally treated by immobilisation in plaster. Three to six months after the inflammation has subsided massage and movements may be given to mobilise the joint, and muscle massage to strengthen the atrophied muscles.

N.B.—Great care must be taken in these cases, especially as regards movement, since bacteria which have become encapsuled may be set free by forced movement, and thus give rise to fresh inflammation.

Inflammation in Tendon Sheaths (*Teno-synovitis*) and in Bursæ (*Bursitis*)

Tendon sheaths and bursæ are similar to joint capsules in structure, and, like them, are lined with synovial membrane. Inflammation in these structures *resembles synovitis as regards both changes and causes.* We distinguish as before between *traumatic* and *bacterial* inflammation. A few special cases may be taken.

Traumatic Teno-synovitis

Morbid Changes.—Inflammatory changes in a tendon sheath, or in the surroundings of a tendon, like those present in traumatic synovitis. The exudation often contains fibrin which is deposited on the inner surface of the tendon sheath.

Causes.—1. *Strain* of a muscle or muscle-group, especially by *unaccustomed work.*

2. Forced *stretching* of a tendon.

Symptoms.—1. Teno-synovitis frequently occurs on the

dorsal surface of the forearm and around the Tendo-Achillis.

2. *Pain on movement*, in which the affected tendon takes part or in which it is stretched.

3. *Cord-like swelling* over the affected tendon.

4. *Tender thickening* of the tendon and its surroundings.

5. *Crepitation on movement* in many cases, due to the rubbing of the roughened surfaces against each other (teno-synovitis crepitans).

Treatment.—*Rest. Cold compresses allowed to become warm. Massage.* At first gentle *effleurage*, later, deeper effleurage, with *friction* and *gentle active movements.*

Hydrops.—A chronic inflammation is occasionally found in connection with the sheath of the common flexor tendon on the palmar surface of the wrist. The synovial sheath is distended with fluid. Melon seed bodies are formed from the fibrinous material lining the sheath. The sheath is thickened by the growth of tuberculous granulation tissue. This condition must, therefore, not be treated by massage.

The so-called *passive chronic teno-synovitis*, due to long fixation, has already been spoken of in connection with fractures.

Suppurative Teno-synovitis

Morbid Changes.—The changes are like those which occur in formation of pus elsewhere. Any tendon sheath may be affected, but most frequently the tendon sheaths on the palmar surface of the hand or forearm are attacked. Since the tendon sheaths of the thumb and little finger are connected with the common tendon sheath at the wrist, a purulent inflammation beginning in either of these fingers may spread to the other fingers and up into the forearm, while purulent inflammation in any of the three middle

fingers generally remains limited to that finger, and does not reach beyond the middle of the hand. Pus may break through the tendon sheath and spread in its surroundings, and in severe cases may produce necrosis of the tendon.

Scarrings and adhesions are formed during healing, which bind down the tendon to its surroundings, and by subsequent contraction may produce great limitation of movement.

Causes.—Frequently small injuries to the skin, by splinters, nails, spikes, or other sharp objects, by which bacteria gain entrance and cause suppuration, which spreads to a tendon sheath.

Symptoms.—The symptoms characteristic of pus formation in the acute stage are marked redness, heat, pain, extreme tenderness, swelling and fever. In this stage only surgical treatment comes under consideration. When healing is complete or well under way the patient may be treated by massage and gymnastics, and the symptoms then to be considered are scar formation, as already mentioned, and contractures in the joints and limitation of movement caused by scars.

Treatment.—Mechano-therapeutic treatment, as already stated, is not applicable until inflammation has ceased. The aim of treatment then is to break down any inflammatory products and to stretch adhesions between the tendon and its surroundings. For this purpose *strong continuous frictions* are used on the scar and any thickenings, and *prolonged stretchings* by *passive movements*, while the strength of the muscles and their power of movement are improved by *muscle massage*, and by *exercises progressively increased in strength*, which also stretch the adhesions. Stiffness in other joints due to fixation and long-continued immobility must also be treated.

The treatment is, however, very long and trying, sometimes lasting six, eight, or ten months or more.

N.B.—If the tendon sloughs or becomes separated there is no object in increasing mobility by stretching.

Pre-patellar Bursitis (*Housemaid's Knee*)

Morbid Changes.—Inflammatory changes occur in the pre-patellar bursa similar to those in traumatic synovitis.

Causes.—1. A *knock or blow* on the knee-cap.

2. Much kneeling :—in scouring, etc.

Symptoms.—1. Pain.

2. *Tension and stiffness of the joint.*

3. A *rounded limited swelling* in front of the knee-cap.

4. No tenderness or thickening in the joint capsule, nor pain in the joint itself on movement.

Treatment.—In quite recent cases treatment by massage may be tried. In a case of rather longer duration, but with the walls of the bursa not much thickened, the bursa may be ruptured, and effleurage and friction then given to get rid of the inflammation and break up its products. In *chronic* cases with marked thickening in the walls of the bursa massage is of no use, and operation is necessary.

A similar bursitis is often found in the bursa over the olecranon.

Bursitis in the Neighbourhood of the Shoulder

Morbid Changes.—Inflammation in one or more bursæ, with changes like those found in acute serous synovitis (bacterial or traumatic).

Causes.—1. *Rheumatism.*

2. *Infection, e.g.,* influenza.

3. *Trauma and over-strain.*

Symptoms.—The symptoms resemble those of an acute

synovitis of the shoulder joint, *i.e.*, the general symptoms of a joint inflammation, but the swelling and tenderness are *limited to the affected bursa*, while those movements which cause pressure on, or stretching of the bursa, especially abduction, are most limited and painful. There is no tenderness of the joint capsule. The bursa at the upper and outer part of the arch of the shoulder, between the skin and the acromial process, appears the most prone to inflammation.

Treatment.—At the most acute stage, especially if fever is present, no massage should be given. Later *light effleurage* may be given, and when the tenderness has lessened friction and movements.

N.B.—If hard massage is given the symptoms are not relieved but increased.

Ganglion

This is a lump about the size of a hazel nut or walnut, which sometimes occurs in the neighbourhood of certain joints, most frequently on the back of the hand. These swellings consist of a sac of connective tissue, usually distended by a glairy fluid. They are formed by the distension of congenital sacs, when the secretion is for any reason increased, *e.g.*, by irritation due to strain, over-stretching, a blow, or other injury. According to recent research (by Dr. Björn Floderus) these sacs appear to be parts of the mass from which the joint is formed, and which for some reason during fœtal life have strayed into the part immediately around the joint.

Treatment.—No massage. Sometimes rupture of the ganglion is of use with gentle massage afterwards to get rid of the inflammatory reaction, but recurrence is common, and operation is best.

Chapter V

DEFORMITIES

A **deformity** is a *congenital or acquired fault of position in the skeleton or motor apparatus, e.g.*, spinal curvature, flat-foot, club foot, etc.

In each of these deformities there is found as a rule shortening of certain muscles and soft parts, and lengthening and weakening of their antagonists. In most cases, especially if the deformity has lasted for any length of time, changes in the shape of the bones are found.

Besides the obvious and sometimes unsightly alterations in form, deformities are frequently accompanied by functional changes in the motor apparatus, which are often very troublesome to the patient.

In the treatment of a deformity the first aim is to *restore the faulty position to normal*, but in addition to this the patient must endeavour *to maintain the correct position*, and to *regain power by exercise of the normal functions.*

To restore a faulty position to normal, correcting movements are used in the slighter cases. These produce a strong and long-continued *stretching of the shortened muscles and other soft parts.* In more severe cases special orthopædic apparatus must be used, sometimes also forced correction with or without cutting of soft parts and crushing and remoulding of bony parts, for example in severe club foot. Section of tendons and other more or less extensive operations may be necessary.

To enable the patient to maintain the corrected position muscle massage is given to strengthen the corresponding

muscles, as well as *active movements with strong muscle work in the inner path of the range of movement for those muscles which are lengthened by the deformity.* Fixation apparatus may be necessary in certain cases.

To restore *normal functional power*, the normal movements of the part are practised, maintaining the corrected position as far as possible.

Even when orthopædic apparatus or operative treatment is employed, massage and gymnastic treatment is generally necessary to counteract the muscle atrophy due to fixation, as well as to enable the patient to maintain the corrected position and to increase functional power.

Postural Activity.—Sherrington demonstrated that the upright posture depends upon continuous reflex muscular activity. This activity is a reflex dependent upon nervous impulses from the muscles themselves, and has been demonstrated only in those muscles which are constantly resisting the influence of gravity. It can be maintained for long periods without fatigue.

Bankart teaches that this reflex may be inhibited by overwork, worry or other mental causes, and that it is to this failure of postural activity that such static deformities as scoliosis, kypho-lordosis, flat foot and knock knee are sometimes due.

The object of treatment in this type of case, if the deformity is not fixed, is to re-educate the postural reflex by means of simple free exercise.

Flat Foot (*Pes Valgus*)

Morbid Changes.—1. *Lowering of the arches* of the foot and of its inner border, with eversion.

2. *Lengthening of the ligaments* of the sole of the foot, especially the inferior calcaneo-navicular ligament.

3. In more advanced cases *deformity of the bones* of the foot, especially lengthening of the neck of the astragalus, and of the plantar aspect of the bones in the arch of the foot.

4. Inflammation in certain ligaments, joint-capsules, muscles and bones occurs in most cases, due partly to stretching, partly to pressure.

(*a*) The ligaments and joint-capsules of the sole and inner border of the foot are liable to over-stretching, and therefore become inflamed.

(*b*) The muscles of the sole of the foot and the muscles of inversion are strained in the attempt to resist the over-stretching of the ligaments and joint-capsules, and so become inflamed.

(*c*) In severe cases, the bones of the dorsum of the foot are pressed so firmly against each other by the lowering of the arch that irritation and inflammation are produced.

These inflammatory processes are often the only obvious changes, and constitute a premonitory stage of the deformity. This stage may be called *weakness of the foot*, *i.e.*, failure of the supporting power of the arch of the foot.

Causes.—1. *Excessive body weight.*

2. *Long-continued or heavy weight-bearing on the arch*, *e.g.*, in people who carry heavy weights, or who stand or walk much in their work, as waiters, bakers, shop assistants and nurses.

3. *Weakness of the arch of the foot*, and of the other supporting parts. This may be due to:—(*a*) *Rickets* (during the first year of life or at puberty). (*b*) *General weakness.* (*c*) *Inflammatory changes*, produced by trauma or rheumatism.

Symptoms.—1. *Pain in the foot*, often extending up the leg. This is caused by inflammation in the ligaments, capsules, bones and muscles. In many cases it is the only

obvious symptom. These pains are increased by much walking and standing and are generally worse in the evening. In some cases, however, patients say they are worse in the morning and better after a little walking, as in an ordinary joint inflammation, when the joint is first used after resting.

2. *Prominence of the inner border of the foot* caused by projection of the head of the astragalus owing to lengthening of its neck.

3. *Lowering,* or complete flattening, *of the arches of the foot.*

4. *Eversion of the foot,* sometimes accompanied by lessened power of inversion.

5. Tenderness over certain definite points due to the above-mentioned inflammatory processes :—

(*a*) *In the muscles of the sole of the foot and in the deep-lying ligaments.* The muscles and soft parts are also felt to be thickened and infiltrated.

(*b*) *In the muscles of inversion* on the back and front of the leg.

(*c*) *Along the under-surface of the inferior calcaneo-navicular ligament,* behind the tubercle of the navicular.

(*d*) In the *joint capsule at the inner side of the talo-calcaneal joint,* just below the tip of the inner malleolus.

(*e*) At the *outer side of the talo-calcaneal joint,* just below the tip of the outer malleolus, due to the edges of the articular surfaces being pressed against each other by the everted position of the foot.

(*f*) For the same reason there is often tenderness *on the dorsal surface of the foot,* at the outer part of the talo-navicular joint, also over the calcaneo-cuboid joint, and sometimes over the cuneo-metatarsal joints.

Treatment.—1. Of *the causes,* if possible. Therefore :—

(*a*) *Decrease of the body weight.*

(*b*) *Lessening of work.* The patient must avoid much standing and walking. In severe cases the patient must go to bed for two or three weeks with the foot in an over-corrected position, possibly in plaster.

(*c*) *General strengthening*, often along with *anti-rheumatic treatment.* Hot air treatment and massage.

2. *Inflammation* is counteracted by *massage* of the muscles of the sole of the foot and the invertors, and of the stretched ligaments and joint-capsules.

3. *Support for the arch* by a pad or support in the shoe.

N.B.—At first the pad or support must be left off for a couple of hours or more at a time, because of the pain produced by its pressure on the inflamed muscles and soft parts. This is relieved by massage.

4. Lastly, *the invertors should be strengthened and exercised* by active movements, especially by inversion of the foot. The plantar flexors, the invertors and the short muscles of the foot should be made to act in strong shortening, that is, in the inner range of their path of movement, so that they may be shortened, and their tone improved, and that they may thus help to support the arch of the foot and counteract the tendency to eversion. In all cases it is advisable to make the patient practise walking on the outer edge of the foot, and other home exercises.

Pes Cavus

An exaggeration of the normal longitudinal arch of the foot.

Causes.—1. Heredity may be a factor.

2. Habitual wearing of high-heeled shoes.

3. Some nervous diseases, *e.g.*, Friedreich's ataxy, perineal muscular atrophy, etc.

Morbid Changes.—The plantar fascia is contracted.

The Achilles tendon may be shortened.

The toes are hyperextended at the metatarso-phalangeal joints and flexed at the interphangeal joints.

Corns develop on the dorsum of the toes and beneath the heads of the metatarsals.

Treatment.—In early cases much may be done by massage and stretching of contracted tissues. Operative treatment may be necessary in more advanced cases, followed by massage and passive stretching.

Low-heeled shoes or sandals with slots to enable the toes to be strapped down are helpful.

Club Foot (*Talipes*)

Morbid Changes.—The relation of the tarsal bones to each other and to the bones of the leg is altered. The bones are held in their abnormal position by contraction of muscles, ligaments and fasciæ, and sometimes by alteration in the shape of the bones. The deformity may be congenital or acquired.

Varieties.—1. **Talipes varus.** The foot is inverted. Patient walks on the outer border.

2. **Talipes valgus,** position of flat foot.

3. **Talipes equinus,** heel drawn up, patient walks on ball of toes. Result of infantile paralysis, bad setting of fracture or any lesion affecting the anterior tibial nerve.

4. **Talipes calcaneus,** front of foot drawn up, patient walks on heel.

5. Combinations of these forms, as **equino-varus.** This is the commonest form of congenital club foot.

Talipes Varus (Congenital)

This is characterised by a position of marked inversion of one or both feet.

Morbid Changes.—1. *Malposition or malformation of the foot, especially of the os calcis and astragalus*, possibly caused by pressure of the wall of the uterus during fœtal life pressing the foot into a markedly inverted position. The anterior process of the os calcis is unusually large and developed. The outer part of the neck of the astragalus is considerably lengthened, while its inner part is shortened. The outer part of the articular surface of the navicular is lowered, so that the whole talo-navicular joint lies obliquely.

2. *Shortening of the ligaments on the inner side of the foot and of the muscles of inversion*, with lengthening of the ligaments on the outer side, and of the muscles of eversion.

Causes.—1. Heredity.

2. Intra-uterine pressure on the foot in an inverted position, as above mentioned. It is thought that this may be connected with an insufficiency of liquor amnii.

Symptoms.—1. *The foot is strongly inverted* and adducted. In neglected cases the sole may be directed backward.

2. In those cases which have not been properly treated in infancy we find also :—

(*a*) *Definite atrophy* of calf *muscles*. This begins to show during the second year of life.

(*b*) *Arrested growth of bone*, so that the foot is stunted and the leg shortened.

(*c*) *Thickening of the skin, the tread being developed* on the outer side, or even on the dorsal surface of the foot. Tenderness and inflammation often arise in these positions, so that walking is very painful.

(*d*) Tendency to walk with the leg rotated in.

Treatment.—During the first year of life *muscle massage* is begun as early as possible and given several times a day,

to strengthen the muscles and to prevent atrophy; also, *strong passive corrective movements*, eversion and abduction combined with dorsal flexion, the position being over-corrected as much as possible. In doing this, care should be taken that not only the front of the foot is corrected, but also the posterior part with the heel. This is best done by pressing a book or other flat hard object against the sole, while the leg is fixed by the gymnast's hand. Both book and foot are pressed against the gymnast's chest. In doing this, the knee should not be bent, as this would lessen the stretching of the calf muscles and Achilles tendon. In everting the foot, care must be taken to avoid stretching the inner side of the knee.

Passive outward rotation of the limb is also given. The corrected position should be maintained as much as possible between the treatments by means of a small malleable metal splint.

By means of the above treatment, a sufficiently good position of the foot is often obtained for the patient to place the whole sole of the foot on the ground when he begins to walk. The effect of the body weight may then produce full correction of the faulty position. If this is not the case *forced correction under an anæsthetic followed by fixation in plaster* must be resorted to, and frequently also *tenotomy of the Achilles tendon* in cases of equino-varus. This treatment should be preceded and followed by treatment by gymnastics and massage as above described. The patient is further taught to perform the above *corrective movements actively and against the resistance* of the gymnast. They should be performed with the muscles (the evertors and dorsal flexors of the foot and the outward rotators of the hip) working in shortening, *i.e.*, in their inner range. In many cases orthopædic apparatus, plaster or irons, must be used.

Paralytic Contractures and Paralytic Forms of Club Foot

In paralysis of single muscles or groups of muscles of the calf, as often happens in infantile paralysis, faulty positions often develop owing to the antagonists of the paralysed muscles gaining the upper hand and by degrees undergoing trophic shortening. **Paralytic Talipes varus** thus arises in paralysis of the evertors ; **Talipes valgus,** in paralysis of the invertors ; **Talipes equinus,** in paralysis of the dorsal flexors of the foot ; **Talipes calcaneus,** in paralysis of the calf muscles. Combinations of these paralyses may arise, *e.g., Talipes equino-varus,* in paralysis of the dorsal flexors and the evertors. Similar contractures may of course arise in other joints of the body.

Treatment of these paralytic contractures consists of :—

(*a*) *Stretching* of the shortened muscles.

(*b*) *Massage of the paralysed muscles* (all manipulations), to improve nutrition and restore power of movement.

(*c*) *Exercise of any remaining power of movement,* which must be carefully looked for in the paralysed muscles. This is frequently present in infantile paralysis.

(*d*) Orthopædic apparatus is often necessary, or special operations such as tenotomy, transplantation of tendons, etc.

Hallux Valgus

Changes.—Abduction of the phalanges with adduction of the metatarsal of the great toe.

Causes.—1. Often associated with flat foot, especially with lowering of the transverse arch.

2. Pointed-toed boots.

Symptoms.—1. Lameness. 2. Deformity. A bunion may be present. Sometimes there is osteo-arthritis.

Treatment.—A boot with a straight inner edge. A toe post may be used or a spring along the inner side, drawing the great toe inwards.

Sometimes excision of the joint is performed. Massage and movements are of use in early cases or after operation. Flat foot must of course be treated, and movements of the toes practised, such as picking up a pencil with the toes.

Knock Knee or Genu Valgum

Changes.—May be present in one leg only.

First Stage.—Yielding of int. lat. lig. and of fascia on inner side of knee joint.

Second Stage.—Contraction of tissues on outer side of joint, ilio-tibial band of fascia lata, ext. lat. lig. and biceps tendon.

Third Stage.—Bony changes, prominence of int. condyle of femur and internal tuberosity of tibia due to alteration of shape of lower end of the shaft of the femur and upper end of the shaft of the tibia.

Causes.—1. Rickets.

2. Much walking, standing or weight-carrying, especially at age of fourteen to eighteen, in under-nourished, rapidly growing boys or girls.

3. Flat foot.

Symptoms.—1. One or both knees prominent on inner side.

2. When patient stands with knees together, feet are apart.

3. When patient stands with heels together, one knee is in front of the other, one hip and knee being flexed.

4. Feet often everted and flat.

Treatment for early cases.—1. Of rickets, feeding, splints, keeping child off its legs. Leg movements without weight-bearing should be encouraged.

2. Massage and movements. Massage of limb and joint. Exercises for muscles on inner side, stretching of those on outer side.

3. Operative treatment.

Special Exercises.—1. Leg ab. and adduction, resistance above outer malleolus in abduction, and on inner condyle in adduction. One leg at a time.

2. Half-lying leg-updrawing and outstretching, resistance at inner side of knee in flexion, outer side of outer malleolus in extension.

3. Half-lying leg-updrawing and -downdrawing, guiding knee in outward direction all the time.

Congenital Dislocation of the Hip

Causes.—Malposition in utero or failure of one of the joint surfaces to develop.

Changes.—Rim of acetabulum may be absent, or iliac portion. Acetabulum consists of a triangular shallow depression at union of pubis and ischium.

Head of femur absent or small. Neck short. Angle between neck and shaft more open than normal (*coxa valga*). A false acetabulum may form on the dorsum ilii.

The joint capsule is lengthened and thickened.

The ligamentum teres may be longer than usual or absent.

Symptoms.—Child walks late. Deformity then noticed. Early fatigue. No pain. Waddling gait. Lordosis. Buttocks prominent behind and trochanters laterally. Scoliosis in unilateral cases. Heel often not brought to the ground in such cases.

Thigh flexed, adducted, rotated in slightly.

Shortening of one to three inches. Trochanter may be at level of iliac crest, well above Nélaton's line (from ant. sup. il. spine to isch. tuberosity).

Mobility free except in abduction.

Limb can be drawn to full length by traction during flexion.

Treatment.—Reduction is generally achieved by means of the Lorenz method, and is most successful between the ages of three and five years.

The shortening of the muscles maintaining the deformity is first overcome by manipulation. The dislocation is then reduced and a plaster bandage is applied, fixing the limb in the flexed and abducted position. The child is kept in bed about a fortnight to allow pain and swelling to subside, and is then encouraged to stand and walk. A shoe with a high cork sole may be worn on the abducted side.

The plaster is worn for six or eight months. It is re-applied as a rule twice during that time in order to reduce gradually the amount of flexion and abduction.

After-Treatment.—Massage of the thigh should be given and passive and active movements, care being taken to preserve full abduction and hyper-extension of the thigh.

Coxa Vara

Changes.—A deformity of the hip joint, due to lessening of the angle between the neck and the shaft of the femur. The angle is normally about 125 degrees. At birth it is more open (160 degrees), and continues to diminish till growth is complete. May be bilateral or unilateral.

Causes.—1. Rickets.

2. Adolescence. The normal closing of the angle is carried too far. Late rickets may contribute, also carrying heavy weights.

3. Injury. Separation of the epiphysis may cause marked unilateral deformity.

4. Old age, by producing atrophy of the neck.

5. Osteo-arthritis in the same way.

Symptoms.—1. Aching and fatigue with marked limp.

2. Shortening of the leg with prominence of the trochanter.

3. Outward rotation of the leg at the hip joint.

4. Adduction, marked especially on flexion. Scissor leg deformity if both sides are affected.

5. Abduction and internal rotation limited.

6. Flexion and extension free and painless.

7. No tenderness.

8. If the deformity is unilateral, scoliosis is produced.

Treatment.—1. Rest while the deformity is increasing.

2. Extension is sometimes applied to draw the shaft of the femur downwards and in the abducted position.

3. Osteotomy is sometimes performed below the trochanter when growth has ceased. The limb is put up in an abducted position.

4. Massage and movements to improve the circulation of the limb and the nutrition of the bone. Abduction and internal rotation need special attention. The exercises are best performed in lying position. If the deformity is unilateral a raised boot may be necessary.

Spinal Curvatures

Spinal curvatures may be divided into two main groups :—

A. Curvatures in the sagittal plane : Kyphosis and lordosis.

B. Curvatures in the frontal plane : Lateral curvature or scoliosis and torticollis.

Congenital Torticollis (*Wry-neck*)

As the name implies this deformity is congenital, or possibly it is more frequently acquired at birth. In the

first case, it is the result of faulty position in utero, in the second it is due to partial rupture of muscle, generally of the sterno-cleido-mastoid, resulting in hæmatoma.

Morbid Changes.—1. *Shortening of the sterno-cleido-mastoid* muscle and the muscles working with it on one side of the neck, with stretching of their antagonists, *i.e.*, chiefly the same muscles on the other side.

2. *Corresponding changes in the ligaments*, and, in severe cases, even in the *cervical vertebræ*.

Symptoms.—Characteristic position of the head, corresponding to shortening of one sterno-cleido-mastoid muscle, so that the head is bent slightly backward and to one side, while the face is rotated to the opposite side.

In marked wry-neck a compensatory curve is developed in the dorsal region owing to the patient's effort to bring the plane of the optic axes into the horizontal.

Treatment.—1. *Stretching* of the shortened muscles and ligaments by :—*Hanging in the head suspension apparatus ;* by *one-sided passive Head-side-flexions and rotations*, separately and combined ; and by *Head rollings*.

2. *Active movements* in which the lengthened muscles work in their inner range. *One-sided Head-side-flexion and rotation* separately and combined.

3. *Symmetrical and alternate head movements* are also given to educate the normal innervation of the neck muscles. Other gymnastic movements involving the limbs and trunk should be given with the head in the corrected position. It is encouraging, both for patient and gymnast, to measure the sterno-cleido-mastoid muscles at intervals.

4. Operation on the sterno-cleido-mastoid muscle and fixation is often employed, but this should be preceded and followed by treatment on the above principles. In

some cases the faulty position recurs, because the muscle shortening was not limited to the muscle operated upon, but was also present in the synergist muscles. The lengthened antagonists are not directly affected by operation.

Rheumatic torticollis and spasmodic torticollis (chronic one-sided cramp in the neck muscles) are dealt with in the chapter on Diseases of the Nervous System.

Hunch Back (*Kyphosis angularis*)

Morbid Changes.—As a rule there is tuberculous inflammation in the bodies of one or more vertebræ, which are thereby softened and break down, so that they become unable to support the body weight. The spine then sinks together, and a sharp angular bend arises. This generally has the angle directed backward, but occasionally to the side, depending upon what part of the vertebral body is affected. Above and below the angle compensatory curves are developed, because the body tries to maintain the upright position, and to bring the vertical line from the centre of gravity within the supporting base.

Causes.—1. *The tubercle bacillus.*

2. *Lowered resistive power*, generally due to injury of the spine.

Symptoms.—1. *Deformity.*

2. *Symptoms of chronic myelitis*, due to pressure on the spinal cord by the inflammatory swelling or the sharpness of the angular curve causing disturbance of circulation nutrition and function.

The symptoms due to myelitis may be shortly mentioned :—

(*a*) *Irritative sensory symptoms*, especially pain, numbness and tingling.

(*b*) *Paralytic sensory symptoms*, lowering of sensation.

(*c*) *Irritative motor symptoms*, cramp.

(*d*) *Paralytic motor symptoms*, weakness or complete paralysis.

(*e*) *Increased reflexes.*

These symptoms generally affect both sides and are generally present only in the lower part of the body.

3. *General disturbances of circulation and respiration, due to obstruction to the work of the heart and lungs*, caused by the deformity of the chest.

4. *Inflammation of the back muscles.*

It is important to recognise the very earliest symptoms which should make one suspect the presence of disease, so that treatment may be undertaken before deformity arises.

These **early symptoms** are :—

(1) *Pain in the back* after much standing or walking.

(2) *Stiffness in the back.*

(3) *Tenderness to pressure* on the spine, or on the spinous processes of the diseased vertebræ.

(4) *Pain in the back on striking the head or heels* in the direction of the spine.

Treatment.—1. Lying (continuously) in a *plaster bed ;* also

2. *A plaster jacket*, to immobilise the spine and to help the healing process, as well as to prevent deformity. No gymnastic treatment, but possibly kneading of arms and legs, with gentle passive movements of the extremities.

3. Gymnastic treatment may be given when the disease has been quiescent for about six months. It consists of :—

(*a*) *Back massage*, to strengthen the muscles and to get rid of inflammation in them.

(*b*) *General strengthening treatment.*

(*c*) *Movements cautiously given to increase the mobility of the chest*, and so to facilitate the action of the heart and lungs.

N.B.—No attempt should be made to straighten the spine by stretching.

Example.—Treatment for *kyphosis angularis*, when healing is complete.

1. Sitting Chest-lifting in different planes.
2. Half-lying Leg kneading + Foot-rolling + flexion and extension.
3. Yard-sitting Plane-arm-carrying (gently).
4. High-ride-sitting Circle-turning + Chest-lifting.
5. Hips-firm-close-sitting Alternate-trunk-rotation.
6. Massage of back muscles.
7. Stretch-grasp-stoop-stride-sitting. Trunk-raising in different planes.
8. Half-lying Arm-kneading.
9. Hips-firm-high-ride-turn-sitting Side-flexion.
10. High-reach-grasp-standing Leg-carrying in a circle.
11. Stretch-sitting Arm-flexion and extension (gently) or, Sitting Chest-lifting in different planes.

Kyphosis and Round Shoulders

By *kyphosis* is meant an increase in degree or extent of the normal curve, convex backwards, in the dorsal region of the spine. Kyphosis is most frequently combined with round shoulders; the back is rounded from side to side, the shoulders being carried forwards and the front of the chest contracted. Kyphosis is often associated with lordosis.

Morbid Changes.—In kyphosis the ligaments and muscles running in a longitudinal direction at the back of the spine and chest are lengthened and stretched and those in front are shortened.

In round shoulders the transverse muscles on the back of the chest, especially the shoulder muscles, are lengthened,

those on the front, especially the pectoral muscles, are shortened.

In old-standing cases the curves of the clavicles are accentuated and the sterno-mastoid muscles shortened.

Causes.—1. Old age. Because the muscles and ligaments become weak and yield to the weight of the body.

2. Failure of the postural reflex from any cause.

3. *Occupation in a forward leaning position*—study, office work, manual labour. If the muscles on the front of the chest are chiefly used, it will lead also to *round shoulders*.

4. *Faulty cut of the clothes*, too narrow and too short in front, fitting too closely. To examine properly both the outer and under clothing should be unfastened, and the position corrected. It should then be noticed whether the clothes meet in front.

5. Defective sight.

6. Adenoids.

Treatment.—1. In treating a child it should be seen that the clothes are not too narrow nor too short in front.

2. The patient's position during work, especially school work, should be supervised and corrected.

3. Gymnastic treatment follows the general principles for treatment of deformities, and includes re-education of the postural reflex.

4. Correct the position of the patient's head.

5. The patient's general health should be attended to, and any other physical defect corrected.

To counteract *kyphosis* the following are therefore given :

(*a*) Long and strong passive stretching movements for the longitudinal muscles and ligaments on the front. Hanging or lying with cushion in the back, head suspension, etc.

(*b*) Movements with active work in strong shortening in the inner range of movement, for the longitudinal back

muscles: Arch-leg-forward-lying Holding; Neck-raising; Stretch-stoop-grasp-standing Holding, etc.

To counteract *round shoulders*:—

(*a*) Passive stretching movements are used for the transverse muscles and soft parts in front of the chest: Chest expansion; Heave-grasp-standing Forward-drawing, etc.

(*b*) Movements with active work in strong shortening for the posterior shoulder-muscles: Plane-arm-carrying; Movements in heave position, etc.

Many movements may of course be combined, or so given that they counteract at the same time round shoulders and kyphosis:—*e.g.*, Arch-leg-forward-lying; Plane-arm-carrying. But the gymnast must use the movements with discrimination, having regard to that part of it which is specially effective in each case.

Since some of the active movements which are used to counteract kyphosis may produce *lordosis*, *e.g.*, Arch-leg-forward-lying Holding, it is necessary when these are used to give movements to counteract this tendency, *e.g.*, General Correcting Position, etc. (See Treatment of Lordosis.)

Example.—Treatment for *kyphosis and round shoulders.*

1. Heave-grasp-standing Chest-expansion.
2. High-reach-grasp-standing Leg-backward-drawing.
3. Hanging with cushion in the back.
4. Yard-leg-forward-lying Plane-Arm-carrying.
5. Arch-hanging Neck-raising.
6. Hips-firm-high-ride-sitting Plane-twisting.
7. Arch-leg-forward-lying Holding.
8. Hips-firm-loin-lean-stride-standing Trunk rolling.
9. Stretch-grasp-stoop-standing Holding.
10. Stretch-sitting 2-Arm-bending and stretching.
11. Hanging Leg-parting and impressing.
12. Stretch-grasp-standing Forward-drawing.

Resting position.—Crook lying with a hard cushion under the convexity.

Lordosis (*Hollow Back*).

By *lordosis* is meant an increase in degree or extent of the normal convexity forward in the lumbar region. The pelvic tilt is often increased, but in some cases is diminished. In the erect position the plane of the brim normally forms an angle of 50 to 60 degrees with the horizontal.

Morbid Changes.—*Lengthening* of the abdominal muscles and of the ligaments in front of the lumbar spine, *shortening* of the muscles and ligaments on the back of the spine.

Shortening of the flexors of the hips with *lengthening* of the hamstring muscles, semi-tendinosus, semi-membranosus and biceps femoris, if the pelvic tilt is increased. If the pelvic tilt is diminished the flexors of the hips are lengthened and the hamstrings shortened.

Causes.—1. *Misunderstanding of the correct position and* failure of the postural reflex.

2. *Weakness of the abdominal muscles.*

3. *Over-exercise of the back muscles in the lumbar region* often produced in the treatment of kyphosis and lateral curvature.

4. *Excessive practice of low arch positions,* without counteracting exercises.

5. Habitual wearing of high heels.

Treatment.—1. *Correct idea of the fundamental position.*

2. *Gymnastic treatment,* in which one aims at :—

(*a*) Re-education of the postural reflex.

(*b*) *Passive stretching of muscles and ligaments on the dorsal surface* of the lumbar region. Strong deep forward-downward-bendings; Hewing; Sawing; Stretch-grasp-crook-sitting Holding; Movements in Long-sitting position, etc.

(*c*) *Active work in strong shortening for the abdominal*

muscles should be given in all cases. When the pelvic tilt is diminished and the hamstring muscles shortened the following exercises may also be given :—

2-Leg-up-drawing, best in Short-sitting, but also good in other positions ; 2-Knee-down-pressing ; Lying-2-Leg-lifting and down-pressing ; Lying Trunk-raising ; General Correcting Position (G.C.P.).

N.B.—All these movements except the last act strongly in taking blood to the pelvis, and may therefore increase menstruation. They must therefore be counteracted by movements which have a depleting effect.

(*d*) *If the hamstring muscles are lengthened*, Forward-lying Knee-bending is given concentrically and eccentrically ; Leg-forward-lying Holding ; General Correcting Position. In the opposite case, lengthening of these muscles may be produced by the movements under (*b*).

Example.—Treatment for *lordosis :—*

1. Stretch-sitting 2-Arm-bending and stretching.
2. Half-sitting Knee-bending and stretching.
3. Stretch-grasp-crook-sitting Holding.
4. Short-sitting 2-Leg-updrawing.
5. Heave - grasp - stoop - stride - sitting Alternate - trunk-rotation.
6. Leg-forward-lying Holding.
7. High-ride-sitting Trunk-rolling.
8. Yard-long-sitting 2-Arm-upward-carrying.
9. Lying 2-Leg-lifting and down-pressing.
10. Yard-stoop-stride-sitting Plane-arm-carrying.
11. High-ride-sitting Chest-expansion.

Between Movements.—Sawing ; Hewing ; General Correcting Position (G.C.P.).

Resting position.—Crook lying with the knees sufficiently high to obliterate the lumbar curve.

In the treatment of combined kyphosis and lordosis (kypho-lordosis) we follow the above principles for the treatment of each of these curves separately, but with the modifications necessary for each individual case. We use especially :—

1. *Positions* which at the same time stretch the ligaments and soft parts on the back of the lumbar spine and on the front of the dorsal spine, *e.g.*, Stretch-grasp-crook-sitting position with a cushion in the back.

2. *Holdings* in carefully corrected positions which correct both curves, *e.g.*, Leg-forward-lying Holding ; Neck-firm-standing ; *General Correcting Position.*

3. *Active movements for kyphosis* in positions which have a correcting effect on lordosis, *e.g.*, Stretch-grasp-long-sitting Neck-raising.

4. *Active movements for lordosis* in positions which have a correcting effect on kyphosis ; *e.g.*, Hanging with a cushion in the back 2-Knee-updrawing and down-pressing.

Resting position.—Crook-lying with hard cushion under the kyphosis and knees sufficiently raised to obliterate the lordosis.

Flat Back

Changes.—The term " flat back " is applied to a condition in which the normal curves of the spine are markedly diminished.

Causes.—1. An exaggerated idea of the upright position.

2. Excessive practice of arch positions.

3. May be produced by treatment of kyphosis and lordosis.

Symptoms.—1. The normal curve convex backwards in the dorsal region is for the most part obliterated, but is in some cases comparatively pronounced at its upper part, producing the position of " poking head."

2. The lumbar curve concave backwards is also less pronounced than usual.

3. There is frequently a short backward concavity in the dorso-lumbar region.

4. The flattening of the spine in the dorsal region brings the posterior parts of the ribs closer together. The anterior ends of the ribs are more prominent and wider apart, *i.e.*, the position is one of inspiration and the mobility of the chest is interfered with.

5. The angles of the ribs are less sharply bent.

6. For both these reasons the scapulæ appear winged.

Treatment.—Preventive. Children should not be told to draw their shoulders back, but to hold the head up with chin in. If the condition has arisen, arch positions should be avoided and forward-downward bendings practised.

Lateral Curvature (*Scoliosis*)

Scoliosis is a lateral bending of the spine, with simultaneous rotation of the vertebræ, so that their anterior parts or bodies are turned towards the same side as the convexity of the curve. *The curves are named* partly according to their form, partly according to their situation. A single curve is called "*C-shaped*," and "*right*" or "*left*," according to the side to which the convexity is directed. A double curve is sometimes called "*S-shaped*." The curve is called *lumbar*, *dorsal*, or *cervical*, according to its situation.

Morbid Changes.—In a definite scoliosis morbid changes are found in the muscles and ligaments as well as in the vertebræ and ribs. The *muscles on the convex side* of the curve are *over-strained* and become *lengthened*, *thinned* and *weakened*. Muscle inflammations are often found. On the *concave side* the muscles are *shortened*.

The *ligaments on the convex side become stretched* and *lengthened*, on the concave side they become *shortened* and *thickened*.

The *intervertebral cartilages* become *wedge-shaped*, thinner on the concave, thicker on the convex side. The gelatinous nucleus is displaced towards the convex side.

The *vertebræ* become *wedge-shaped* in advanced cases, thinner on the concave side, thicker on the convex. This is due to the side-flexion producing greater pressure on the concave side, hindering the growth and development of bone on that side, while the diminished pressure on the convex side allows increased growth of bone.

Owing to the rotation of the vertebræ certain changes of structure take place in the bodies of the vertebræ, as well as in the roots of the arches. The *direction of the lamellæ* in the bodies of the vertebræ is *not*, as under normal conditions, *vertical, but diagonal*, slanting towards the highest part of the curve, and therefore in different directions in the upper and lower parts of the curve. This deviation depends on the fact that the part of the vertebral body which lies nearest to the maximum of the curve is more rotated than the part which lies farther from it. *The roots of the arches have also an abnormal direction*, the *direction of the root on the convex side* being more *sagittal, that on the concave side* more *frontal*. They are also less strongly developed on the concave side than on the convex.

The *rotation* of the vertebræ is due to the *side-flexion*. The *vertebral bodies are higher than the arches*, and are therefore first affected by the rotating force or body weight. *The bodies are rotated towards the convex side where there is more room*, while the arches are turned towards the concave side. But the arches are more firmly fixed than the bodies by ligaments and muscles, and during the time of growth

an *epiphysical cartilage is present at the junction between the vertebral body and the root of the arch* so that some mutual displacement of these parts can take place. The bodies are therefore rotated out of position more than the arches and ribs.

The *ribs on the convex side* are altered, the *angles being more acute* than normal, while the *anterior part of the rib is less curved.* On the *concave side the angles of the ribs are less acute*, the ribs are therefore less curved, but the *anterior part is more sharply bent* than normal. This is due to the fact that the ribs are prevented from following the rotation of the vertebræ because their anterior ends are fixed to the sternum, which is kept in its position by its connection with those ribs which do not take part in the rotation.

Owing to the rotation of the vertebræ and the alteration in the shape of the ribs, the *thorax becomes deformed, the region of the angles on the convex side projects backward*, while that on *the concave side is flattened and depressed. On the front* of the chest the condition is *reversed ;* the ribs are flattened on the side of the convexity, and prominent on the side of the concavity. *The chest is therefore compressed in the diagonal which runs forward and inward from the region of the angles of the ribs on the concave side*, while the opposite diagonal is lengthened. The relative *position of the ribs is also altered*, those on the concave side being pressed together, those on the convex side farther apart. The lower margin of the thorax is higher on the concave side, lower on the convex.

N.B.—In some early cases of scoliosis the bodies of the vertebræ rotate to the side of the concavity. This is a transitory condition and is known as " paradoxical rotation."

Causes.—1. *Congenital Deformity of the Spine.*—This type of scoliosis is generally localised to the junctions of the chief

parts of the spinal column and is found most frequently between the lumbar vertebræ and the sacrum. Röntgen rays first opened our eyes to the nature of this form of scoliosis. It is characterised not only by its localisation, but by a sharp angular bend in the spine. It is almost inaccessible to treatment.

2. *Rickets.*—The vertebræ are softened, owing to the deficiency of bone salts which characterises this disease; they are therefore unable to support the weight of the body, and thus yield to pressure, so that curvatures are produced.

Rachitic scoliosis is generally recognised by being *irregular in form*, by the presence of other *changes in the thorax due to rickets*, and by the *hardness and stiffness of the chest*. It is also as a rule difficult to correct, because after recovery from the disease the bones are harder and thicker than normal.

3. *Pleurisy and Fibrosis of Lung.*—In severe cases of pleurisy fibrin is deposited on the pleural surfaces. This results in the formation of adhesions which limit the expansion of the lung. *Empyema* (pleurisy with suppuration) is followed by marked sinking in of one side of the chest, and a curvature arises with its convexity towards the opposite (healthy) side. *Chronic pneumonia*, resulting in fibrosis, acts in the same way.

4. *Unequal length of legs* has been considered a cause of *scoliosis*. The pelvis is lowered on the side of the shorter leg, the trunk is therefore carried over to the opposite side in order to bring the line of gravity within the supporting surface. A curvature thus arises in the lumbar region, with its convexity to the side of the shorter leg. If the spine remains normal this curvature disappears on levelling the pelvis by raising the shoe of the shorter leg.

Recently attention has been directed to unequal develop-

ment of the two halves of the body, when scoliosis may arise owing to one leg being later than the other in development. The resulting lumbar scoliosis frequently disappears as the legs become equal again.

5. Scoliosis may arise due to *one-sided paralysis in childhood*, whether due to hemiplegia or infantile paralysis.

Growth of bone is often retarded on the whole of the paralysed side. The convexity of the curve may be towards either side: owards the healthy side if statically produced, towards the less developed side if due to a compensatory effort.

6. *After infantile paralysis* one frequently sees scoliosis arise owing to some *partial paralysis of the back muscles persisting*. This type of scoliosis is most often irregular and very troublesome.

7. *Habitual faulty position* is the commonest cause of lateral curvature. The unequal weighting which thus arises acts constantly in the same direction on the bones, muscles and ligaments which hold up the body, and especially the trunk, and produces curvatures. Postural scoliosis develops generally during school life, and especially about the period of puberty. The rapid growth of all parts of the body, and especially of the legs, during this period increases the liability to deformity.

At first the body resumes a symmetrical position in times free from work, but after a time the muscles begin to accommodate themselves to the crooked position, and become lengthened and shortened respectively. As this takes place the patient no longer realises that her position is crooked, and does not try to correct it. Unless the patient is suitably treated the position soon becomes fixed, and the above-mentioned changes arise in the muscles, ligaments, and finally in the bones.

The taking up of a crooked position may be due to several causes :—

(*a*) *Lack of postural tone.* The back muscles fail to maintain the upright position of the spine, which sinks to one side so much that the muscles on the other side become stretched.

(*b*) *Bad positions during work.* In writing, certain types of faulty position arise, each of which produces its own form of scoliosis. If the body is supported on the left ischial tuberosity and the left elbow, a single curve convex to the left is produced. If it is supported on both ischial tuberosities, leans to the left, and is supported on the left elbow, a double curve arises, with the lower convexity to the right and the upper to the left.

The habit also in standing of supporting the weight of the body chiefly on one leg, and always using the same leg for the purpose, *e.g.*, the right leg, while the other leg is slightly bent at the knee, and therefore shortened, produces a curve in the lumbar region, with its convexity to the left, *i.e.*, to the side of the shorter or non-supporting leg, the body leaning over towards the supporting leg.

(*c*) *The position of the light*, and also the arrangement of the room, may cause a habitually crooked position to be taken up.

8. That *hereditary predisposition* may play some part in the development of scoliosis is indicated by the following facts :—

(*a*) Similar and severe forms of scoliosis are occasionally seen in parents and their children.

(*b*) A comparatively small number of children develop definite scoliosis, although a habitually crooked position is common.

9. Sex plays some part. *Girls are more liable to develop*

scoliosis than boys, probably because they are more inclined to keep still, while boys fight and romp in their free time.

If for any reason a definite single curve has arisen, more or less marked compensatory curves may develop above and below. These are produced by the body making an effort to maintain the upright position, with the line of gravity falling near the middle of the supporting area. If a compensatory curve did not develop, the patient would find it necessary to push the pelvis over to one side, so as to bring the line of gravity to the middle of the supporting area. At times this happens before compensatory curves have developed, and is shown by the arm on the side towards which the pelvis is pushed lying close against the hip, while the arm on the other side hangs away from the body. In such cases the centre of gravity lies, in reference to the middle of the spine, farther towards the concave side, so that increased tension arises in the muscles of the convex side, with increased work for them. By reflex action this leads to the development of compensatory curves.

Symptoms of a Single Curve in the Lumbar Region, with Convexity to the Left.

I. *The waist angle* formed by the side line of the body *is more acute on the concave side*, more or less obliterated on the convex.

II. *The iliac crest is more prominent on the concave side*, less distinct on the convex. It looks as if the hip were higher on the concave side, and dressmakers always say that it is, because the skirt has to be longer on that side, but this apparent difference in height is often an illusion, as can be shown by measurement. Both these symptoms are due to the side flexion and rotation of the lumbar vertebræ, by which the soft parts lose their support and

sink in toward the mid-line on the concave side, while they become more prominent backward and over the iliac crest on the convex side.

If one leg is shorter the pelvis naturally stands obliquely, and according to Professor Haglund this is often the case.

III. *The width of the two halves of the back is unequal*, the convex side being narrower and the concave broader. In dorsal curves this condition is frequently reversed.

IV. *Rotation of the pelvis* in relation to the trunk is often spoken of and is most easily shown by measuring the distance between the ant. sup. il. spine and the umbilicus. In doing so one should see that the hips are on the same level.

In reality, the pelvis is more fixed than the spine. If the transverse axis of the shoulders is not parallel with the transverse axis of the pelvis it is more logical to speak of rotation of the spine in relation to the pelvis.

V. *The tips of the spinous processes of those vertebræ which take part in the curve are carried over towards the convex side by the lateral flexion*, but this deviation is less than that of the vertebræ as a whole, because the bodies in rotating to the convex side carry the spinous processes towards the mid-line.

VI. *The shoulder on the convex side is generally higher* than the other if the curve is at all marked.

VII. *The transverse processes and soft parts on the convex side are carried backward by the rotation of the vertebræ*, making that part of the back more prominent. This is best seen with the patient in forward bending position, but may also disappear in this position if the curve is slight, since the weight on the vertebræ which causes the rotation is diminished by forward bending.

VIII. *The lowest dorsal vertebræ* often take part in a

lumbar curve. This is shown by the projection backward of the lowest ribs in the region of their angles on the side of the lumbar convexity.

IX. With a marked lumbar curve a compensatory curve generally develops in the dorsal region.

Symptoms of a Single Curve in the Dorsal Region.

I. *The region of the angles of the ribs projects backward on* the convex side, and is flattened on the concave. This is best seen in forward bending position.

II. The *position of the shoulder blade* is therefore altered as follows :—

(*a*) *On the convex side the shoulder blade* rests on the part of the ribs just outside the angle, and is *therefore somewhat farther from the mid-line*, its *lower angle projecting backward*, the whole shoulder blade taking a somewhat *sagittal direction* and standing higher than on the concave side.

(*b*) *On the concave side the shoulder blade* lies on the flattened region of the angles of the ribs, and therefore *in closer contact with the chest wall, nearer to the mid-line*, and with its *lower angle rotated in, the whole shoulder blade being* in a more *frontal direction*.

III. *The shoulder blade and shoulder on the convex side are higher than* on the concave.

IV. *The tips of the spinous processes deviate from the mid-line* in the same way as is described in the case of a lumbar curve.

V. *The back may be broader on the convex side* than on the concave, due to the projection outward of the shoulder blade. If the ribs are very sharply bent at their angle the back may be narrower on the convex side.

N.B.—In a lumbar curve the convex side of the back is the narrower.

VI. *The thorax is obliquely compressed* in the diagonal running from the region of the angles of the ribs on the concave side forward and inward, while the opposite diagonal is lengthened.

VII. A *compensatory curve* generally develops early in the *lumbar region*, with its accompanying characteristic changes. But it is worth noting that there is often present *on the convex side of the lumbar curve a crescentic sinking in of the lateral contour* of the body, somewhat higher up than the usual position of the waist angle and just below the scapula. This sinking in corresponds to the concavity of the dorsal curve, and is due to the *lowest dorsal vertebræ taking part in the curve* being rotated with their ribs towards the convex side, so that the lateral contour of the body sinks in on the concave side of the dorsal curve.

In *a primary lumbar curve* with a compensating curve in the dorsal region the alteration in the waist angle is the same as in a simple lumbar curve. In such a case no noticeable sinking in takes place on the concave side of the dorsal curve, because the curve is so high up that the ribs taking part in it are more fixed, and therefore deviate less than the lower ribs.

Symptoms of a Cervical Curve.

I. *The lateral contour of the neck forms a more acute angle on the concave side*, less acute on the convex. The outline of the neck is shorter on the concave side.

II. *The region of the angles of the upper ribs on the convex side may project backward* because the upper dorsal vertebræ take part in the curve.

III. For this reason *the upper part of the shoulder blade also projects backward* on this side.

IV. *The shoulder blade and shoulder of the convex side are higher.*

If along with the cervical curve there is a curve in the opposite direction in the dorsal region, the shoulders may be equal in height. If one curve is more strongly developed than the other, the corresponding shoulder is higher.

Examination.

I. For a satisfactory examination the upper part of the body must be uncovered to just below the iliac crests, where the clothes may be fastened by a strap. It is better still if the patient is fully undressed and wrapped in a blanket which is fastened at the back of the neck, so that it may be thrown aside to get a view of the whole back. As a preparatory measure the tips of the spinous processes are marked out, the lower angles of the scapulæ, the posterior angle of the acromion and the posterior superior iliac spine on both sides. To make a *provisional examination of the length of the legs* the patient lies full length on a flat support and dorsally flexes the ankles to a right angle. One can then see whether the heels are in the same plane. The patient must lie straight.

II. The light must be good and uniform, preferably daylight. The patient should stand with his back toward a window, the examiner being between this and the patient.

III. The patient's position must be correct, knees straight, weight equally supported on both legs. *The feet should be about a foot apart and parallel.* This prevents any lateral movement of the pelvis.

At first the patient will contract his muscles, but soon takes up a natural position.

IV. The examination should be conducted as quickly as possible, otherwise the patient becomes tired and changes

his position. It is well to follow a definite order in examination, and to avoid touching the patient at first, as this may also lead to change of position.

Special note is made of—

(*a*) The side contour of the trunk and the condition of the waist angles.

(*b*) The shape and position of the iliac crests.

(*c*) If displacement of the pelvis to either side is present.

(*d*) If any rotation of the spine on the pelvis is seen from behind.

(*e*) The position of the shoulder blades and shoulders.

(*f*) If there is any backward prominence of one side of the back (seen from behind).

(*g*) The breadth of the two halves of the back.

(*h*) The position of the head and the lateral contour of the neck.

(*i*) The back muscles are examined for muscle inflammation.

(*j*) While the patient slowly bends forward it is noted whether any prominence is present in any part of the back. For this the examiner places himself in front of the patient.

(*k*) The spinous processes are marked out, if this is not already done, and any deviation from the mid-line may be demonstrated in the forward bend position.

(*l*) The shape of the chest is noted from the front.

(*m*) Rotation of the spine is shown by the shoulders facing in a slightly different direction from the pelvis.

(*n*) The length of the legs is ascertained by measuring the distance between the upper border of the great trochanter and the tip of the external malleolus. This measurement is difficult, but is more accurate than that taken by measuring the distance between the anterior superior iliac spine

and the tip of the external malleolus. It is often sufficient to measure from the anterior superior spine to the floor with the patient in the standing position. If one leg is shorter, a support of a thickness corresponding to the amount of shortening is placed under the foot of the short leg to see whether the curve becomes corrected.

Testing the Mobility of the Curve.

The mobility of a lumbar curve may be tested by *letting the patient bend the knee of the concave side*, or by placing a book of suitable thickness, $\frac{1}{2}$—1 inch, under the same foot, or by letting him take Fall-out-standing or Spring-sitting position with the leg of the concave side stretched backward. If the curve is movable the waist angle is improved, or a curve to the opposite side may arise.

Hanging in a suspension apparatus or on the boom may also be used.

The mobility of a dorsal curve may be tested *by upward stretching of the arm of the concave side ;* by *diagonal pressure on the thorax ;* and by *hanging in the suspension apparatus.*

Curvatures are divided into three different grades according to their degree of mobility :—

1. A curve which can be fully corrected, and even over-corrected, is considered to be a curve *of the first degree, i.e.*, completely flexible.

2. A curve *of the second degree* is one which can be partially but not fully corrected, *i.e.*, partly flexible.

3. An inflexible curve, or a curve *of the third degree*, is one which cannot be corrected at all, or only very slightly, and which leads to marked deformity of the chest.

The prognosis depends partly on *the degree of the curve*, partly on *the age of the patient.* As to degree, *a curve of the first degree can be completely cured. A curve of the second*

degree can generally be *improved* by *energetic* treatment, but *not cured*. In some cases one must be content with preventing the curve getting worse. *A curve of the third degree cannot be improved, or only very slightly so.* Treatment in these cases aims at removing or diminishing backache by massage, increasing the mobility of the deformed chest and thereby improving respiration and circulation, and so the patient's general condition.

The age of the patient affects the prognosis in that it is naturally better the younger the patient, but since the growth of bone does not cease before the twenty-fourth year, there is possibility of improvement up to that time. The treatment is most effective about *the age of eighteen* when the patient begins to take an interest in her appearance.

Treatment.—I. *Prophylactic or Preventive Treatment.*—It is of the greatest importance to prevent a curve arising. With this end in view the following points must be noted :—

1. *Careful supervision of the child's position* during lessons and home-work. Suitable desks, seats, lighting, etc. These belong to school hygiene.

2. *The child should be strengthened and developed as equally as possible* by educational gymnastics.

3. *Plenty of open air life and games.*

4. *All one-sided occupations* should be avoided, and

5. *Even piano-playing* should be avoided if there is a tendency to scoliosis, because the child's back becomes easily tired, and then sinks to one side, so resting on ligaments. Violin playing is of course more harmful than piano-playing.

II. *Static Correction.*—This may consist of *altering the length of the legs* by raising the heel and sole of one shoe, or by means of a cork sole ; or by *putting the pelvis in a slanting position* by seating the patient on a wedge-shaped cushion,

the thickness of the base of the wedge being on the side of the convexity.

Raising the shoe, or a cork sole, may be used with advantage when one leg is short. Even if the legs are of equal length the foot might be raised on the side of the convexity of the curve, but experience has shown that the patient often does away with the effect by a slight bending of the knee.

The wedge-shaped cushion is most suitable for lumbar curves, but must be used with caution and under careful supervision to see that its effect is not too strong.

In cases of severe deformity or when the deformity shows signs of increasing, a spinal jacket may be necessary.

III. *Medical Gymnastic Treatment.*—The aims of medical gymnastic treatment are :—

1. To re-educate the patient in regard to the upright position.

2. To strengthen weak muscles.

3. To improve mobility when necessary.

In very slight scoliosis, or a tendency thereto, we may use :—

1. *General strengthening gymnastic treatment.*

2. *Back-kneading, or massage,* to strengthen the muscles and relieve pain.

3. *Symmetrical back-movements* and holdings in a carefully corrected position, to exercise equal innervation of back muscles, and to improve muscle sense, as well as to strengthen the muscles.

4. At the maximum point of the curve *one-sided active side-flexions are also given towards the convex side,* in which the muscles work in their inner range of movement. If there is any sign of over-correction these one-sided exercises should be stopped.

In a more marked scoliosis we may give :—

1. *Massage of back muscles* to strengthen them, and to get rid of muscle inflammations.

2. In some cases *the spine must be made more movable* by trunk-rolling, rolling in rings, crawling exercises, *passive stretchings* of muscles and ligaments on the concave side by hanging in suspension apparatus, one-sided passive side-flexions, etc. These should be strong and protracted, and should be immediately followed by :—

3. *Active movements in the inner range of movement for the muscles of the convex side.*

4. *Symmetrical Back-movements and Holdings* are also given to re-educate muscle sense.

5. *General treatment* should not be forgotten. Weak and delicate patients must often have general strengthening treatment for a time without special movements, before they can stand special treatment for scoliosis.

Treatment must as a rule be energetic, and therefore may be tiring. The patient should therefore rest after the most tiring movements. This is best done by *lying in a good position on the back, on a plinth or hard couch.*

Special correcting movements for the different forms of scoliosis, and suitable *between movements*, are described along with other medical gymnastic movements in the books dealing with this subject.

Examples.—I. Treatment for *tendency to spinal curvature* (slight dorsal curve convex to the left).

1. Stretch-sitting 2-Arm-flexion + extension (with care as to position).

2. Stretch-standing Slow Heel-raising + Knee-bending (with care as to position).

3. Reach-grasp-standing Neck-raising.

4. Rolling in rings.

5. Right-neck-firm-hip-lean-walk-standing active Side-flexion to the left with pressure.

6. Hips-firm-high-ride-sitting Plane-twisting.

7. Hips-firm-leg-forward-lying Holding or standing in a carefully corrected position.

8. Balance walking.

9. Back-kneading or Massage + Hips-firm-stoop-stride-sitting Back-raising.

10. Left-hip-firm-stoop-stride-sitting Right-Arm-up-stretching + down-pressing.

11. Hanging Leg-parting + closing.

12. Heave-grasp-standing Chest-expansion.

Between Movements.—Hanging on the boom; Right-stretch-left-hip-firm-standing Heel-raising Knee-bending at the corner of a door; G.C.P.; Rest on the back.

II. *Treatment for a single lumbar curve* (*convex to the right*).

1. Stretch-grasp-standing Forward-drawing.

2. Hanging Neck-raising-with-Leg-parting.

3. Stretch-leg-forward-lying 2-Arm-down-drawing (concentrically + eccentrically).

4. Right-spring-sitting Trunk-rolling with pressure, or Standing Trunk-rolling.

5. Back massage.

6. Hanging (against the wall bars) passive 2-Leg-carrying to the right with pressure on the convexity.

7. Self-correcting in belt.

8. Hips-firm-leg-forward-lying Alternate-Trunk-rotation.

9. Left-side-leg-lying Correcting with pressure + Neck-firm-side-arch-leg-lying Holding.

10. Yard-stoop-leg-lean-standing Plane-arm-carrying.

11. Reach-grasp-standing Heel-raising Knee-bending.

12. Stretch-sitting 2-Arm-bending + stretching.

Between Movements.—Hanging on the boom; Balance-walking with curtsey on right leg; G.C.P.; Rest on the back.

III. *Treatment for a single dorsal curve (convex to the left).*

1. Heave-grasp-standing Chest-expansion.
2. Stretch-standing Heel-raising Knee-bending (with careful correction of position).
3. High-ride-sitting Circle-turning.
4. Hanging in suspension-apparatus.
5. Self-correcting in belt.
6. Hips-firm-high-ride-sitting Plane-twisting.
7. Right-neck-firm-high-ride-sitting Side-bending to the left with pressure.
8. Leg-forward-lying Holding.
9. Back massage.
10. Hips-firm-stoop-stride-sitting Back-raising.
11. Left-side-lying-over-boom. Stretch-side-grasp-standing Forward-drawing.
12. Left-hip-firm-stoop-stride sitting Right-arm-up-stretching + down-pressing.
13. Hanging Leg-parting + in-pressing.
14. Stretch-sitting 2-Arm-bending + stretching.

Between Movements.—Hanging on the boom; Sawing; Right-stretch-standing Heel-raising against a wall. Resting on the back.

IV. *Treatment for a triple curve*, right cervical, left dorsal, right lumbar, with right hip forward.

Back massage.

1. Stretch-sitting 2-Arm-down-drawing.
2. Half-lying Leg-rolling + outstretching.
3. Rolling in rings.
4. Hanging in suspension apparatus.
5. Self-correcting in belt.

6. Reach-grasp-standing Head-rolling + Neck-raising.
7. Hanging Correcting rotation of spine on pelvis.
8. Heave-grasp-close-standing. Left-hip-forward-turning.
9. Leg-forward-lying Correcting with pressure on both curves.
10. Left-neck-firm-Right-stretch-Right-spring-sitting Holding.
11. Left-crutch-standing Head-side-bending to the right.
12. High-reach-grasp-standing Right-leg-outward-carrying + in-pressing.
13. Yard-left-walk-standing Plane-arm-carrying.
14. Stretch-grasp-standing Forward-drawing.

Between Movements.—Hanging on the boom ; Balance-walking ; Sawing ; Resting on the back.

Chapter VI

CONSTITUTIONAL AND BLOOD DISEASES

Anæmia

In the strict sense of the word *anæmia* means poverty of blood. Anæmias are classified as primary and secondary. There are two forms of primary anæmia: (1) chlorosis, (2) pernicious anæmia. Secondary anæmia is due to hæmorrhage or toxins.

Chlorosis as originally described is now seldom seen. It is characterised by a deficiency of hæmoglobin and, as the name implies, a greenish pallor of the skin.

Morbid Changes.—In *secondary anæmia* the diminution of blood colouring matter is due to *diminution in the number of blood corpuscles;* in *chlorosis* each corpuscle has less colouring matter than normal, but the number of corpuscles is not diminished to any appreciable extent, besides which many of the red corpuscles show deviations from the normal in form and size. Chlorosis is further characterised by a frequently sudden onset without perceptible cause in young girls about the age of puberty.

Causes of Anæmia.—1. *Bad hygienic conditions.* Poor food, *e.g.*, tea and cakes without proper meals; overwork; too little rest.

2. Congenital weakness of the blood-forming organs.

3. *Hæmorrhage*, acute and chronic, *e.g.*, from bad hæmorrhoids and profuse menstruation.

4. General disturbances of nutrition, often connected

with chronic diseases, such as gastritis, enteritis, heart, lung and kidney disease.

5. Acute infectious diseases, owing to the fever, loss of appetite and lowered power of digestion.

6. Toxic conditions, such as rheumatism.

Symptoms.—Since the blood colouring matter is diminished the blood's capacity for taking up oxygen during its passage through the capillaries of the lungs is diminished, with the result that the supply of oxygen to all the organs of the body is diminished, and therefore the processes of oxidation, and consequently of metabolism, throughout the body are lessened. Disturbance of function arises in all the organs, and so we find symptoms in all parts of the body, as follows :—

1. *Paleness* of the skin and mucous membranes.

2. *General muscular weakness.* The diminished oxidation and metabolism cause diminished production of heat and muscular development. *Fatigue and inflammation of muscle* arise easily, especially in the back muscles, due to over-strain of the weakened muscles.

3. *Symptoms pointing to a certain enervation and weakness of the brain and nervous system.* Lessened power of mental work ; giddiness on rising from a lying position ; attacks of faintness ; headache ; spots before the eyes ; singing in the ears, etc.

4. *Respiratory symptoms.* Breathlessness, partly due to lack of oxygen, which in turn depends partly on the diminution of blood colouring matter and partly on the weakness of the muscles of respiration.

5. *Circulatory symptoms.* The heart is weakened like all the other muscles. *Palpitation* is thus produced by the slightest strain ; to save its strength the heart makes frequent small contractions instead of fewer strong ones.

The circulation becomes *slowed ;* the hands and feet are therefore cold, and cellulitis may arise. In more severe cases the feet and lower legs become swollen.

6. *Digestive symptoms.* Dryness of the mouth, *dyspeptic symptoms* (loss of appetite, discomfort after meals, acid eructations, nausea, vomiting). These symptoms show a disordered gastric digestion and are connected with changes in the gastric juice, which are in turn produced by the disturbed glandular activity due to the lack of oxygen. *Constipation* due to weakness of the intestinal and external abdominal muscles.

7. *Disturbance of general metabolism* due to lack of oxygen. In severe cases *fatty degeneration* may take place, especially in the heart, kidneys and walls of the blood vessels. The last-mentioned often leads to hæmorrhage.

8. *Disturbances of menstruation.*

(*a*) Diminished menstruation, in the effort of Nature to economise blood.

(*b*) In some cases, especially in the more severe cases, increased menstruation, probably due to the changes already mentioned in the walls of the blood vessels.

9. Sometimes there is slight fever.

Principles of treatment aim at :—

1. *Saving the strength of the body* by rest and diminished work.

2. *Increasing the patient's strength* by general strengthening treatment (see p. 20).

3. *Increasing the respiratory capacity* and so improving the oxygenation of the blood.

4. *Producing an increase of blood colouring matter* and of the number of corpuscles. This is done by *general strengthening treatment*, by *abdominal kneading*, and possibly also by *Arm and Leg shaking*.

5. *Relieving symptoms.* This is best done by increased supply of oxygen, since most of the symptoms are due to lack of oxygen. *Muscle inflammation* and *cellulitis* are treated by massage. Indigestion and constipation must be treated.

Example :—

Treatment for a very weak Patient.	Stronger Treatment.
Half-lying Chest-lift-stroking.	Sitting Chest-lifting.
	Half-lying Leg-kneading.
Half-lying Leg-kneading + General Nerve-pressures.	Sitting Arm-shaking.
	High - ride - sitting Circle - turning.
Half-lying Abdominal kneading.	Crook-half-lying Abdominal kneading + Stomach-shaking.
Sitting Back-hacking.	Reach-grasp-standing Back-hacking.
Half-lying Arm-kneading + General Nerve-pressures.	Half-lying Arm-kneading.
	Half-lying Leg-shaking.
Half-lying Chest-lift-stroking.	Heave-grasp-standing Chest-clapping.

Plethora.

Morbid Changes.—A state of the system characterised by an excessive quantity of blood or of its solid constituents, especially of the red corpuscles.

Causes.—1. *Cessation of customary loss of blood* (menstruations, piles, varicose veins).

2. *Heredity.*

3. *High feeding* combined with insufficient exercise.

Symptoms.—High colour ; rushes of blood to the head ; heavy, unwieldy body ; drowsiness ; feeling of weight and tension in body and head ; constipation.

Treatment.—1. Limitation of food, especially of carbohydrates and fat, but also of protein.

2. *Vigorous gymnastic exercise.*

3. *Movements taking blood away from the head.*

4. Movements which take blood to the pelvis, if cessation of menstruation is the cause.

5. Movements to counteract constipation.

Example.—I. Treatment for *a plethoric patient* who is too fat, given to over-eating and too little exercise.

1. Stretch-sitting 2-Arm-bending and stretching.
2. Reach-grasp-standing Heel-raising + Knee-bending.
3. Reach-grasp-sitting Head-rolling + Neck-raising.
4. Crook-half-lying Abdominal kneading.
5. Stretch-grasp-stoop-lean-standing Back-raising.
6. High-ride-sitting Arch-twisting.
7. Yard-walk-standing Plane-arm-carrying.
8. Half-lying Leg-parting and closing.
9. Stretch-grasp-standing Forward-drawing.

II. Treatment for a patient suffering from *plethora* due to delayed menstruation.

1. Stretch-half-lying 2-Arm-bending and stretching or Standing 2 - Arm - lifting - outward - upward-outward-downward.
2. Stretch - arch - instep - support - standing Heel - raising Knee-bending.
3. Hips-firm-loin-lean-stride-standing Active Trunk-rolling.
4. Reach-grasp-standing Back-hacking + Sacral beating.
5. Hips-firm-high-ride-sitting Plane-twisting.
6. Hips-firm-high-knee-stride-standing Screw-twisting.
7. Yard-sitting Arm-rotation-with-rod.
8. Half-lying Leg-rolling + Knee-updrawing and down-pressing.
9. Sitting Chest-lifting.

Hæmophilia.

Morbid Changes.—A peculiar quality in the blood which prevents coagulation, so that bleeding which is difficult to arrest is apt to take place after the slightest injury or operation. A patient may even bleed to death after extraction of a tooth.

Causes.—Heredity. Inherited through the mother, although she herself may be healthy.

Treatment.—The disease is incurable. If a bleeder requires treatment by massage and gymnastics for any reason, great care must be taken. By massage (effleurage), the strength of which is slowly increased, the blood vessels may be locally improved in tone, so that eventually quite strong treatment can be borne. The increased tone disappears rapidly when treatment ceases.

Similar changes in the blood and blood vessels occur in *leukæmia, scurvy, purpura* and *morbus maculosus.*

Leukæmia is characterised by an enormous increase in the number of the white blood corpuscles.

Scurvy is due to the absence of fresh food. It is characterised by great general weakness, sponginess of the gums and bleeding from them, loosening of the teeth, hæmorrhages in the skin and mucous membranes. It is cured by fruit juices and fresh meat.

Purpura and morbus maculosus are diseases allied to rheumatism. The former is characterised by small punctate hæmorrhages in the skin and mucous membranes, the latter by somewhat larger hæmorrhagic spots.

These diseases are not suitable for gymnastic treatment, but are mentioned because the gymnast must take great care if any one suffering from them should require gymnastic treatment or massage for any other reason.

Diabetes Mellitus.

The power of the body to oxidise carbohydrate is more or less diminished, sugar therefore accumulates in the blood and is excreted by the kidneys when the sugar content of the blood has reached a certain point (about 0·3 per cent.).

Causes.—1. *Hereditary predisposition*, also a hereditary predisposition to nervous diseases.

2. *Unsuitable mode of living.* Too rich a diet and especially too much carbohydrate.

3. *Mental overstrain* as well as sudden and repeated *shocks.*

4. *Other disorders of metabolism, e.g.*, gout, obesity.

5. *Morbid changes in the nervous system*, especially in the brain and spinal cord.

6. *Morbid changes in the liver and pancreas.*

7. *Changes in the glands of internal secretion* with disturbance of their activity, especially changes in the thyroid glands.

Sometimes no definite cause can be discovered.

Symptoms.—1. *Sugar in the urine.* Shown by chemical tests. It may be suspected if the amount of urine is markedly increased (the normal amount is 2½ pints in twenty-four hours), and if at the same time the urine is very light in colour.

2. *Increased hunger and thirst.* Increase of thirst is, of course, connected with the increased secretion of urine. The feeling of hunger depends on defective nutrition, owing to the fact that the body cannot make full use of some of the food taken, especially carbohydrate. For this reason the food that is digested is relatively richer in protein than under normal conditions. Food rich in protein increases

oxidation processes, so that this in turn increases the craving for food. It is common for diabetic patients to say: "I am always eating and yet I am always hungry."

3. *Loss of flesh and strength*, since only part of the food taken is utilised.

4. *Digestive symptoms*, due to overstrain of the digestive organs, acid saliva, decay of the teeth, constipation.

5. *Itching of the skin* and a tendency to boils. The itching is possibly due to the fact that a certain amount of sugar is excreted by the skin.

6. The *early development of senile cataract.*

7. *Neuralgia or neuritis* (sciatica, etc.).

Treatment.—The power of the body to oxidise carbohydrates is lessened by emotion, but increased by moderate muscular activity. The patient should therefore lead as quiet a life as possible, and should also receive suitable gymnastic treatment. This consists of general strengthening treatment with active movements which do not tire the patient. *Muscle kneading* especially should be given, since it increases the activity of the muscles and consequently the combustion of carbohydrate. It should be included in every scheme of treatment, but especially for weak patients who cannot stand active movements. *Movements and manipulations to increase the activity of the digestive organs* should also be given, since digestion is generally overstrained. *Diet* is prescribed by the doctor.

If neuralgia or neuritis arises it may be treated by massage or by various forms of electricity.

Example.—Treatment for a patient with *diabetes.*

1. Sitting Chest-lifting.
2. Half-lying Leg-kneading.
3. Stretch-half-lying 2-Arm-bending and stretching.
4. Half-lying Foot-rolling, bending and stretching.

5. Hips-firm-high-ride-sitting Circle-turning or Trunk-rolling.

6. Hips-firm-close-sitting Alternate-trunk-rotation.

7. Crook-half-lying Abdominal kneading + Stomach and Cross-abdominal-shaking.

8. Hips-firm-stoop-stride-sitting Back-raising.

9. Half-lying Arm-kneading.

10. Reach-grasp-standing Back-hacking.

11. Half-lying Leg-rolling + outstretching.

12. Half-lying Chest-lift-stroking.

Gout.

Gout is a disease of metabolism.

The power of the body to oxidise protein is more or less diminished, so that part of the protein taken as food does nor reach the stage of urea, but remains as uric acid.

Morbid Changes.—The uric acid in the blood is increased and is deposited as insoluble biurate of soda in the lymph spaces and tissues in those parts of the body where the circulation is slow, *e.g., in the hands and feet,* or *in the cartilages of the ear,* where loss of heat is great. Biurate of soda tends to be deposited in the joints and in their immediate surroundings, but may also be deposited in other parts and tissues (bursæ, kidneys, walls of blood vessels, liver, etc.).

Causes.—1. *Heredity.*

2. *Too rich a diet.*

3. *Defective metabolism* due to insufficient exercise or general weakness. It is often associated with other constitutional diseases, such as diabetes and obesity.

4. Chill.

Symptoms.—1. *Painful thickening* in the affected tissues due to deposits of biurate of soda.

2. *Varying intensity* of the pains, generally connected with increase or diminution (by re-absorption) of the deposits.

3. *Attacks of gout.* These are often preceded by premonitory (prodromal) symptoms. The commonest are dyspeptic symptoms; fatigue; mental depression; muscular pains; cramp in the calf muscles.

The attack itself usually begins in the night with severe pain in the metatarso-phalangeal joint of the great toe or in some other affected part. *The skin* over the painful spot becomes *red, swollen and shiny* and so *tender* that the lightest covering causes pain. There is often *shivering and fever.* Towards morning the patient perspires and the pain is somewhat relieved, but the attack comes on again at night. This continues for three to ten days, when the attack generally passes off and the swelling goes down by degrees, but generally not completely. During the attack pain is sometimes so severe that even the strongest patient cries out with pain produced by the shaking when any one walks across the floor.

These attacks may recur at intervals of six months or a year and the condition may gradually become chronic. The joint remains swollen and deformed and the general health suffers. In other cases the attacks are not so typical, but increases of pain recur with tenderness and thickening—a more chronic form of the disease. In such cases there is often no free interval. This form of the disease often begins with small, round nodules round the knuckles. These grow and are sometimes tender, sometimes not.

The symptoms may be much relieved by treatment, and recurrence of the attacks may be prevented by a well regulated diet and mode of living. Length of life depends

upon the conditions of the circulatory system and of the kidneys.

Treatment.—A gouty patient should lead a temperate life, should avoid alcohol and malted drinks, chocolate, red meat, brains, sweet-bread, liver and kidneys. He should drink plenty of water.

Gymnastic treatment consists of *walking and vigorous gymnastic exercises* to increase general metabolism.

By *massage* one may try to promote resolution and re-absorption of the gouty nodules, but this treatment is generally very long and painful, and all patients will not stand it. In any case it demands much patience both from the patient and the gymnast. Abdominal massage should be given to improve digestion and circulation and promote elimination.

Sometimes the attack is milder if the affected part is treated by *light effleurage* as soon as premonitory symptoms appear.

Example.—See first treatment for plethora (p. 100).

Obesity.

Morbid Changes.—The power of the body to oxidise fat is lowered. The deposit of fat in the body is therefore abnormally increased. This is especially the case in the subcutaneous connective tissue, more particularly round the hips and in the abdominal walls, but also round the heart and kidneys and in the mesentery.

It is difficult to fix a limit between a condition of very good but still normal nutrition and a condition in which the deposit of fat is abnormal, but one may consider a weight of 12 stones for a man and 10 for a woman a normal weight for medium height.

Causes.—1. *Too rich a diet.* Excessive beer drinking.

2. *Diminished metabolism* due to too little exercise, or to anæmia and circulatory changes. In this case combustion is defective owing to lack of oxygen, and the patients are generally fat and pale.

3. *Hereditary tendency.*

4. *Defects* in the activity of the glands *of internal secretions,* especially of the thyroid gland.

Symptoms.—1. These patients *are easily tired.* All movement is more difficult owing to their excessive weight.

2. They *perspire easily,* partly owing to much heat being formed in the body by the increased muscle work necessary to move the heavy weight, partly because the fat has the same effect as a fur coat.

3. *Breathlessness,* owing to the rapid onset of fatigue.

4. *Circulatory disturbances.* The action of the heart is hampered by the amount of fat deposited outside the heart and in the connective tissue between the fibres. Patients complain of a feeling of tightness in the chest.

5. *Cellulitis,* due to slowing of the circulation (see p. 24).

Treatment.—1. *Diet* and regular weighing once a week.

2. *General heart treatment* (see "Diseases of the Heart," p. 180) if the heart's action is weak. When the heart has recovered one goes on as soon as possible to—

3. *Vigorous gymnastic exercise.*

4. *Vigorous kneading of the fat masses.*

5. *Abdominal massage.*

Example of a day's treatment.—See "General Heart Treatment" (p. 186), "Treatment for Fatty Infiltration of the Heart," p. 196, and "Treatment for Plethora" (p. 100).

Rickets (*Rachitis*).

Rickets is a chronic disease of nutrition occurring in early childhood. Its most important and constant changes are

in the bones, but it also affects muscles, ligaments and mucous membranes, and nearly all the organs, especially the nervous system.

Morbid Changes.—"Extensive preparation for ossification and imperfect performance."

1. Deficient deposit of bone salts and absorption of salts already formed in the growing bones.

There is excessive formation of cartilage at the epiphyses with irregular arrangement of cartilage cells. Cell growth under the periosteum is excessive.

2. Both cartilage and bone are softer and more flexible than normal.

3. The epiphyses may join the shaft too early, resulting in stunted growth.

4. Muscles and ligaments are flabby.

5. Catarrh of mucous membranes.

6. Anæmia.

7. When the disease is over the bone is generally harder and thicker than normal.

Causes.—1. *Bad hygienic conditions,* especially lack of sunlight.

2. *Bad feeding.* Diet deficient in the fat-soluble vitamin A. The disease is especially prevalent among "bottle-fed" babies.

3. *Severe acute or chronic diseases,* as inflammation of the lungs, measles, bronchitis, etc.

4. *Race and climate.*

Symptoms.—1. *The disease usually arises during the first year of life,* and is generally over by the age of three. It occasionally arises later, at puberty.

2. *The fontanelles close late and the shape of the skull is often square,* owing to the back of the head being flattened by pressure against a pillow.

3. *Late and irregular dentition.* Normally the teeth come through in the following order :—

The two lower central incisors.
The two upper central incisors.
The two upper lateral incisors.
The two lower lateral incisors.
The four lower temporary molars.
The four upper temporary molars.
The two upper canines.
The two lower canines.

4. The so-called *rickety rosary* on the chest due to swelling at the junction of the rib with its cartilage.

5. *Deformities of the thorax,* with protruding sternum (*pigeon chest*) or sunken grooved sternum.

Eversion of the lower margin of the thorax is also a common deformity.

6. *Spinal curvatures,* generally irregular.

7. *Enlargement and tenderness of the epiphyses,* greatest and most noticeable at the distal ends of the ulna, radius, tibia and fibula and at the anterior ends of the ribs.

8. *Abnormal curves and deformities, especially of the lower limbs,* knock knee (genu valgum) ; bow legs (genu varum) ; flat foot, etc. The latter deformity frequently arises at puberty owing to rapid growth and increase of the body weight combined with rickets, which may develop at the same time, and which lowers the weight-bearing capacity of the arches of the foot.

9. *Laxity of the capsules and ligaments of the joints.*

10. *Child begins to walk late* (normally at about the age of a year).

11. *General symptoms,* such as anæmia ; sweating, especially about the head ; weakness of muscles ; wasting ; tendency to convulsions ; hydrocephalus, etc.

The disease usually passes off after the age of three, but the deformities may remain although they become less.

Treatment.—*Improved hygienic conditions. Diet rich in vitamins, milk, cream fats, salt baths, general strengthening gymnastic treatment, general massage. Abdominal kneading is important. Special treatment of deformities.*

Example.—See "Treatment of Anæmia" (p. 98).

Glandular Tuberculosis.

This is a form of tuberculosis in which there is frequently marked swelling of the glands of the neck. It is due to the tubercle bacillus, which has gained entrance to the body and by its multiplication has produced chronic inflammatory changes in the places where its colonies have settled. It may even be possible, as some have supposed, that this mild local process is of great importance in that it causes the body to manufacture antidotes to the tubercle bacillus and its toxins, and by the frequency of its occurrence develops a protection against the more severe forms of tuberculosis.

Morbid Changes.—Chronic inflammation in many parts of the body, caused by tubercle bacilli which have settled there, most commonly in the mucous membrane of the nose, throat, middle ear, conjunctiva, cornea, eyelids, larynx and trachea, *i.e.*, chiefly in the mucous membranes of the head. As a rule there is *swelling in the lymphatic glands of the neck*, the bacilli being carried there from the foci of inflammation. Joints are often affected.

Causes.—1. *Tubercle bacilli.* These are present in the air as dust wherever tubercular sputum becomes dried. They may be carried directly to the more accessible mucous membranes, or they may accompany the inspired air into

the mucous membrane of the air passages. Tubercle bacilli may also get into the body along with the food, especially with milk from tuberculous cows. Milk, especially for children, should be boiled before use, unless one can obtain "certified milk." For inflammation to develop, *the bacilli must be alive and multiply.* For this to happen, either the bacilli must be unusually strong or the resistive power of the body must for some reason be lowered. Tubercle bacilli are weak creatures, and the cells and fluids of the body possess a fair amount of resistive power, *i.e.*, power to kill bacteria. The vitality and virulence of the tubercle bacilli, as of all other bacteria, are not always equally great. Bacilli from a patient in galloping consumption are much more dangerous than bacilli from a patient who is holding his own and improving.

The resistive power of the body may be lowered by :—

1. *Hereditary predisposition* to the disease.

2. *Bad hygienic conditions*, which weaken the body and give greater opportunities for infection.

3. *Certain illnesses*, especially *measles, whooping cough and catarrh* of the mucous membranes of the nose and air passages, produce a lowered power of resistance to tubercle.

Symptoms.—1. *General weakness.*

2. *Symptoms due to inflammation in the mucous membranes* and other parts affected ; obstinate cold in the head ; discharge from the ears, due to inflammation in the middle ear ; ophthalmia, corneal ulcers, inflammation of the eyelids ; obstinate laryngitis and bronchitis ; sores about the nose, mouth, eyes and head. Swollen glands in the neck ; joint inflammations, etc.

3. Often slight *fever.*

Treatment.—1. Hygiene.

2. *Good and sufficient food,* especially much fat, cream, cod liver oil, etc.

3. *General strengthening treatment.*

Modern treatment of these forms of tuberculosis consists largely of methodical exposure of the body to the rays of the sun—sun baths, or to other forms of light which have a similar effect.

N.B.—No massage over the affected glands or joints.

Chapter VII

DISEASES OF THE NERVOUS SYSTEM

Mental Diseases.

These are characterised by disturbances in the functions of the mind, and most frequently depend upon some change in the brain. They are not generally suitable for gymnastic treatment, but in certain cases, where there is reason to believe that they are connected with circulatory disturbances in the brain (without other changes), and if the patient is not violent, gymnastic treatment may be tried if sufficient care is taken. Generally *those cases in which there is cerebral congestion* respond best to treatment. The treatment is general strengthening treatment with *special movements* to *deplete the head.* Sometimes mental trouble *is associated with arrested menstruation,* and in that case one would give *movements taking blood to the pelvis,* to bring back menstruation.

Anæmia of the Brain.

This disease is nothing more than *ordinary anæmia* with the *cerebral symptoms* (giddiness, etc.), for some reason, *specially marked. Treatment* is for the most part *the same as for ordinary anæmia,* but movements which take blood away from the head would naturally be avoided.

Fainting or collapse is caused by *sudden anæmia* of the brain, and is shown by the accompanying pallor of the face. It is best treated by keeping the patient lying down.

and if necessary by raising the legs. The patient should *not* otherwise be raised.

Congestion of the Brain (*Hyperæmia cerebri*).

Morbid Changes.—*Increased quantity of blood in the brain,* either active hyperæmia due to increased blood-flow to the brain or passive hyperæmia due to slowing of the blood-flow from the brain. Sometimes it is continuous; sometimes there are attacks which come and go. In most cases one may consider the disease a *vaso-motor disturbance.*

Causes.—1. *Plethora* (see p. 99).

2. *Heart disease.* Some forms of heart disease are associated with increased action of the heart, so that active hyperæmia of the brain may arise. If the heart's action is weakened there may be passive hyperæmia.

3. *Overstrain by mental work,* owing to the associated flow of blood to the brain.

4. *Abuse of alcohol,* by its action on the vaso-motor nervous system.

5. *Hindrance to the blood-flow* from the brain by a tumour, tight collar, etc.

6. *Climacteric,* the time of cessation of menstruation in women.

Symptoms.—Owing to the disturbed circulation and nutrition of the brain :—

1. *Uneasiness and excitement.*
2. *Feeling of heat in the head and neck.*
3. *Redness of the face.*
4. *General irritability and over-sensitiveness.*
5. *Giddiness, singing in the ears and malaise.*
6. *In severe cases, confusion and even loss of consciousness.*

Treatment is directed first and foremost against the causes, plethora, heart disease, etc. *Movements depleting*

the head are always given, as active leg movements, respiratory movements, neck massage. On the other hand, all movements and positions hampering respiration, *e.g.*, strong abdominal movements, are avoided.

Example.—Treatment for *a patient who suffers from rushes of blood to the head*, the patient having done much strenuous mental work.

1. Sitting Chest-lifting.
2. Reach-grasp-standing Heel-raising Knee-bending.
3. Neck massage.
4. High-ride-sitting Circle-turning + Chest-lifting.
5. Hips-firm-close-sitting Alternate Trunk-rotation.
6. Reach-grasp-sitting Head-rolling + Neck-raising.
7. Crook-half-lying Abdominal kneading.
8. Yard-stoop-lean-standing Back-raising.
9. Half-lying Leg-parting and-closing.
10. Yard-sitting Arm-rotation-with-rod.
11. Heave-sitting Chest-expansion (for respiration).
12. Arm-lean-standing Back-hacking + Sitting vibrations over the head.

Cerebral Hæmorrhage (*Apoplexy*).

Morbid Changes.—*Rupture of a blood vessel in the brain or its membranes* with more or less *hæmorrhage* and consequent *damage to the brain tissue* in a larger or smaller area. There is also *disturbance of circulation* in the region around the hæmorrhage due to pressure. According to the exact position of the hæmorrhage, different symptoms arise. The lesion is in the upper motor neuron.

Causes.—A. Brittleness of the blood vessel walls.

B. Temporary rise of blood pressure.

Brittleness of the walls of the blood vessels generally depends on *arterio-sclerosis*, a morbid change in the walls of

the blood vessels, especially of the tunica intima and media. It is a form of chronic inflammation with migration of white corpuscles, increase of the tissue cells and connective tissue, on which supervenes degeneration of cells and deposit of lime salts in the degenerated tissues, so that the walls of the blood vessels lose their elasticity and become hard and rigid, as well as brittle.

Causes of arterio-sclerosis are :—(*a*) *Old age*, as the result of physiological changes. The age of onset varies in different families.

(*b*) *High blood pressure* which may be induced by *hard physical work and hypertrophy of the heart.*

(*c*) *Irritation by poisons* in the blood due to abuse of alcohol, over-eating, gout, kidney disease, lead poisoning, infectious diseases, especially syphilis.

A temporary rise of blood pressure may take place due to :—

(*a*) *Physical strain*, especially a forced effort which changes negative pressure in the thoracic cavity to positive and so raises blood pressure.

(*b*) An unusually large meal, by increasing the activity of the heart in a reflex way.

(*c*) *An excessive dose of alcohol*, by increasing the heart's action.

(*d*) A cold bath too soon after a meal, by raising pressure in the internal organs, and therefore also in the brain, by contraction of the blood vessels in the skin.

(*e*) *Violent emotion*, producing marked increase in the action of the heart.

Symptoms.—The symptoms due to cerebral hæmorrhage may be divided into :—(*a*) *immediate* or *early*, and (*b*) *late* symptoms, according to the time of their onset.

The *symptoms which appear immediately* are :—A more or

less sudden disturbance of the brain, the intensity of which may vary from slight giddiness to complete unconsciousness, according to the situation of the hæmorrhage, whether large or small, or whether it took place quickly or slowly.

If the hæmorrhage is *small* and takes place in a more or less *indifferent part of the brain*, the symptoms may be limited to an attack of giddiness, cramp or such like. Sometimes there are no symptoms.

If the bleeding takes place slowly, no marked immediate changes arise, but paralysis and other symptoms develop in the course of a few hours. In such cases there is, as a rule, no loss of consciousness.

If, on the other hand, the hæmorrhage is large and sudden, the characteristic symptoms of an attack of *apoplexy develop at once.* These symptoms depend on a sudden marked rise of pressure within the skull. The bleeding is so sudden that the cerebro-spinal fluid cannot flow away as quickly as the blood is poured out of the ruptured blood vessel. The great increase of pressure produces *such disturbance of the circulation in the brain that unconsciousness supervenes. Irritation* of other parts of the brain is caused by the pressure, especially near the origin of the vagus nerve, and for this reason *changes take place in respiration and in the heart's action. The respiration becomes stertorous, and the face is cyanosed.* This distinguishes unconsciousness due to apoplexy from that due to fainting, in which case the patient is pale. The pulse is hard and full and somewhat slow.

Sudden loss of consciousness, stertorous breathing, cyanosis of the face, hard, full, rather slow pulse, are the most important early symptoms in an attack of apoplexy.

The *symptoms which arise later* if the patient recovers are :—

1. *More or less extensive one-sided paralysis* (hemiplegia),

due partly to destruction of brain substance, partly to pressure of the hæmorrhage on its surroundings. With a small hæmorrhage a very limited paralysis may arise, *e.g.*, in one hand or arm, or no paralysis at all.

N.B.—The paralysis is always found on the opposite side to the hæmorrhage.

2. *The reflexes* on the paralysed side are increased, because the controlling power of the brain is weakened.

3. *Sensibility* is often somewhat lowered, especially immediately after the attack, but much less affected than power of movement. In hysterical paralysis the loss of sensation is, as a rule, co-extensive with the paralysis.

4. *Vaso-motor disturbances.* At first there is redness and heat, later coldness and cyanosis in the paralysed parts.

5. *Trophic changes.* Slight atrophy due to disuse in the paralysed parts. The atrophy is slight because the muscles are still in unbroken connection with their trophic centres, which lie in the grey substance of the anterior horn of the spinal cord.

6. *Recovery takes place as a rule* by the re-absorption of the hæmorrhage, so that the pressure on its surroundings is lessened. Recovery takes place in a definite order. Power of movement returns in the proximal parts of the extremities earlier than in the distal, in the legs earlier than in the arms, in the flexors before the extensors. The more specialised movements, *e.g.*, of the hands and fingers, recover last. *Eccentric power of movement recovers long before concentric.*

7. *Contractures* often arise due to the earlier recovery *of the flexors.*

8. *Aphasia, loss or alteration in the power of speech,* often arises in *right-sided paralysis* in right-handed people.

9. Intelligence is generally unaffected. In some cases it

becomes lowered after a time, and this is accompanied by some loss of emotional control.

10. These patients often become fat owing to lack of exercise.

Treatment.—*The first aim of treatment is to keep the muscles, joints and nerves in good working order* till the brain in its progress toward recovery can resume its command over them.

Owing to the risk of further hæmorrhage no gymnastic treatment can be thought of immediately after the attack. The patient must be kept in bed and as quiet as possible. Care must be taken during this time that the feet are supported by cushions in a good position (not plantar-flexed and inverted), as contractures soon arise and make walking difficult when the power of movement returns. Gymnastic treatment can generally be begun after two or three weeks.

The joints must not be allowed to become stiff. Passive movements are given in all the joints, round all their principal axes, and to the limit allowed by the structure of the joint.

The muscles must be prevented from atrophying and becoming shortened. Muscle atrophy is prevented partly by massage, especially *kneading*, which increases metabolism and improves nutrition; partly by *special nerve pressures and muscle-hacking*, which produces small contractions. The two latter manipulations are not used if there is any tendency to opasticity. These small contractions produce dilatation of the blood vessels going to the muscles, increased metabolism and improved nutrition. At first hacking must not be given, as the brain might be affected by the shaking, which is undesirable. *Shortening* of muscles must be prevented by passive stretching movements and by carefully keeping the limb in a good position,

The tendency to contracture of the flexors must be specially noticed.

The nerves must be saved from degeneration due to inactivity. This may be done by nerve-massage and nerve-pressures, general and special, which compel activity in the nerves, and so increase their nutrition and blood supply.

Abdominal kneading must not be given, as it raises blood pressure. Constipation must be treated by enemata or aperient medicine.

At a later stage (generally after three to four weeks), when the power of active movement is beginning to return, it must be tested and exercised by small assisted active movements. The next step should be eccentric muscle work against gravity. For instance, in the case of dropped foot, the gymnast places the foot in a dorsi-flexed position and the patient attempts to hold it there against gravity. As muscular power increases free movements as well as concentric and eccentric work are given.

In each treatment it must be specially noticed :—

1. That *all* the muscles are exercised. This is most easily done by letting the patient try to give resistance to all the movements which can be performed in the individual joints. The movements are performed round the principal axes of the joints. Rotation must not be forgotten.

2. *The flexors must not be exercised too much* in proportion to the extensors, as this would promote the onset of contractures.

3. *The patient must not be tired.*

4. If the patient's strength allows, the healthy side should also be exercised.

5. Double-sided resisted movements are not given, as the power of movement on the two sides is so unequal.

Movements, however, of the paralysed side are made easier if the patient tries to perform the same movement, free, with the unaffected side.

6. *Passive movements, muscle massage or kneadings*, as well as *nerve massage or nerve pressures, should be given before active movements*, to increase the muscles' power of work, and to increase the conducting power of the nerves.

At this stage cautious abdominal kneading is sometimes ordered.

In order not to tire the patient by too lengthy treatment of one part of the body, the table may be arranged according to the following example. The plan is that kneading or massage, as well as nerve pressures, are given first to the lower, and then to the upper extremities. Movements are then given, again beginning with the lower limbs. The movements for arms and legs should, however, again be divided into two groups, the first group consisting of movements for the distal parts of the leg and arm, the second for the proximal parts. When the patient has so far recovered that he can perform concentric movements and support the weight of the limb, it is often wise to let him perform double-sided free movements. A "general treatment," with movements also for the trunk muscles, can then usually be given.

Examples.—I. *Treatment for a patient who has had a stroke followed by left-sided paralysis.* Two to three weeks have passed since the attack. No power of active movement has yet returned.

1. Lying Chest-lift-stroking.

2. Lying Leg-kneading (or massage) Nerve-massage or Nerve-pressures, special and general.

3. Lying Arm-kneading (or massage) Nerve-massage or Nerve-pressures, special and general.

4. Lying Passive Foot-rolling + flexion, extension, eversion and inversion.

5. Lying Passive Knee-flexion and extension.

6. Lying Passive Finger- and Wrist-rolling + flexion and extension, Radial and Ulnar flexion of Wrist, Finger-stretching with abduction. Thumb movements, rolling + flexion and extension + abduction and adduction, and opposition.

7. Lying Elbow-flexion and extension + pronation and supination.

8. Lying Leg-rolling + flexion and extension + abduction and adduction + rotation.

9. Lying passive single Arm-rolling + abduction and adduction, Arm - carrying - forward - backward - upward + Arm-rotation.

10. Side-lying Back-kneading.

11. Lying Chest-lift-stroking.

At the beginning, or if the patient gets tired, only massage or kneading is given. The other manipulations and movements are introduced by degrees as strength increases.

II. *Treatment for a patient who has had a stroke followed by one-sided paralysis.* Four to six weeks have passed since the attack. Power of movement has partially returned, so that the patient can get up.

The movements are given first passively, and then the patient is encouraged to try if possible to resist them. Later he must try to perform them actively, the gymnast, if necessary, helping a little. Finally the movement is taken as an ordinary resistance movement (concentrically and eccentrically).

1. Sitting Chest-lifting.

2. Half-lying Leg-kneading + Nerve-pressures (special

and general) + Foot-rolling, bending and stretching, inversion and eversion, Knee-bending and stretching.

3. Half-lying Arm-kneading + Nerve-pressures (special and general) + Finger- and Wrist-rolling, bending, stretching, Radial- and Ulnar-bending of the Wrist + Finger stretching with abduction. Thumb movements separately.

4. Hips-firm-close-sitting Alternate-Trunk-rotation, if the patient is able.

5. Hips - firm - stoop - stride - sitting Back-raising, if the patient is able.

6. Half-lying Leg-rolling + Leg-updrawing and out-stretching + Leg-parting and closing + rotation.

7. Half-lying Elbow-flexion and extension + pronation and supination.

8. Sitting Arm-rolling, ab- and adduction, Arm-carrying-forward, backward, upward (to stretch position) + rotation.

9. Sitting Chest-lifting.

Movements are given at first only on the paralysed side ; later, as strength increases, some movements are given also to the healthy side. Cautious abdominal kneading may possibly also be given, but only with the doctor's special permission.

Embolism and Thrombosis of Cerebral Blood Vessels.

Morbid Changes.—Blocking of a larger or smaller artery by an embolus or thrombus. An *embolus* generally comes from some portion of a thrombus in the heart, or a vegetation on a valve becoming detached. In most cases of embolism in the brain the patient is suffering from heart disease. *Thrombosis* is generally due to arterio-sclerosis. The medium-sized and smaller arteries of the brain are terminal arteries, *i.e.*, they do not anastomose with each other. The result is that if an artery is blocked, all circula-

tion and nutrition in the area it supplies is cut off, so that the brain substance degenerates and is absorbed.

Symptoms and Treatment are for the most part the same as described for cerebral hæmorrhage.

Tumour in the brain may also cause one-sided paralysis. Tumour as a rule is accompanied by severe and obstinate headache, and the paralysis develops very slowly. This is, of course, not suitable for gymnastic treatment.

Diseases of the Spinal Cord.

Inflammation of the Spinal Cord.

(*Chronic Transverse Myelitis.*)

Morbid Changes.—Chronic inflammation in the spinal cord, which leads to destruction of nerve tissue and to increase of connective tissue. This process generally affects the whole cross-section and may extend 2—4 inches in a longitudinal direction. It generally occurs in the dorsal region.

Causes.—1. *Extension of inflammation* from a neighbouring organ (generally from a vertebra).

2. *Bacteria or poisons* formed by bacteria, especially *syphilis* or *puerperal fever*, but also other infectious diseases.

3. *Chill, overstrain*, etc. The causes are not well understood.

4. *Pressure on the spinal cord* by tumour or sharp angular curvatures, as already mentioned (p. 69), may cause symptoms similar to those of chronic myelitis (compression myelitis).

Symptoms.—Double-sided—in contrast to diseases of the brain.

1. *Motor disturbances.*

(*a*) *Irritative symptoms.* Cramp, jerking and trembling.

These arise more in the beginning of the disease, and are due to irritation of the nerve cells of the cord produced by the inflammation.

(*b*) *Paralytic symptoms*:—paresis (= lessened power), paralysis (= complete loss of power). These arise later, and are due partly to the disturbed circulation and nutrition of the cord, partly to degeneration of nerve cells. They arise in the parts of the body corresponding to the diseased portion of the cord, and in those parts which correspond to the part of the cord below the affected portion.

2. *Disturbances of sensation.*

(*a*) *Irritative symptoms.* Aching, pain, over-sensitiveness or hyperæsthesia, abnormal sensations or paræsthesia (pins and needles, creeping sensations).

(*b*) *Paralytic symptoms.* Lessened sensation, partial disturbances of sensation, such as loss of sense of touch, pain or temperature, etc., complete loss of sensation or anæsthesia. What has already been said as to motor disturbances applies also to sensory.

3. *Ataxy, i.e.*, inability to innervate the muscles accurately and sufficiently to perform a movement, so that it is performed uncertainly.

4. *Disturbances of reflexes.*

The reflexes are lost in the parts supplied by nerves from the affected portion of the cord.

The reflexes are increased in the parts supplied by nerves, from that part of the cord below the affected portion, because the inhibiting power of the brain cannot make itself felt.

The reflexes are normal in the parts supplied by nerves from the part of the cord above the affected area.

5. *Disturbances of the bladder and bowel.* Generally difficulty or inability to empty them voluntarily. Empty-

ing takes place involuntarily, as the brain loses its power to control the reflex to the sphincter muscles. These reflex centres lie in the lowest part of the cord, therefore generally below the affected part.

Treatment.—The same principles are followed as in the treatment of paralysis due to cerebral hæmorrhage (see p. 119).

At first no movements or manipulations should be given which directly affect the spinal cord, such as Back-hacking, Spinal Nerve-pressures, etc. Later, and when no irritative symptoms are present, such as spasticity, it is possible to venture on giving gentle vibrations over the spine.

Locomotor Ataxy (*Tabes dorsalis*).

Morbid Changes.—Degeneration of nerve elements and formation of connective tissue in the posterior columns, horns and nerve roots of the spinal cord and in the sensory fibres of the peripheral nerves. It is a disease of the lower afferent neuron. The degenerative processes begin in the nerves of the legs and in the lower part of the spinal cord, and gradually spread upward.

Causes.—The effect of the poison of syphilis on the nervous system. It is most common in men between the ages of twenty and fifty. It is very rare in women.

Symptoms.—The disease has a very tedious *course*, twenty to thirty years, and can be divided into three stages each of which is characterised by certain symptoms.

1. *The first* or *pre-ataxic stage* begins slowly and insidiously and often lasts ten years or more. It is characterised by :—

(*a*) *Irritative sensory symptoms : Lightning pains* in the feet and legs, later also in the arms. Patients generally think they have rheumatism. *Paræsthesia* and the *so-called* " *girdle-sensation* " are often present.

(*b*) *The patellar reflex* is diminished or lost.

(*c*) *The pupil reflex* to light is sluggish or lost.

2. *The second or ataxic stage* is characterised by :—

(*a*) *Ataxy*, especially in the lower extremities, so that the gait becomes peculiar and characteristic. The patient has difficulty in balancing and walks with the legs wide apart ; the foot is swung forward and strikes the ground hard with the heel. It is caused by an increasing loss of sensation, especially of muscle sense.

(*b*) *Sensory symptoms. Diminished sensation.* Feeling of cotton wool under the feet. *Partial loss of sensation*, most frequently of *pain, temperature and muscle sense.* Owing to the loss of muscle sense, the patient finds it *difficult to walk in the dark*, and *loses his balance easily* if he shuts his eyes when in close standing position, " Romberg's symptom."

(*c*) *Difficulty in emptying the bladder and bowel*, owing to disturbance of the reflexes by the morbid changes in the lower part of the spinal cord.

(*d*) Sometimes a *characteristic joint affection* known as Charcot's joint. This is a rapid, painless disorganisation of a joint (commonly of the knee).

3. *Third stage. The paralytic stage* is less often seen, as the patient generally dies of some inter-current disease. It is characterised by :—

(*a*) *Increase of all the symptoms found in the ataxic stage*, especially of the ataxy, so that the patient is unable to get up.

(*b*) Frequently *severe catarrh of the bladder* supervenes generally by infection with a catheter used in emptying the bladder.

(*c*) *Sometimes paresis and paralysis.*

Treatment.—1. We must try to improve nutrition in the

affected parts of the nervous system, in order to counteract degeneration and, if possible, repair damage. For this end are given :—

(*a*) *Nerve-pressures, nerve-frictions,* and *nerve-vibrations* (also vibrations down the spine); the sensory neuron is thus compelled to work and receives increased blood supply. Treatment over the spine must not be too strong.

(*b*) *General muscle kneadings* to improve circulation and metabolism, and therefore the nutrition of the nerves.

2. Further, the *power of co-ordination and the control of the brain over the muscles must be methodically exercised.*

For this purpose *resisted movements given both with concentric and eccentric muscle work* are specially effective, but they must be given with slight resistance, as the patient must not be tired. The end in view is to exercise innervation, not to increase strength of muscle. Since the ataxy of the feet and legs is the symptom which causes most inconvenience to the patient, *foot and leg movements must be carefully and methodically practised* in each individual joint, as in the treatment of paralysis (see "Cerebral Hæmorrhage," Example II., p. 122), also as combined movements. *Simple balance,* and in particular *walking exercises,* are necessary and useful. The latter are best given according to Frenkel's method.

It must be borne in mind that the *patient's sense of fatigue is no longer normal,* so that it cannot be counted on. The exercises must be regulated by the clock, or in some other way, *e.g.*, by the number of exercises performed, or by observation of the patient's pulse. With the onset of fatigue the pulse rate rises.

3. As far as possible one must insist that *the patient does not lie in bed and become an invalid,* but that he gets up and continues his work.

4. If there are bladder and bowel symptoms *bladder shaking* and *abdominal kneading* should be given.

5. The treatment is arranged as a *general treatment.*

Other diseases of the spinal cord are treated on the same principles, but *nerve pressures must not be used in diseases in which the reflexes are increased.*

Example.—Treatment for a patient with *locomotor ataxy* in the second stage.

1. Half-lying Chest-lift-stroking.

2. Half-lying Leg-kneading, -clapping + Nerve-frictions and General-Nerve-pressures.

3. Half-lying Arm-kneading, -clapping + Nerve-frictions and General-Nerve-pressures.

4. Half-lying Foot-rolling, -bending, -stretching + rotation (concentrically and eccentrically).

5. Hips-firm-close-sitting Alternate-Trunk-rotation.

6. Crook-half-lying Abdominal kneading + Bladder-shaking.

7. Frenkel's exercises + Balance-walking.

8. Hips-firm-stoop-stride-sitting Back-raising.

9. Half-lying Knee-flexion, -extension (concentrically and eccentrically).

10. Reach-grasp-sitting Spinal-nerve-pressures + Vibrations.

11. Half-lying Knee-updrawing, Leg-outstretching, Leg-parting, -closing, -rotation (concentrically and eccentrically).

12. Stretch-sitting 2-Arm-flexion, -extension.

At first active resisted movements are omitted.

Frenkel's method may also be used to exercise the power of co-ordination, and since excellent results have been obtained by this method, I give a short account of it here, following for the most part the account given by Gymnastic

Director Kåre Teilmann at the Baltic Gymnastic Congress held at Malmö in 1914.

Frenkel proceeded from the well-known fact that the disorders of co-ordination in tabes, that is the ataxy, depend on the lowering of sensation, and especially of muscle sense. For this reason the patient has not a distinct and exact perception of the position of the parts of his body or of the movements which he performs, and cannot send the necessary impulses to the muscles with sufficient precision. It seemed to Frenkel, that just as a healthy person could by practice gain a markedly increased precision and certainty in his movements, so a patient suffering from ataxy should be able by methodical exercises to increase his power, and utilise what remained to him of sensation and muscle sense, so that he should have a clearer perception of his movements and a greater readiness in innervating his muscles, and be able to perform movements with greater certainty.

In order to make the exercises as effective as possible without unnecessarily tiring the patient, Frenkel allows them to be performed slowly and without resistance, but the patient is told to try to carry them out as steadily and with as much precision as possible, so that the antagonistic muscles also come into play and have a regulating effect.

Those movements especially are practised which the patient performs in daily life, but at first they are divided into their simplest parts, which are each practised separately and are then gradually combined into more complicated movements. Great stress is therefore laid on the practice of walking.

At first the patient controls the movements by sight, but as his certainty increases he practises them without looking at the part of the body which is moved.

In Frenkel's experience, fatigue is best avoided by letting the patient work for periods of four minutes alternately with equal periods of rest.

Frenkel divides his exercises into three chief groups :— I. *Exercises in lying position.* II. *Exercises in sitting position.* III. *Walking exercises.* He arranged a great many different exercises, but has gradually reduced their number. Only the most important movements in the different groups will be mentioned here.

I. **Exercises in Lying Position.**—In these exercises the patient lies in bed or on a plinth with the head high enough for the eyes to follow and control the movements of the legs. These, of course, are performed first with one, then the other, leg or arm.

1. The left foot is carried gliding along the plinth up on to the side of the right knee ; it is then placed again on the supporting surface and carried back to position.

2. The right knee is bent, the foot gliding along the plinth. When the foot is about the level of the other knee the leg is abducted, again adducted and finally extended, the foot gliding back to position again.

3. The left foot is carried up on to the side of the right knee (as in Exercise 1). It is then lifted, and the heel placed on the right knee. It is then carried downwards, the heel gliding along the front of the shin down to the right foot. In doing this a halt is made half-way, and again at the instep. The heel is then lifted and placed on the right great toe, and then back into position beside the right foot.

4. One leg is lifted, adducted till it crosses the other leg, and rests in that position on the plinth. It is then returned to position.

5. The gymnast puts a mark on one of the patient's legs, and the patient is told to place the heel of the other leg on

this mark. The gymnast then moves his finger to another point. The patient follows with his heel.

II. **Exercises in Sitting Position.**—These are comparatively few, and comprise sitting with knees together, putting on stockings or shoes, practising sitting down and getting up.

The patient may also be made to place the tips of his toes or heel on definite points, which are marked by the gymnast, or to follow with his toes or heel simply drawn figures, or to knock down ninepins with his toes, etc.

III. **Walking Exercises.**—For walking exercises a mat 21 cms. wide is used, or a track painted on the floor and divided by cross-markings of different thicknesses into whole steps (63 cms.), quarter, half, or threequarter steps. On this mat or track walking is practised *forward*, *sideways*, and when the patient is becoming more confident, walking *backward*.

In walking exercises an assistant must always walk beside the patient and support him when he totters. Experience has shown that if a patient is allowed to fall, it has a detrimental effect on the treatment for a long time afterwards. In the exercises patients should accustom themselves to walk with the feet pointing straight forward, and not to place the feet outside the track.

In walking forward, one foot is not at first carried past the other. One foot, *e.g.*, the left, is first carried forward the body weight is transferred to that foot, the other foot is then brought forward and placed beside its fellow. This manœuvre is then repeated with the right foot first. All these movements are performed slowly and calmly, and each part of the movement is completed before the next is begun.

At first no definite length of step is required, but the patient must keep to the mat or track. After some practice

he should try to adapt the length of step to command, and should first practise the half-step, then threequarter, then quarter, and lastly the whole step. When he has learnt this he should begin to carry one foot past the other and try to walk with ordinary steps.

In walking exercises also he should control the movements of the feet by sight, and it is generally a long time before he can attempt to perform the exercises with his gaze directed forward.

Patients generally have a tendency to perform the movements too quickly, and to make the intervals between too long. This is counteracted by performing the movements to command.

Walking sideways is put in between the different forms of walking exercises, and is generally easier for the patient.

For exercises for the upper extremities different apparatus is used, as, for example, wooden trays with holes and pegs, which are placed in the holes as in the game of "fox and geese." The patient practises taking pegs which are definitely pointed out, and places them in definite holes. Playing draughts may be used to pile upon one another, or to lay out in figures. Also exercises in writing or drawing definite letters or figures, either to command or after a copy.

Frenkel's treatment can, of course, be combined with the medical gymnastic treatment already described, which has long been used, and more particularly with kneadings and special nerve treatment.

Disseminated (or Multiple) Sclerosis.

Morbid Changes.—Numerous irregularly distributed patches in the brain and spinal cord, with degeneration of the nerve fibres and replacement by connective tissue. This is a disease of the upper motor neuron.

Causes.—Hereditary predisposition. Possibly toxins. Commoner in young adults.

Symptoms.—1. *Ataxy*, which is like trembling, but is really only uncertainty or lack of precision in movement, and arises therefore chiefly in the attempt to perform voluntary movements—"*intention tremors*." Connected with the ataxy is *alteration in speech*, which becomes staccato, and nystagmus, or a lateral oscillating movement of the eyes when the patient looks to the side.

2. *Increased reflexes*. Spastic walk, due to involuntary contraction of the leg muscles.

3. *No disturbances of sensation or bladder* as a rule.

4. *Disturbances of sight*.

5. *Headache, giddiness* and sometimes *lowering of intelligence*.

6. Course of disease, 10 to 20 years. Temporary improvement is common.

Treatment.—1. *One must try to improve circulation and metabolism* in the whole body, in order to improve circulation and nutrition of the nervous system. With this in view, *general treatment* is given with circulatory exercises and kneadings, including abdominal kneading.

2. *Active movements, with concentric and eccentric muscle work*, are also given to exercise the control of the will over the muscles.

3. Frenkel's exercises and balance movements are indicated to improve co-ordination.

4. Soothing, rhythmical kneading, followed by prolonged passive stretching of the limbs, ending with soothing stroking down the back and limbs, often allays muscular spasm.

Nerve pressures are avoided, because they further increase the reflexes.

Congenital Diplegia.

Also called congenital spastic paraplegia. A disease of the upper motor neuron.

Changes.—A spastic condition of the legs and sometimes of one or both arms, possibly due to defective development or to injury at birth of motor convolutions.

Causes.—Injury at birth by difficult labour, especially with forceps, is possibly a cause. Marked prematurity of the infant may be a cause of defective development.

Symptoms.—1. Nothing may be noticed at birth, but walking is slowly acquired, and the legs become gradually more stiff. Finally resembles spastic paraplegia of adults.

2. Limbs are extended and rigid.

3. Knee jerk is increased, but ankle-clonus is not always present.

4. Sometimes spasm of the adductors is extreme, and the legs are crossed over one another. Child walks in cross-legged fashion.

5. The arms are never so rigid as the legs.

6. Sometimes there are jerky or choreic movements.

7. Convergent strabismus and nystagmus may be present.

8. There may be mental deficiency or actual idiocy.

Treatment.—Cure is impossible. Improvement may be obtained by massage and methodical movements, having special regard to the patient's difficulties. Tendons may have to be stretched or cut.

Amyotrophic Lateral Sclerosis.

Morbid Changes.—Degeneration and replacement by connective tissue of the motor nerve tracts which go from the medial part of the brain cortex by the pyramids and the lateral tracts of the spinal cord to the muscles. A disease of both upper and lower motor neurons.

Causes.—Hereditary predisposition, overstrain and exposure.

Symptoms.—*The disease generally begins in one arm,* then in the other, then affects the legs, and finally the head. In this way gradually arise :—

1. *Paresis and muscle atrophy,* beginning in the thenar, and later hypothenar eminences, interossei, extensors of the forearm, triceps and deltoid muscles. Atrophy does not affect the whole muscle at once, but fibre after fibre.

2. *After six months or a year* symptoms arise in the legs similar to those in the arms.

3. *Tendon reflexes are markedly increased,* and other spastic symptoms arise. Walking especially is difficult, owing to contractions of the leg muscles.

4. Disturbance of the power of speech and difficulty in swallowing arise in the late stages, if the medullary region becomes affected.

5. *Sensation and bladder normal.*

6. Duration of disease one to three years.

The disease resembles *disseminated sclerosis,* but is distinguished from it by *the absence of ataxy* (trembling), and by its peculiar *course.* It also resembles *progressive muscular atrophy,* but is distinguished from it by the *spastic symptoms, increased reflexes* and the shorter course.

Treatment.—See " Disseminated Sclerosis and Tabes."

Progressive Muscular Atrophy or Spinal Muscular Atrophy.

Morbid Changes.—Atrophy, degeneration and sclerosis (or replacement by connective tissue) of the anterior horns and anterior roots of the spinal cord. Also degeneration of the peripheral motor nerve fibres, with muscle atrophy. A disease of the lower motor neuron.

Causes.—1. Hereditary predisposition.

2. Overstrain and chill.

Symptoms.—1. The first noticeable symptoms are :—Weakness in the hands, and gradual *loss of power to hold small objects*, such as needles, pens, crochet-hooks, etc. Then follows *progressive atrophy, with paresis, and finally paralysis* of the muscles. The atrophy begins in the muscles of the thenar and hypothenar eminences, then advances to the interossei, lumbricales and the *muscles of the forearm* (which are sometimes missed over), then reaches the muscles of the upper arm (not triceps), later on the trunk, and last of all the leg muscles. The head generally remains unaffected. The atrophy does not attack the whole muscle at once, but fibre after fibre.

2. *Fibrillary muscle tremors.*

3. *Absence of tendon reflexes.*

4. *Sensation and bladder reflexes normal.*

5. Progress of disease very slow, ten to fifteen years.

Treatment.—*General strengthening treatment; Muscle kneadings, and nerve vibrations.* The patient must not be tired. Muscle kneadings and massage *must not be given too hard.* Back-hacking, too, must be given cautiously, whereas vibrations on the back seem to have a good effect.

Myopathic (Idiopathic) Muscular Atrophy or Pseudo-hypertrophic Muscular Atrophy.

Morbid Changes.—*Degeneration, sclerosis and atrophy of certain muscles*—sometimes a considerable deposit of fat between the muscle fibres (*pseudo-hypertrophy*). *No changes in the spinal cord or peripheral nerves.*

Causes.—Heredity. The disease is a typical instance of heredity.

Symptoms.—1. *Slowly progressive muscle atrophy* in the following muscle groups : The muscles of the face, shoulder

girdle (except deltoid), trunk, pelvis and thigh. Some increase in size, either from real or pseudo-hypertrophy, occurs most commonly in infraspinatus, deltoid, and tricep in the upper limb, and in the lower limb in the glutei, sartorious and muscles of the calf.

2. *Begins in childhood. No fibrillary tremors of the muscles. Sensation and bladder normal. Extremely slow progress.*

Treatment.—Massage and gentle gymnastics. Cautious treatment. Generally with poor result.

Infantile Paralysis

(*Acute Anterior Poliomyelitis*).

Morbid Changes.—An acute bacterial inflammation in the grey matter of the anterior horn of the cord, with œdema and pressure on the surrounding parts. Then follows degeneration and sclerosis of the affected parts. A larger or smaller area may be affected. Generally not very large. A disease of the lower motor neuron.

Causes.—A specific organism which gains entrance to the body by the mucous membrane of the nose and throat. The disease sometimes makes its appearance as an epidemic. Usually children are attacked most.

Symptoms.—1. The disease often begins with catarrh of the throat or larynx, accompanied by sudden *high fever and other symptoms of an acute infection.* Headache, pains in the muscles, weakness, malaise and drowsiness. Also stiffness in the neck and back ; tenderness and pains in the back and in the arms and legs ; frequently also convulsions.

2. *Sudden appearance of widespread paralysis,* often on both sides, which soon partially recovers. It is partly due to pressure on the parts surrounding the seat of inflammation, and consequently disappears with the diminution of pressure as the inflammation subsides.

3. *There remains a more or less complete paralysis of certain muscles or groups of muscles*, due to destruction of nerve-cells in the inflamed parts. As some of the nerve-cells have escaped destruction, *a greater or smaller number of muscle fibres in the paralysed muscles retain the power of contraction*. This is of great importance, as this power can be trained in a very high degree by judicious treatment, although to begin with in many cases it can only be discovered by careful examination.

4. *Flaccidity, atrophy and degeneration of the muscles still paralysed*, because their tropic centres are destroyed.

5. *Reflexes* are lost in the paralysed parts.

6. *Sensation and bladder normal.*

7. *Secondary contractions* always arise, owing to the predominance of the antagonists of the paralysed muscles.

8. *Growth of bone is retarded*, as a rule, in the affected parts, and when the patient is full-grown this may cause a difference of even two to four inches in a leg. Scoliosis may also arise if the paralysis is one-sided, or if it has given rise to a permanent paresis or paralysis of some muscles, or groups of muscles of the back (see p. 81).

9. Sometimes the disease is *localised in the brain*, in which case the symptoms are generally unilateral.

Treatment.—Care must be taken from the first to prevent deformity arising by means of appropriate splinting. So long as the fever and other symptoms of an infectious disease remain, no gymnastic treatment is given. When the fever is over, and the power of movement begins to return, the time has come for such treatment.

We know that the nerve-cells which have been destroyed cannot be replaced by the formation of new nerve-cells. But if such a cell is not completely destroyed it may recover. In poliomyelitis it not infrequently happens that some of

the nerve-cells at the seat of disease are not completely destroyed, and because of this, as a rule, improvement gradually takes place in addition to that which appears early as a result of subsidence of the swelling at the seat of disease.

By gymnastic treatment we cannot directly influence the healing process at the actual seat of the disease, but we can and ought to work to keep the joints, muscles and nerves in a fit condition, till the process of repair in the spine has progressed so far that the nerve-cells, which are not destroyed, begin to recover their functional power. This should then be exercised in the best possible way.

At first treatment should be given chiefly on the same principles as in the case of paralysis following cerebral hæmorrhage (see p. 119).

Owing to the special conditions which arise in poliomyelitis, the following procedure should form part of the treatment :—

(*a*) First of all the threatening *contractions must be prevented* by stretchings of the antagonists of the paralysed or weakened muscles; moreover, one should carefully avoid unnecessarily strengthening the antagonists by unsuitable movements.

(*b*) *The paralysed or weakened muscles should be specially treated by massage,* so that their nutrition and functional power may improve, and atrophy be prevented.

(*c*) We should endeavour to *discover and exercise the slightest remnant of power* in the paralysed muscles. It often happens that there is such power, though it may only be discovered by very careful examination. It may also, as already stated, be improved to a surprising extent, while it can easily be lost if it is not noticed and exercised.

(*d*) Finally, in trying to *exercise the weak muscles we may*

at first allow the healthy muscles to help the action of those which are paralysed. For instance, in the case of paralysis of the extensors of the knee one often sees how the patient tries to make up for this by using the tensor fasciæ latæ. To train such vicarious muscular action, in cases where recovery appears hopeless, we should recommend the patient to try to perform those movements which should be carried out by the paralysed muscles, in such a way as he best can without considering the form, so long as he can in one way or other perform the movement.

Formerly it was believed that paralysis which remained after six months, notwithstanding proper treatment, would be permanent, but according to the experience of recent years, even after this time good results have been obtained, particularly if the patient has not previously received gymnastic treatment.

Orthopædic treatment is often necessary for these patients.

NEUROSES.

Chorea (*St. Vitus's Dance*).

Morbid Changes.—Unknown, but it is thought that there is some irritation in the dura mater. The disease is characterised by the appearance of involuntary jerkings and by ataxy.

Causes.—1. *Hereditary tendency* to nervous complaints.

2. *Emotions.*

3. The instinct to imitate (a rare cause).

4. *Acute rheumatism* and heart disease.

5. *Pregnancy.*

Symptoms.—1. *The disease begins gradually,* and is often preceded by slight general malaise, with pains in the muscles (? rheumatic).

2. *Disturbance of co-ordination* in active movements, so

that they cannot be performed with assurance. The patient is awkward and clumsy and liable to drop things.

3. *Involuntary movements*, jerking and twitching. They most often appear in the face and arms, and are increased by emotion, *e.g.*, the patient's being under observation. They *cease during sleep*. They produce no apparent fatigue.

4. *Sensation and reflexes normal.*

5. *Sometimes there are tender spots on the spine.*

6. *Change of temper*. Capriciousness, irritability.

7. *Incapacity to do mental work*. The patient should therefore not be allowed to go to school. Permanent lowering of intelligence, however, need not be feared.

8. The heart may be affected.

9. Constipation common, digestion poor.

10. General muscular weakness and mal-nutrition.

The disease often lasts several months. Recurrence is common. *Prognosis good.*

Treatment.—*Fixation, when necessary, e.g.*, of the head or one arm.

2. *Massage and gymnastics*. One must specially try to exercise the brain's control of the muscles. For this we give :—

(*a*) Movements which compel the patient to close *attention*, and definite innervation, *e.g.*, resisted movements with concentric and eccentric muscle work.

(*b*) *Movements which specially exercise co-ordination, i.e.*, complicated movements, as Leg-updrawing and out-drawing ; Climbing, Balance movements, etc.

(*c*) *Methodical exercises* in keeping still, also slow, well-controlled movements. These exercises may with advantage be performed in front of a looking-glass, so that the patient himself can then control them.

First the patient *performs certain definite movements.* These should be performed slowly, without resistance and as evenly and precisely as possible. They are repeated a definite number of times, three to five or more. Later the patient must try *to keep the twitching parts still* during short prescribed periods, beginning with five seconds, and gradually longer.

To begin with, only the simplest movements in one joint, or a group of joints, should be practised, *e.g.*, Finger-bending and stretching, Forearm-bending and stretching, then combined movements in several joints.

Movements are, of course, chiefly practised in those parts of the body where the twitchings appear. The exercises should be gone through daily, under the supervision of the gymnast, and only when the patient fully understands the meaning of them may he be allowed also to practise them alone, but then only according to definite instructions.

(*d*) To have a soothing effect on the patient, "soothing strokings" should be given, and all movements should be performed slowly and quietly.

(*e*) General strengthening treatment should also be given. Kneading of muscles should be given in those cases where muscular weakness, rather than involuntary movement is a prominent symptom.

Note.—*The patient must not be tired.* Nerve pressures must not be given. Patients who are embarrassed by their twitchings frequently get worse if treated along with other patients, and should therefore be treated alone.

Example.—Treatment for a patient suffering from *St. Vitus's Dance.*

1. Stretch-sitting 2-Arm-bending, -stretching.
2. Half-lying Leg kneading + stroking (slow).

3. Reach-grasp-sitting Head-side-bending, rotation (con.-ecc.).

4. High-ride-sitting Side-flexion.

5. Balance walking (not on high boom).

6. Reach-grasp-standing Back-stroking (slow).

7. Sitting Single Arm carrying outward-inward, forward-backward, rotation (con.-ecc.), slight resistance.

8. Half-lying Leg-updrawing, -downdrawing.

9. Yard-stoop-leg-lean-standing Back-raising.

10. Half-lying Arm-kneading or massage + stroking (slow).

11. Stretch-grasp-standing Forward-drawing.

12. Lying Soothing strokings.

Between Movements.—Practise in front of a looking-glass, partly to keep still, partly to perform slow, steady movements with the arms and the head, for instance, Finger-bending and -stretching, Wrist-bending and -stretching, Ulnar- and Radial-flexion, pronation and supination, Fore-arm-bending and -stretching, etc. Carrying the hand to the chin, the nose, the forehead, crown of the head, back of the neck, then back to the original position. Head-side-bending and rotation. Practise wrinkling the forehead, screwing up the mouth, smiling, etc.

Paralysis Agitans.

Morbid Changes.—Degenerative changes in the basal ganglia. The disease is characterised chiefly by tremors, particularly in the hands and arms, and by a certain rigidity of the muscles.

Causes.—1. *Age.* Seldom manifests itself before the fortieth year.

2. *Possibly hereditary predisposition.*

3. *Chills.*
4. *Emotions.*
5. *Traumata.*

Symptoms.—1. Tremors. These usually begin in the right hand, and spread by degrees over the whole body. The tremor is *continual and increases with emotion* (observation), but *diminishes in deliberate actions* (contrary to multiple sclerosis).

2. Rigidity of muscles and shortening. The rigidity shows itself partly in the patient's wax-like facial expression, partly in the peculiar stiffness which is noticeable in passive movements. For the same reason the patient finds it difficult to make up his mind to carry out certain movements of the body, and, therefore, tends to sit still. There is always difficulty in beginning a movement, but when once started it is easier.

Muscle-shortening gives rise to fixed positions in most of the joints. This causes a peculiar attitude of the body in a position of flexion.

3. *Strength is long maintained*, but finally pareses arise.
4. *Sensation, bladder and reflexes normal.*
5. *Long duration.* Never cured.

The symptoms resemble those occurring after encephalitis lethargica.

Treatment.—In many cases gymnastic treatment relieves, to a considerable extent, the troubles associated with this disease.

(*a*) *Gentle muscle-kneading* lessens the muscle-stiffness. Soothing strokings help.

(*b*) *Passive movements* encourage the muscles to relax. Prolonged stretching of the flexor muscles sometimes gives relief.

(*c*) *Easy active movements with concentric and eccentric*

muscle work, to exercise innervation, and increase the brain's control over the muscles.

(*d*) *Abdominal massage* may be necessary for constipation.

Note.—*Nerve pressures should not be given*, as they might increase the tension of the muscles. Difficult trunk movements should also be avoided.

Hysteria.

Morbid Changes.—None. The disease is characterised :—

1. By a disturbance of mental activity, which may be roughly interpreted as a *limitation of the mind's control over the body*, causing paralysis and irritative conditions of various kinds.

2. The disease from the very beginning, and during its course, *is closely connected with psychic conditions, i.e.*, mental conditions, particularly the patient's own conscious or subconscious imaginings.

3. Symptoms in all parts of the body may appear.

4. Because certain symptoms very often appear, they are called " stigmata."

5. By *characteristic attacks*.

Causes.—1. Predisposition, which is either *congenital or acquired*. Congenital predisposition to nervous diseases is often met with in old degenerate families, and consists of an inherited weakness and lessened power of resistance in the nervous system, whereby several different kinds of nervous diseases, among them hysteria, develop more easily than in quite normal persons.

Acquired predisposition may arise :—

(*a*) *By perverted education*, the child not having been taught to restrain or control its temper, or because its imagination has become abnormally *excited and overwrought by unwholesome reading*.

(*b*) From causes which have had a *generally weakening effect*, such as protracted illnesses.

(*c*) *By mental overstrain.*

When there is such a predisposition, the disease may easily be produced by the following causes :—

2. *Violent or recurring emotions*, which by degrees undermine the nervous system and diminish its power of resistance.

3. *Physical traumata*, probably by emotions connected with them, as fright, fear of consequences, etc. The symptoms begin or become most developed in that part of the body, or in those organs, to which the attention of the patient has been directed.

4. *Sexual conditions*, as for instance pregnancy, the appearance of menstruation in the years of development, or its cessation at a later period, or other alterations in the functions of the pelvic organs.

Symptoms.—All possible symptoms may present themselves. Here we only mention those most frequently occurring.

1. *Functional disturbances of the organs of sense*, general lowering of their functional power.

(*a*) *Sensory disturbances. Hyperæsthesia, analgesia* (insensibility to pain) or complete *anæsthesia* frequently arise. In severe cases, even muscle sense may be absent. These sensory disturbances are often limited to special areas, which, however, do not correspond to the distribution of any nerve.

(*b*) *Nervous insensibility* (paralysis) in *one or more organs of sense ;* eyes, ears, etc.

(*c*) *One-sided total anæsthesia.* In these cases of hysterical anæsthesia, it is carefully limited to the middle line of the body. In organic injury or disease of the nerves, it goes in a zig-zag line.

2. *Catalepsy, i.e.*, a waxlike stiffness of the joints and inability to move them voluntarily when the eyes are closed.

3. *Transference of a symptom* from one side of the body to the other may be produced by laying on pieces of metal or other objects. It is, of course, due to its effect on the patient's imagination.

4. *Hyperæsthetic areas.* These are seldom found on the extremities, most often on *the head*, or by the *sternum*, under the *breasts*, in the *ovarian regions*, and over *the spine*. Sometimes an attack of hysteria may be produced by pressure on such an area, it can also sometimes be stopped by pressure on another part, they have therefore been called *hysterogenic zones*.

5. *Hysterical paralyses* (paralysis of the will), not accompanied by atrophy or reflex disturbances. They usually appear in the extremities, and are as a rule accompanied by loss of sensation in exactly the same region as the motor paralysis. They are also common in the vocal cords, the organs of speech, and the muscles of the throat.

6. *Hysterical contractures.* In the larger joints usually contractures of the extensors, in the smaller joints of the flexors. They often arise in the pharynx and œsophagus: "the hysterical lump in the throat."

7. *Various vasomotor and secretory disturbances.* Redness or pallor; dryness of the skin or increased perspiration; cessation of micturition or increase of it; salivation.

8. *Symptoms from internal organs.* Usually calculated to surprise, to cause fear, or arouse sympathy, *e.g.*, vomiting and coughing up blood, spasmodic vomiting or hiccough, dyspeptic symptoms, high fever (by rubbing the thermometer).

9. Symptoms of *abdominal disease* (most frequently imaginary).

10. *The general disposition is irritable, sensitive and changeable. The patient shows a great inclination to exaggerate, and tries to excite sympathy.* In many cases the disease only manifests itself by such disturbance of the psychic balance, without any other symptoms.

11. *Hysterical attacks* of all degrees of severity.

(*a*) Slight. Consisting of a loss of self-command or a slight swoon. The patients never hurt themselves, and always fall comfortably.

(*b*) Slight limited attacks of cramp, often in the larynx—a feeling of a lump in the throat.

(*c*) *Marked hysterical attacks resembling epileptic fits.*

The patients very rarely hurt themselves, they do not bite the tongue, nor do they completely lose consciousness. The pupil is not fixed.

Usually the symptoms diminish with age, but the patients seldom have well balanced minds.

Treatment.—General strengthening treatment if the patient is delicate. For the rest, gymnastic treatment alone cannot do much. The *personal influence of the gymnast* has more effect.

The patients should have peace of mind as much as possible, and moral support. One should therefore treat them in a friendly way, firmly, but not severely. One must not pamper them, or ask too often how they feel, and particularly one must not turn their attention to any special symptom, because they may readily acquire it. They should be encouraged to perform some definite task every day, whereby their attention is turned in a direction away from themselves.

The efficacy of the treatment depends chiefly on imparting to the patient the idea that it is useful. One should therefore choose such movements as the patient himself can feel are

likely to influence his symptoms. For dyspeptic symptoms one should give Abdominal kneading and Stomach-shaking, etc.; for anæsthesia, clapping and skin stimulation; for paralysis, massage, nerve pressures and exercises giving resistance to passive movements, etc.

One should besides choose some *complicated and difficult movements, e.g.*, Heel-raising Knee-bending; Arch-twisting, vibrations with a vibrator, etc., to impress the patient.

One should never tell them that they are hysterical.

Neurasthenia (*Nervous Debility*).

Morbid Changes.—We do not know the morbid changes which cause neurasthenia, but the disease is characterised by:—

(*a*) Nervous temperament.

(*b*) Considerable lessening of capacity for mental and physical work.

(*c*) Anxious imaginings and sensations.

By *nervous temperament*, on the other hand, we mean a condition of slight nervous irritability, sensitiveness to all kinds of impressions, and a tendency to anxious imaginings and abnormal subjective sensations.

Causes.—1. *Predisposition*, hereditary or acquired through circumstances which have had a general depressing influence on the body and mind, as for instance severe illness, especially influenza, enteric, or any form of sepsis.

2. *Mental overstrain*, sometimes also physical strain.

3. *Chronic emotions* (business speculations, sorrow, anxiety and worry, etc.).

Symptoms.—1. *A sensation of pressure on the top of the head*, pains and giddiness.

2. *Incapacity for brain work* (mental slackness).

The patients cannot keep their thoughts collected, make mistakes when writing and counting, forget what they had intended to do, etc.

3. *Sleeplessness and restlessness.*

4. *Mental depression.*

5. *Anxious imaginings*, as fear of open spaces, dread of crowds, etc.

6. *General physical weakness* and a sense of fatigue. Cold hands and feet.

7. *Dyspeptic symptoms*, loss of appetite, and sluggish evacuations (abuse of purgatives).

8. *Spinal symptoms.* Pains, paræsthesia, tenderness in the back, etc., etc.

Treatment.—*General strengthening treatment.* Rest and quiet for a time, so that physical energy may increase. The Weir-Mitchell cure is particularly suitable for this purpose. The patients should be frequently and carefully examined, and encouraged by the assurance that they will get well, and that the disease is not dangerous. They should be urged not to brood over their symptoms, and to divert themselves in various ways. It is best for them to have a change of surroundings.

As special movements, those movements should be given which are likely to relieve the symptoms. To counteract the sensation of pressure on the brain, one may, for instance give: Head-treatment and Hand-standing (inversion); for muscle weakness, kneadings; for sleeplessness, Head-rolling and vibrations, etc.; for worry, soothing strokings; for abdominal symptoms and constipation, Abdominal kneading, etc.

Muscle kneadings and vibrations down the back should always be given.

Note.—These patients must not be tired.

Example.—Treatment for a *neurasthenic patient.*

1. Sitting 2-Arm-rolling.
2. Half-lying Leg-kneading + General nerve pressures.
3. Yard-sitting Arm-rotation-with-rod (gently).
4. Sitting Head-treatment.
5. High-ride-sitting Circle-turning + Chest-lifting.
6. Hips-firm-close-sitting Alternate-Trunk-turning.
7. Crook-half-lying Abdominal kneading, Stomach-pit-shaking and Stomach-shaking.
8. Hips-firm-stoop-stride-sitting Back-raising-with-stroking.
9. Half-lying Arm-kneading + Clapping.
10. Half-lying Leg-rolling + Leg-outstretching.
11. Reach-grasp-standing Back-hacking or Vibration.
12. Sitting Chest-lifting.

Traumatic Neuroses.

Morbid Changes.—None known, except such as may possibly remain after a previous trauma.

Causes.—1. Severe bodily and mental shocks. Generally from railway collisions, or other great disasters, particularly if the patient has been injured.

2. Even minor traumata, such as fractures of the leg, and the like, may cause this disease in persons with a nervous tendency.

Note.—The injuries which may have arisen from the accident often recover in the usual time, but on the other hand one hysterical or neurasthenic symptom develops after the other, probably because *the emotion caused by the accident has disturbed the balance in a nervous system already weak.* Often anxiety in regard to possible consequences of the accident tends to increase the symptoms.

Symptoms.—These are, as has been said, sometimes

neurasthenic as depression, anxiety, mental and physical weakness, lack of energy, trembling, etc. The symptoms may sometimes be of a more hysterical kind, such as hyperæsthesia, paræsthesia and anæsthesia, local paralysis, contracture, etc., *never* atrophy or any disturbances of the electric re-actions. Very frequently there is great tenderness of the injured part.

Treatment.—*Massage* of any possibly remaining inflammation, as well as general treatment suited to the hysterical or neurasthenic condition of the patient.

Psychological treatment may be required, and is often very effective.

Epilepsy (*Falling Sickness*).

Morbid Changes.—Unknown. The characteristic attacks of unconsciousness, with or without convulsions, are due to functional disturbance of the cortical centres.

Causes.—1. *Heredity.* Either the disease may be directly inherited, or a weakened nervous system which easily succumbs to the special influences producing the disease.

2. *Alcoholism* in the parents.

3. Overstrain and emotion often cause the first attack.

4. Injury to the head.

Symptoms.—There are two varieties of epilepsy, (1) major (*grand mal*), (2) minor (*petit mal*). Minor epilepsy may be little more than a sudden unconsciousness or giddiness or both. If speaking or walking the patient may stop, or may commit some irregularity of conduct.

Symptoms of major epilepsy are: 1. *Prodromal symptoms*, generally consisting of some definite sensory perception, as of light, sound, smell, etc., only lasting a few moments, and immediately followed by the attack itself.

2. This consists of a sudden *unconsciousness.* The

patient *falls suddenly uttering a cry. Then follow convulsions of the whole body* (first tonic, then clonic), *foaming at the mouth*, when the tongue is usually bitten. The *pupils* are dilated and fixed. *Involuntary micturition. Injuries are often caused by the fall* (not so in hysteria). The attack usually lasts a few minutes and is followed by deep unconsciousness and languor, which passes into sleep. On waking, muscular pains, drowsiness, irritability, etc.

The attacks either follow closely on each other, or at longer intervals, *often during the night.* Sometimes the attacks take some form other than convulsions, as for instance acute mental disorder, homicidal mania, etc.

Treatment.—Medical and sometimes psychological treatment are necessary. Possibly general gymnastic treatment, with depletive movements from the head. Movements to improve the circulation, especially portal circulation and to relieve constipation.

Migraine.

Sick headache or megrim. A paroxysmal neurosis, probably toxic in origin.

Causes.—1. Heredity, nervous or gouty.

2. Puberty, rarely begins after thirty.

3. Sedentary work.

4. Physical and mental overstrain.

5. Eye strain.

6. Bad teeth.

7. An indigestible meal.

Symptoms.—1. Visual sensations may last 20 to 30 minutes.

2. Headache, varying much in severity, often lasts a day, gradually becoming worse.

3. There may be a preceding mental depression or irritability.

4. Vomiting in severe cases.

5. Headache may be limited to one side or one part of the head.

6. Face pale and drawn, hands and feet cold, pulse feeble and slow.

7. Attacks occur at intervals of days or months.

Treatment of cause is important.

Gymnastic treatment for circulation, digestion and nervous system as in epilepsy.

Nerve Pains. Neuralgia.

Neuralgia is pain in a nerve, without morbid changes. The pain, as a rule, is *strictly limited to the area of one or several nerves*, and not continuous, but showing a distinct *alternation between improvement and the reverse.*

In a number of so-called neuralgic cases, morbid processes, such as inflammation and degeneration of nerves, do, as a matter of fact, occur. Such cases should by right be classed as true *nerve inflammations or neuritis.*

Causes.—A. *Predisposing.*

1. *Hereditary predisposition to nervous diseases.*

2. *Age.* Most often middle age.

3. *Sex.* More often in women, particularly in connection with sexual conditions.

4. *Constitutional causes ;* particularly general debility.

B. *Exciting.*

1. *Rheumatic causes ;* particularly chill through draught.

2. *Injury* of or near a nerve.

3. *Pressure* of foreign bodies, wounds, cicatrices, tumours, inflammatory processes in muscle within the area of a nerve.

4. *Poisoning.* Lead, mercury, arsenic, alcohol, nicotine, etc.

5. *Infection.* Malaria, influenza, etc. Probably by irritation of the nerves, caused by the poison generated by the bacteria.

6. *Constitutional diseases.* Anæmia, gout, rheumatism, diabetes.

7. *Reflex causes, e.g.*, dental caries.

Symptoms.—1. Aches and pains of the above-mentioned character.

2. *Other sensory disturbances*, particularly irritative symptoms, as hyperæsthesia, paræsthesia, more seldom anæsthesia.

3. *Definite painful points.* Generally located in places where the nerve can be pressed against some hard surface.

4. *Motor disturbances.* General symptoms of irritation, as twitchings, tremors, spasms—but *no* symptoms of paralysis.

5. *Vasomotor disturbances*, as redness or paleness; *secretory disturbances*, as for instance, perspiration; *trophic disturbances* of the skin, as rashes, blotches, and blisters, etc., may also appear.

6. *Lowering of the general condition* through pain, sleeplessness, etc.

Treatment.—When treating neuralgia, one must try in every case to discover, and if possible to remove the cause. Special attention should be given to constitutional diseases, chronic poisoning and above all *inflammatory processes in the nerve areas*, which are, perhaps, the most frequent cause of the complaint. It is difficult to be certain that an inflammatory or degenerative process has not actually begun in the nerve, so that, as a matter of fact, we may have a *true nerve inflammation or neuritis* to treat, though

the symptoms distinguishing such a change may not yet have become apparent. The treatment must, therefore, also be suited to influence the changes present in neuritis. When possible one should therefore give :—

(*a*) *Massage on the inflammation* which presses on or has extended to the nerve.

(*b*) *Nerve massage* (effleurage, vibrations and nerve frictions) over the trunk of the nerve itself and its area of distribution.

Note.—This massage must not be given too hard.

(*c*) *Nerve stretching.* Such a movement acts, partly by stretching any adhesions between the nerve and its surroundings, partly by compressing the neurilemma, so that pressure reaches the nerve fibres.

Note.—The stretching must be given with a certain degree of caution. Owing to anatomical conditions, it can only be effectively performed on certain nerves. It is easiest on the sciatic nerve.

(*d*) *Muscle massage,* especially kneading, is also given to improve nutrition, and counteract atrophy.

(*e*) In addition one gives, as always after massage *gentle active movements,* and in some cases *general strengthening treatment.*

Nerve Inflammation (*Neuritis*).

Morbid Changes.—We distinguish between two different kinds of neuritis : *Interstitial* and *Parenchymatous.*

In *interstitial* neuritis there are inflammatory changes in the neurilemma (nerve sheath), and in the connective tissue which penetrates from it between the nerve fibres. In more severe cases the nerve fibres themselves may become involved, in which case parenchymatous neuritis also develops.

In *parenchymatous* neuritis the nerve fibres themselves are the seat of the inflammatory changes which lead to degeneration and destruction of the medullary sheaths and axis cylinders. Such degeneration and destruction may also arise through the action of poisons, ordinary or bacterial, or such as are formed in the body through various disturbances of its metabolism, as in diabetes, gout, and other constitutional diseases.

Interstitial neuritis is chiefly characterised by *symptoms of irritation* in the nerves similar to those which appear in neuralgia. They are due to irritation of the nerve fibres by the inflammatory processes in the neurilemma. If this attacks the nerve fibres themselves, then symptoms characteristic of *parenchymatous* neuritis also arise.

Parenchymatous neuritis is distinguished by *symptoms of paralysis, loss of reflexes and atrophy of muscles supplied by the affected nerves.* This, of course, is due to the fact that the damaged nerves can no longer convey nerve impulses and stimuli. Symptoms of irritation, however, occur in parenchymatous neuritis, particularly in the beginning of the disease.

Thus, the symptoms in parenchymatous and interstitial neuritis may be very similar, but these different types of neuritis may in individual cases generally be distinguished from each other, as above-mentioned. They are both definitely distinguished from neuralgia, by the tenderness and swelling of the diseased nerve trunk caused by the morbid changes in the nerve.

Causes.—1. *Rheumatic influences.*

2. *Poisoning* by alcohol, mercury, arsenic, lead, etc.
3. *Infections*, as diphtheria, influenza and malaria.
4. *Constitutional diseases*, as diabetes and gout.
5. *Injuries and pressure on the nerves.*

6. *Inflammation in the surrounding parts*, affecting the nerves.

Thus, for the most part, the causes already mentioned as producing neuralgia.

Symptoms.—Common both in interstitial and parenchymatous neuritis is the occurrence of :—

1. *Irritative sensory symptoms*, aches, pains, hyperæsthesia, paræsthesia.

2. *Irritative motor symptoms*, cramp, twitchings, tremors.

Both these groups of symptoms are found, as already mentioned, also in neuralgia.

3. *Tenderness and thickening of the affected nerves.* This symptom definitely distinguishes neuritis from neuralgia.

In parenchymatous neuritis the following symptoms are added :—

4. *Symptoms of sensory paralysis*, lowered sensation or complete anæsthesia in the region of distribution of the nerves.

5. *Symptoms of motor paralysis*, weakness or complete paralysis of the muscles, which are innervated by the affected nerves.

6. *Muscle atrophy*, often to an extreme degree.

7. Diminution or loss of reflexes.

Treatment.—The same as in neuralgia. In the case of obvious neuritis, great caution, however, must be exercised, and the treatment on the nerve itself must be given very lightly, if at all. Turkish baths, electricity and heat in various forms are often beneficial.

The above-mentioned applies to all cases of neuralgia and neuritis. With reference, however, to their more frequent occurrence in certain nerves, we must further

consider what are the most general causes, symptoms, pains, and characteristics in each individual case, and their special treatment.

Rheumatism of the Neck

(*Trigeminal and Occipital Neuralgia or Neuritis*).

Causes.—1. *Rheumatic inflammatory processes in the neck muscles, throat muscles, and connective tissue surrounding them,* and similar processes in the tissues surrounding the nerves of the face.

If a rheumatic influence, as for instance "draught," has only affected one side of the head and neck, then the consequent muscle inflammations and the symptoms produced by them, especially headache, also appear as a rule only on the same side.

2. *Strenuous work with the arms,* such as massage, often brings on inflammation of the anterior and posterior neck muscles because these have to fix the origin for the powerfully working muscles of the shoulder. These muscle inflammations may naturally have an irritating effect or attack the nerves in the same way as rheumatic inflammations. Gymnasts are often subject to them.

Symptoms.—1. The most prominent symptom is *headache.* It is usually confined to the back of the head (greater occipital nerve), and to the region over and around the eyes (supratrochlear and supraorbital nerves). At times the pain is felt over the whole scalp. It gets worse if the patient has been exposed to draught or wind, but this change for the worse generally sets in a couple of hours afterwards.

2. *Stiffness of the neck* is also very common, caused by the lessened elasticity of the infiltrated muscles.

3. On examining the muscles of the neck, one finds *tender thickenings* in them, and if the disease has lasted long, they become *firmer*. If it has *recently* begun, the consistence of the muscles is of a *doughy* character, and the tenderness is also greater.

These changes are most frequently found in the upper parts of trapezius, in the underlying neck muscles, particularly in the ligamentum nuchæ and in the muscles on the side of the neck, especially in the region below the mastoid process, *i.e.*, in those muscles which arise from or are inserted into or near this process, and also in the muscles which arise from, or are inserted into, the transverse process of the atlas.

4. *Sometimes one finds tenderness and infiltrations in the scalp itself*—" Hair-tenderness "—usually the day after a sharp attack of headache, and probably due to spreading of the rheumatic inflammatory process to the scalp.

5. Very frequently there is *tenderness and thickening in and around the nerves of the face*, particularly at their points of exit from bone where they are liable to pressure.

6. In some cases the headache is accompanied by *pallor of the face, and dilation of the pupils* (irritation of the sympathetic nerve in the neck), in other cases with *redness of the face and contraction of the pupils* (paralysis of the sympathetic). These symptoms are probably due to pressure by the inflamed muscles of the neck on, or extension of inflammation to the uppermost cervical sympathetic ganglion. It is possible that the attacks of vomiting which in some cases accompany headache, are also due to irritation of this nerve.

Treatment.—*Neck massage, i.e.*, complete muscle massage of the trapezius, neck and throat muscles, combined with nerve massage of the occipital nerves, and of the branches

of the trigeminal nerve in the face. Also Head-rolling, Neck-raising, Head-side-bending, and rotation.

So long as the tenderness in the muscles and over the nerves is great, the treatment must be carried out gently, and when giving massage on the nerves it is always safest to proceed with moderation. But after the treatment has been continued for some time, the muscle massage must usually be given very strongly, if one is to succeed in *completely* removing all infiltrations and thickenings. It is also important that it is actually given on all the above-mentioned places and over muscle attachments, because any thickenings left in the muscles and in the tissues round the nerves will, as a rule, soon spread and cause a relapse. After many years of personal experience, I have noticed that those thickenings particularly which are situated in the muscles on the side of the neck immediately below the mastoid process are often overlooked, and this is frequently the cause of unsatisfactory results after treatment.

It generally takes six to eight weeks' careful treatment completely to remove the swellings in the muscles and around the nerves, but as a rule, after a couple of weeks, the patient experiences so much improvement that he willingly continues the treatment.

Of course, the same cause which first gave rise to the trouble may also cause a relapse, but if it is immediately treated one often succeeds in removing it in a short time (in one or two weeks).

Brachial Neuralgia and Neuritis.

Causes.—1. Rheumatic inflammation of the neck, shoulder or arm muscles, particularly in the lateral parts of the trapezius muscle.

2. Trauma, or pressure on the nerves.

3. Cellulitis of the skin of the arms.

Symptoms.—1. *Aching numbness, and a pricking sensation in the arms*, sometimes lowering of sensation.

2. *Symptoms of motor irritation*, tremor, cramp, etc., may also appear, though not so frequently.

3. Weakness in the arm, or complete paralysis and atrophy of one or several muscles.

4. *Often tender infiltrations in the neck and shoulder muscles*, particularly in the lateral part of trapezius.

5. *Tenderness and usually also thickening of the nerves :—*

(*a*) In the supra-clavicular fossa.

(*b*) In the axilla.

(*c*) In the ante-cubital fossa on the inner side of the biceps tendon (median nerve).

(*d*) On the outer side of the upper arm, on the upper edge of the origin of brachio-radialis (radial or musculo-spiral nerve).

(*e*) Between the medial epicondyle and the olecranon (ulnar nerve).

Treatment.—Massage on any inflammation present in the muscles of the neck and shoulder, also if necessary on the cellulitis of the skin of the arm, also nerve massage. Light active movements of the shoulder, elbow and wrist.

Intercostal Neuralgia and Neuritis.

Causes.—Inflammation (rheumatic and traumatic) in the deep muscles of the back.

Symptoms.—1. *Backache* spreading to the side and forwards.

2. *Often pain on breathing and coughing.*

3. *Tender infiltrations in the back muscles.*

4. Those points where the nerve itself or its branches are accessible to pressure, and where consequently the so-called tender points may be found, are :—

(*a*) Near the spinous process, the posterior branch of the nerve.

(*b*) In the axillary line, where the lateral branch of the nerve becomes cutaneous.

(*c*) Beside the sternum, or in the outer edge of the rectus abdominis, where the inner branch becomes cutaneous.

Note.—In lumbar neuritis the corresponding symptoms are lower down. Lumbar neuralgia and neuritis, with inflammation of the lumbar muscles, are commonly spoken of as lumbago.

Intercostal neuralgia may easily be mistaken for muscular rheumatism of the intercostal muscles, but this complaint is distinguished from neuralgia by the tenderness being spread over the whole intercostal space.

A limited dry pleurisy may also be confused with neuralgia. One may, however, recognise or suspect pleurisy if the patient has some fever and general malaise, and particularly if there is an irritable cough.

It is important that the patient should be told that his complaint may possibly be the forerunner of an attack of shingles or herpes zoster, *i.e.*, an eruption consisting of small vesicles on a reddened base following the course of the nerves, the result of hæmorrhage in the ganglia on the posterior nerve roots.

After shingles severe and troublesome nerve pain, which is most inaccessible to treatment, often persists for years.

Treatment.—1. *Massage of the back muscles*, especially of the deep-lying muscles.

2. *Nerve massage along the nerve*, particularly at the tender points.

3. Movements: Circle-turning, Back-raising, Alternate-turning.

Neuralgia or Neuritis of the Sciatic Nerve. Sciatica.

Causes.—1. Those previously mentioned as general causes of neuritis, as chills, constitutional complaints, poisoning, as, for instance, by abuse of alcohol, etc.

With regard to neuritis from poisoning, and particularly the so-called alcoholic neuritis, it may be noted that it usually makes its appearance in the more distal parts of the nerve.

2. *Irritation of the nerve by pressure or other mechanical effect* along its whole course. For instance, by an exceptionally marked curvature in the lumbar spine, which causes stretching of or pressure on the nerve roots; from fracture of the transverse process of the fourth and fifth lumbar vertebræ, or any other trauma of these vertebræ; by the pressure of a tumour situated in the pelvis, or in any other place near the nerve.

3. *Irritation or extension to the nerve, its roots and branches, of some inflammatory process* in the surrounding parts.

(*a*) Inflammatory processes in the abdomen, *e.g.*, appendicitis or some inflammatory process in the organs of the true pelvis.

(*b*) *Muscular inflammation of the posterior part of gluteus medius or pyriformis.* This is very common, and has hitherto been considered the most frequent cause of sciatica.

(*c*) Of late attention has been directed especially to

muscular inflammation of the lower parts of the lumbar muscles as a frequent cause of sciatica.

This is generally due to strain, usually in lifting something heavy or from some other sudden movement, but as no definite symptoms present themselves till several hours later, or even after a longer time, the patient himself often cannot give any reason, but it is generally found out on questioning. Not infrequently in such cases there is also overstrain of the (posterior part of) gluteus medius and of pyriformis, because these muscles, in a strain from lifting, act as a rule as synergists to the lumbar muscles of the same side, particularly if the strain has been caused when standing somewhat obliquely.

The inflammatory process which has been occasioned by the strain of the lumbar muscles causes irritation of the lower roots of the sciatic nerve issuing from the intervertebral foramen between the fourth and fifth lumbar vertebræ, and between the latter and the sacrum, but may even attack the nerve roots and cause the characteristic symptoms. It is probably in such cases that curvature of the lumbar spine sometimes arises, most likely in order to diminish the strain on the affected parts. This particular form of the disease has therefore been called "scoliotic sciatica," or perhaps more accurately "sciatic scoliosis."

A characteristic symptom which often appears in these cases of strain in the lumbar muscles is, that one may cause pains to flash down the leg, or the gluteal region, by a slight blow on the lumbar vertebræ. The supraspinous ligament between the fourth and fifth lumbar vertebræ, and between the latter and the sacrum, is in these cases often tender.

(*d*) Strain of the sacro-iliac joint.

Symptoms.—1. Patients usually state that their trouble began with *pain in the lower part of the back, or in one hip*, and that the pains spread down the leg, particularly on the posterior parts of it. In some cases they have also experienced a sense of numbness and a pricking sensation in the leg and foot (paræsthesia), at times a marked hypersensitiveness.

2. *The so-called sign of Lasègue.* This symptom is that the affected leg, with straight knee and dorsally-flexed foot, can neither actively nor passively be bent at the hip joint to the normal limit (about 90 degrees), as an excruciating pain is caused in the back of the leg and hip when it is flexed beyond a certain point. This pain is caused by the strong stretching in such a movement both of the affected nerve and of the muscles of the gluteal region. For the same reason the patient is often quite unable to, or can only with great difficulty bend forward to lace his shoes.

3. In most cases there are *tender thickenings in the muscles*, in the lower part of the lumbar region, in the gluteal region, particularly in the posterior part of gluteus medius, and in pyriformis, also in other places along the course of the nerve.

4. In cases due to sacro-iliac strain there will be tenderness over the joint.

5. *Tenderness, or tender thickenings in the sciatic nerve or its branches.*

The nerve can be reached most easily in the following places :—

(*a*) At the junction of the lower and middle third of a line drawn from the posterior superior iliac spine to the outer part of the ischial tuberosity.

(*b*) Somewhat internal to a point midway between the great trochanter and the ischial tuberosity, where the nerve passes over the neck of the femur.

(*c*) Along the course of the nerve on the posterior part of

the thigh, between the point (a) and another point situated rather medially to the mid-point at the bend of the knee. In the middle part of this area it is difficult or impossible to feel the nerve, because it is covered by biceps femoris. One can feel it most plainly immediately below the gluteal fold.

(*d*) Behind the head of the fibula (peroneal nerve).

(*e*) Somewhat medially to the mid-point of the bend of the knee (posterior tibial nerve).

(*f*) In the mid-line of the calf of the leg, about the place where the muscle merges into the Achilles tendon (the short saphenous nerve).

(*g*) Between the tip of the inner malleolus and the inner border of the sole.

(*h*) In the middle of the sole.

6. More or less pronounced *atrophy in the muscles* of the hip and leg may also arise, particularly in severe cases (parenchymatous neuritis).

7. Also *symptoms of sensory and motor paralysis* may sometimes arise, such as lowered sensation and weakness of the leg, less frequently complete anæsthesia or paralysis of the muscles.

Treatment.—In *acute cases*, with severe and violent pain, massage and gymnastic treatment should not be given, but the patient should be put to bed and treated medically. If the cause of the trouble has evidently been muscle strain, *light massage* may, however, be given with advantage over the injured muscle, as well as light vibration along the nerve, to reduce its irritability.

In *more chronic cases*, which are by far the most frequent, one should search out and massage the more or less tender thickenings, which in most cases are to be found in the above-mentioned muscles in the lower part of the lumbar region, especially at their origin on the sacrum, as well as

thickenings in the gluteal muscles, particularly in the posterior part of gluteus medius, and in pyriformis. Besides this, one gives massage along the whole course of the nerve and its branches, and careful nerve stretching. This should be given in the following manner. The gymnast grips the patient's heel with one hand, the sole of the foot resting on the forearm of the gymnast. While the foot is dorsally flexed, and a suitable pressure is exercised on the front of the knee to prevent any flexion of the knee joint, the whole leg should be raised so that the hip joint is flexed. When pain is produced, the leg is kept a few moments in the position it has reached, while slight stretching, with small shaking movements, is given, after which it is brought back to its original position. This treatment should be repeated three to four times.

One should also give *gentle active movements* to all the muscles round the hip joint, and cautious Back-raising. Finally, one instructs the patient himself to perform Leg-swinging, forward, backward and to the side, and to perform moderately strong stretchings of the nerves and muscles of the back by Forward-bendings in Standing, Walk-standing, Heel-support standing positions.

In cases due to sacro-iliac strain massage in the neighbourhood of the joint will be necessary. Such cases are often relieved by wearing a supporting belt.

Pain in the Coccyx and Surrounding Parts. Coccydynia.

Pain in or near the coccyx may, as stated below, be connected with morbid changes of very different kinds, but owing to a certain similarity in the symptoms, different complaints have been grouped together under the above-mentioned term.

Causes.—1. *Traumatic affections of the rectal region.* These may be caused by tobogganing or other sport; also from a fall, especially on the stairs, or when some one "sits on a chair which is not there." Through such a trauma the following injuries may arise:—

(*a*) *Traumatic muscle inflammation* in the muscles of the pelvic floor. Levator ani, sphincter ani, transversus perinei, etc.

(*b*) *Dislocation of the sacro-coccygeal joint.*

(*c*) *Fracture of the coccyx.*

2. Also in hæmorrhoids similar pains may arise, particularly with thrombosis of the dilated veins. In such cases massage should not be given before organisation is assured.

Symptoms.—1. *Aches and Pains* in the anal region and towards the lower part of the sacrum.

2. *Difficulty in sitting.* The patients usually have the greatest pain in rising from a sitting position, because it causes strong stretching of the ligaments and capsule at the back of the sacro-coccygeal joint, as well as increased pressure and strain in the other soft parts.

3. *Pain due to difficulty in defæcation*, as the contents of the rectum press against the damaged tissues.

4. *Tender infiltrations in the muscles.*

Treatment.—*Massage* is most effectively given against a finger introduced into the rectum to support the affected parts from inside.

Facial Paralysis.

Morbid Changes.—Most frequently parenchymatous neuritis of the facial nerve.

Causes.—1. *Chill*, with consequent rheumatic inflammation of the muscles and the tissues round the nerve, particularly in the stylo-mastoid foramen.

2. *Inflammation of the parotid gland.*

3. *Inflammation of the middle ear.*

4. *Fracture of the base of the skull,* or a *tumour* which presses on the nerve.

5. *Meningitis.*

6. *Cerebral hæmorrhage.*

Symptoms.—1. Paralysis of the facial muscles of one side of the face. The patient cannot wrinkle his forehead or frown on the paralysed side. The eye cannot be completely closed, and looks larger on the affected side. The naso-labial furrow is more or less effaced; the mouth crooked (drawn towards the sound side), most noticeable when the patient laughs or shows his teeth; if the tongue is protruded it deviates apparently to the affected side, but not in reference to the teeth. Speech may be slurred.

2. The reflex movements are *lost,* especially blinking, which may easily give rise to an irritated condition of the eye.

3. Particularly in rheumatic paralysis there are *often tender thickenings round the nerve* as it emerges from the stylo-mastoid foramen, as also thickening and tenderness of the nerve itself.

Prognosis.—There are three forms, differing in degree of severity, which may be distinguished after a week by electrical examination.

1. Very slight; recovery will take place in three or four weeks.

2. Of medium severity; recovery will take place in two to three months.

3. Severe, which is sometimes incurable, but which will in any case last six months.

Note.—The different forms are not always sharply defined, but intermediate types are often found.

Treatment.—*Massage of the nerve and its surrounding region, particularly as it emerges from the stylo-mastoid foramen, also massage of the facial muscles.* Exercises to move the muscles of the face : wrinkling the forehead, contracting the eyebrows, drawing back the corners of the mouth, pouting the lips, opening and closing the mouth, etc.

Secondary Overaction of the muscles supplied by the facial nerve on the paralysed side occasionally results. The muscles become shortened, the angle of the mouth drawn up and the eye half closed. At first sight the paralysed side looks active when at rest, the normal side paralysed. This idea is corrected when the patient speaks, smiles or closes the eyes. The contracted side is then inactive.

Treatment of this condition is unsatisfactory. Vibrations or frictions over the stylo-mastoid foramen and along the course of the nerve. Movements before a looking-glass.

Cramp.

Cramp is in most cases due to irritation in some part of the motor path from the brain to the muscles. It may, however, also be due to direct irritation of the muscles. Thus it appears as a symptom of brain, spinal, and peripheral nerve disease, also of disease of the muscles. Some special and more frequently occurring forms will be mentioned in detail.

Tonic cramp = continuous muscle contraction.

Clonic cramp = muscle twitchings (jerky spasms).

Facial Cramp.

Causes.—1. *Hereditary predisposition* to nervous disease.

2. *Irritation of the facial nerve* through :—

(*a*) Inflammation of the surrounding parts, usually of a rheumatic nature.

(*b*) Pressure by tumour, aneurism, and the like.

3. Reflex causes generally in connection with trigeminal neuralgia.

4. *Hysteria.*

Symptoms.—1. *Twitchings, generally unilateral,* most often appearing spasmodically, sometimes continuous increased by emotional causes.

2. *Sometimes tonic spasm.*

3. *Frequently tender thickenings in the nerve itself,* or its immediate neighbourhood.

The course is often slow.

Treatment.—1. *Massage* over the nerve and its area of distribution, especially on any existing tenderness or thickening. The muscles of the face should also be treated.

Note.—Not too hard massage on the nerve.

2. *Sustained pressure* on the nerve, so as at least temporarily to lower its conductive power, may be given with caution.

3. Of late the same method of treatment as we have mentioned in connection with chorea (see p. 142), *i.e.*, exercises in front of a mirror, has been applied in facial cramp. This treatment has proved very effective, and has in many cases resulted in cure, sometimes even in desperate cases where operation (the cutting away of part of the nerve) has been in vain.

Cramp of the Throat and Neck Muscles.

The most common form of cramp in the muscles of the neck is the so-called rheumatic torticollis, which is caused by acute rheumatic inflammation of the muscles of the neck on one side. A similar affection however is fairly frequently caused by trauma, especially overstrain of the muscles of the neck.

Symptoms.—1. *Crooked position of the head,* so that it is bent backward and to one side, while the face is turned to the opposite side.

This position is due in some cases to the patient's effort *to lessen the tension in the inflamed muscles* by contraction of their synergists ; in other cases to the swelling and infiltration in the affected muscles or in other soft parts, *forcing the head over to the opposite side.* In the former case the head is bent toward the affected side, in the latter case toward the sound side.

2. *Extremely tender infiltrations* in the affected muscles.

3. Pain on attempting to perform movements, both active and passive, which stretch the affected muscles.

Treatment.—*Massage.* To begin with, light effleurage, then stronger effleurage, and other massage manipulations. Passive and active movements should also be given. Head-rolling, rotation, side-bending, Neck-raising, etc., in the same manner as has been described in detail for congenital torticollis (see p. 68).

Spasmodic Torticollis.

Clonic cramp in the muscles of the neck appears at times. It is often unilateral.

Causes.—1. Shock.

2. Irritation of spinal accessory nerve.

3. May follow rheumatic wry neck, in which case the inflammation in the muscle presses on or spreads to the nerve.

Symptoms.—Jerky movements in which the head is bent to the side and the face rotated to the opposite side of the affected sterno-mastoid. The head may also be jerked backward by the posterior muscles of the head and neck.

Treatment.—The aim of treatment is to exercise the controlling power of the nervous centres, therefore free movements are given, as in educational gymnastics, done under command and supervision, and later practised before a looking-glass. Massage consists of effleurage only or chiefly, and this is omitted if it is found to irritate instead of sooth. Definitely corrective movements are not given, unless the case is of long standing, with shortening of one sterno-mastoid. When given, great caution must be exercised, as they may increase nervous spasm.

If rheumatic thickenings are present, deep kneading, or even friction, may be given, but temporary spasm in the muscle must not be mistaken for rheumatic thickening.

Cramp of the Calf Muscles.

Causes.—1. *Intra-muscular varicose veins, i.e.,* dilatation of the veins in the calf muscles.

2. *Sudden acute over-exertion of the muscles* of the calf, as in mountain climbing, dancing, etc.

3. Actively placing the foot in a position in which the origin and insertion of the calf muscles are brought close to each other.

4. Rheumatic or gouty tendency.

Symptoms.—1. *Painful tonic cramp of the calf muscles occurring frequently,* particularly during the night. The muscles become hard and tender.

2. With intramuscular varicose veins one mostly finds *dilatation also of the superficial veins.*

3. *The consistency of the calf muscles is altered,* so that they have a "doughy" feel, and are besides tender even when they are not contracted. The change in their consistency is either due to internal varicose veins or in some cases to inflammation of the muscles.

Treatment.—1. To counteract the attack of cramp one should give *strong passive stretchings* of the contracted muscles by passive dorsi-flexion of the ankle, while the knee-joint is held well stretched.

2. To counteract a tendency to cramp *massage* of the calf muscles is given, especially effleurage.

Should great tenderness at a definite point be noticed, or appear later on, it may be due to the *formation of a thrombus.* In that case *all treatment must immediately cease.*

3. Movements which promote circulation, as Leg-rolling and Knee-pumping, also gentle active movements, should be given.

4. *Bandaging of the leg* or the use of an elastic stocking should be advised.

Similar cramp from similar causes may also appear in other muscles.

Writer's Cramp, or (Co-ordination-)Occupation-Neurosis.

With persons whose professional work involves the same repeated action of certain muscles, or groups of muscles, as for instance in the case of writers, telegraph operators, masseuses, piano and violin players, some characteristic disturbances often arise in the muscles, or in those parts of the body which are specially employed, sometimes taking the form of *numbness*, sometimes appearing as *cramp or tremor*, or as a difficulty in fully controlling the movements. As in many of these cases one cannot point to any organic changes in the organs of motion or in the nervous system, they are considered as neuroses, and as no fundamental distinction exists between the form of disease which appears in a writer and that which appears, for instance, in a pianist, all similar cases have been grouped together under the common name of co-ordination *occupation neuroses.*

In some cases, however, inflammatory changes appear in the strained muscles, or in the nerves by which they are innervated, or in both, and these cases are of course not neuroses in the usual acceptance of the word, but simply *myositis*, or *neuritis*. These, however, in consequence of the similarity of their origin (overstrain), have also been considered occupation neuroses.

As typical of all these neuroses, we may consider *writer's cramp*, and what is here said in regard to it applies with the necessary modifications to the other forms.

Causes.—1. *Predisposition* to nervous disease.

2. *Over-work*, especially with regard to writer's cramp. It arises from too much and too continuous writing; from the pen being squeezed hard between the fingers; from the use of too hard a nib, a thin penholder, or owing to a bad position of the hand, and above all, by "tension," not only the muscles which are necessary for holding the pen, and for writing, but also their antagonists, being too powerfully innervated.

Symptoms.—1. In the attempt to write, a certain *disturbance in the innervation of the muscles arises*, generally expressing itself in cramp or tremor, and either hampering the writing, or making it impossible, or making the writing more or less illegible. These disturbances often arise only on attempting to write, whereas other movements can be performed with ease. It is therefore considered that in such cases the disturbance must depend upon some fault in the brain and innervation.

According to the kind of disturbance which arises, three different forms of the disease have been described. There are, however, various transition forms between them.

(*a*) *The spastic form*, which is characterised by tonic cramp arising in the muscles which bend or stretch the fingers or wrist on attempting to write.

(*b*) *The form characterised by tremor*, generally in pronation and supination, which makes the writing illegible.

(*c*) *The paralytic form.* This is not characterised by actual paralysis, but on writing a tired feeling, pain, and a sensation of numbness arise suddenly in the arm. In this form particularly, inflammatory changes are often found in the muscles and nerves of the arm (myositis and neuritis), sometimes also in those of the upper arm and shoulder. These cases are therefore, properly speaking, not pure neuroses, but also myositis or neuritis.

2. Sensation is usually normal.

3. Sometimes the patients suffer from general nervousness, which may be congenital, or may have arisen through anxiety about the future, caused by the illness.

The Prognosis is often bad, and the course of the disease usually slow. The patient may sometimes even have to change his occupation. The prognosis is better in those cases associated with myositis or neuritis in the arms.

Treatment.—1. Rest from work for some length of time, preferably several weeks. In the more severe cases, this is an indispensable condition for recovery.

2. One must carefully examine for inflammatory changes in the muscles of the hand, forearm, upper arm or shoulder, and they should be specially treated by massage, all manipulations being given.

The nerves should also be examined and treated by nerve massage. Special attention should be given to the brachial plexus in the supra-clavicular fossa and in the axilla and to the large nerve trunks, the radial, ulnar, and median nerves.

Even should there be no evident changes in the muscles and nerves of the shoulder, one should treat by muscle and nerve massage.

3. *Methodical exercises*, with both concentric and eccen-

tric muscle work, but with *light* resistance, for all the muscles of the arm, hand, and shoulder.

4. A correct method of writing should be taught in order to avoid muscle strain. Large movements from the shoulder must be encouraged and a loose grasp.

5. If the patient is weak, general strengthening treatment is also given.

The patient should not be tired.

Example.—Treatment for a patient suffering from writer's cramp.

1. Stretch-sitting 2-Arm-bending, -stretching.

2. Reach-grasp-standing Heel-raising Knee-bending.

3. Massage of the affected arm and shoulder muscles + nerve frictions, and vibrations along the course of the nerve trunks. (Frictions would not be given in the spastic type.)

4. Hips-firm-high-ride-sitting Trunk-rolling + Backward drawing.

5. Hips-firm-stoop-stride-sitting Back-raising with Back-stroking.

6. Sitting-single-Arm-rolling + Abduction, adduction, Arm-carrying forward, backward, rotation (light resistance, all movements con- and eccentric).

7. Arm-lean-standing Back-hacking.

8. Sitting-single-forearm-bending, -stretching, Wrist-rolling, -bending, stretching, Ulnar and Radial flexion, pro- and supination (light resistance, con- and eccentric movements).

9. Sitting-finger-rolling + bending, stretching, abduction with stretching. First all the fingers at once, then each separately. The movements of the thumb should be practised separately. Rolling, bending, stretching, ab- and adduction (light resistance con- and eccentric).

10. Standing 2-Arm lifting, forward, upward, outward, downward.

Chapter VIII

DISEASES OF THE CIRCULATORY SYSTEM

Diseases of the Heart.

Heart diseases may be grouped in two main divisions :—

A. Diseases of the heart muscle.

B. Valvular diseases.

Disturbances which arise in all Diseases of the Heart.

It is common to all diseases of the heart, of whatever nature, that *the blood pressure* (*average pressure*) *in the arteries of the systemic circulation is diminished.* This is self-evident in all diseases of the heart muscle. It will be shown that the conditions are similar in valvular disease.

In consequence of the diminished blood pressure, *the rapidity of the blood flow* is also diminished.

Because of this, certain changes take place in the quality of the blood, and certain disturbances of metabolism arise. As the blood flows more slowly through the capillary vessels it has time to *lose more oxygen and to become more charged with carbon dioxide* than is the case in a more rapid flow, but *the tissues, however, receive less oxygen and give up less carbonic acid in the same unit of time* than under normal conditions. Compare the conditions between the air breathed and the carbonic acid given off in slow and rapid breathing. *The venous blood therefore contains more carbon dioxide than usual,* while the nutrition of the tissues and the general metabolism is lowered as in anæmia.

During the passage through the pulmonary capillaries, the blood cannot get rid of its surplus of carbonic acid,

especially as these capillaries are often dilated and bulge into the alveoli, thus lessening their capacity and the volume of air they contain ; consequently also the exchange of gases. It follows that *the arterial blood also becomes richer in carbon dioxide and poorer in oxygen* than under normal conditions.

But blood richer in carbon dioxide exercises *greater friction* on the walls of the blood vessels, and also produces *contraction of the smaller arteries*, and therefore increased resistance to the flow of blood, and increased work for the heart.

Resistance is further increased by the impaired nutrition making *the walls of the capillaries more porous, so that increased exudation of blood serum takes place.* By this means the lymphatic spaces become distended, and the pressure from without on the walls of the capillaries becomes greater, which, of course, involves an increased difficulty for the blood flow.

This exudation or transudation is promoted because *the pressure within the capillaries is increased*, which again is due to the fact that the veins contain more blood than normally, so that the blood in the capillaries cannot so easily pass into them.

This excess of blood in the veins necessarily arises from the lowered pressure in the arteries. The lumen in the arteries is lessened and consequently they do not contain so much blood as when the pressure is normal. As the arteries do not hold the usual quantity of blood, the blood which is in the veins and capillaries must be increased. That is to say, the quantity of blood in the human body is not diminished in heart disease.

For all these reasons the resistance to the blood flow is increased, and thereby also *the work of the heart.*

The heart, however, has reserve force, which is not made use of under normal conditions, just as the full power of the respiratory organs is not used in ordinary breathing. By using this reserve force the heart can for some little time satisfactorily fulfil the increased claim made upon it and keep up a fairly normal blood pressure and rapid blood flow, and so long as this is the case the symptoms of heart disease are slight. *Sooner or later, however, this reserve force becomes exhausted* and then the blood pressure and the rapid flow of blood can no longer be maintained, *i.e.*, symptoms arise due to *back pressure*. The lowering of pressure and slowing of blood flow produce the disturbances already mentioned in nutrition and metabolism and also in the quality of the blood with consequent increase in the work of the heart.

The power of the heart now becomes insufficient in proportion to the resistance, and *the heart muscle becomes overstrained*. But when an overstrained muscle is forced to work *its strength quickly becomes diminished* and its power of work ; so also with the heart muscle. The consequence of this is a further lowering of the already diminished pressure in the arteries, still slower flow of blood, still greater disturbances of nutrition, blood further loaded with carbon dioxide, further increased resistance to the flow of blood, and consequent increased work for the heart, further overstrain of the muscles of the heart, further lessening of the force of the heart, etc. The disease thus enters a so-called "vicious circle," *i.e.*, a series of circumstances which affect each other, so that they go from bad to worse.

General Symptoms of Heart Disease.

Due to the above-mentioned disturbances, a great many symptoms arise, which are common to all diseases of the

heart, and may therefore be termed symptoms of heart disease. The most important are :—

1. *Cyanosis*, partly due to the increased amount of carbon dioxide in the blood, and partly to the increased amount of blood in the veins.

2. *Shortness of breath*, due to the increase of carbon dioxide, and the lack of oxygen in the blood and tissues.

3. *Cold hands and feet*, due to the slowness of the circulation and the reduced metabolism.

4. *Pain in the region of the heart.*

Note.—Pain in the region of the heart is not always a sign that heart disease is present. It is frequently due to rheumatic inflammation of the intercostal muscles, or to indigestion.

5. *Palpitation* on the least exertion, because increased demands are made on the heart. Being already overstrained, the heart tries to husband its force by working with weaker and more frequent contractions, instead of with few and more powerful ones.

6. *Changes in the cardiac sounds and in the pulse.*

7. *Swelling*, beginning in the ankles, and extending up the leg, worse in the evening. It first appears when the heart muscle begins to be overstrained. It is partly due to the increased pressure on the capillaries caused by the increased disturbances in the circulation (*back pressure*), also partly due to the increased porousness of the vessel walls.

8. *A general sense of fatigue and weakness*, due to lack of oxygen and diminished metabolism.

Treatment.—As all diseases of the heart are accompanied for the most part by similar disturbances and symptoms, their treatment on the whole must be similar. Of course, in every special case the treatment must be carefully adapted

to the patient's strength and the greatest attention must be paid to the most important symptoms, and to any complications which may arise, such as bronchitis.

The general principles on which a so-called general heart treatment should be arranged are given below. In the description of the different forms of heart disease, the modifications will be mentioned which are demanded in each case by the character of the disease.

General principles of Heart Treatment.—I. So long as the patient is very weak, no gymnastic treatment should be given, but the patient should remain in bed, and *rest* as much as possible.

Gentle Chest-lift-strokings, Chest-lift-shakings and Chest-liftings have, however, even in this stage, been tried with success.

II. *The heart must be spared as much as possible.* This may be effected, not only by *bodily rest* and by avoiding sudden violent movements, but also *by movements and manipulations which promote the circulation*, especially in the veins. If the circulation in the veins is promoted, it reacts on the circulation as a whole, because the blood can then flow more easily from the capillaries to the veins, and from the smaller arteries to the capillaries. When the heart muscle is thus eased in its work it becomes less fatigued, and also gains more time to recover completely during the pause.

The effect of movements which assist the circulation is not confined to temporary relief of the work of the heart, but it also contributes to increase the strength of the heart.

The movements and manipulations which are most suitable for this purpose are :—

(*a*) *Breathing movements*, particularly those which promote inspiration, and thereby increase the negative pressure

in the thoracic cavity, *e.g.*, Chest-lift-stroking, Chest-lifting, Yard-sitting 2-Arm-rolling, etc.

(*b*) *Muscle-kneading.* In more severe cases, particularly for œdema, *effleurage* is given.

(*c*) *Rolling and other passive movements.*

Note.—Leg-rolling should not be given with too large a movement, since it might then impede respiration.

(*d*) *Special movements for the portal circulation*, as Circle-turning and light Abdominal kneading.

Note.—In abdominal kneading, only the large kneading manipulations are used, and one should try to arrange that the pressure on the abdominal wall coincides with the patient's expiration, so that it may not in any way hinder inspiration.

(*e*) *Active movements without resistance, e.g.*, Standing 2-Arm-carrying forward-upward-outward-downward, walking, etc. These movements should not be attempted till the patient has already improved considerably.

III. *The supply of oxygen and the output of carbonic acid should be accelerated by breathing movements*, such as promote inspiration and expiration (they also increase the circulation in the pulmonary system), and such as encourage the exchange of gases by shaking the thorax, *e.g.*, Chest-clapping Chest-lift-shaking, etc.

IV. *The heart should be stimulated to stronger contraction*, though the means employed should not involve increased work for the heart.

This may be effected by local heart treatment, Back-hacking, Back-vibrations, and general nerve-pressures.

V. *If there is no degeneration of heart muscle, and when the heart has somewhat recovered, one should also directly exercise it, and thus increase its reserve force.* This can be effected by active resisted movements, which in a reflex way

force the heart to more powerful contractions, and thus exercise the heart muscle. According to modern ideas the capacity of the heart muscle to utilise the nourishment supplied is thus increased, so that the effect of its work is augmented.

In doing this one should always begin with easy foot and leg movements, after which should be added movements of the finger, hand, and elbow joints, and lastly light trunk movements.

Note.—Anything that may impede respiration, and thus also the circulation in the veins, must be carefully avoided :—

Thus (*a*) *All movements and starting positions which fix the thorax, e.g.,* Hanging position; most of the active abdominal movements (Sitting Alternate-turning may, however, be used if gently given), active shoulder movements, particularly such as go above the horizontal plane; Forward-lying position for massage, etc.

(*b*) *All sudden and strong movements should also be avoided,* partly because in them the patient fixes the thorax, and holds his breath to fix the origin of the muscles on the trunk, partly because such movements directly strain the heart.

Example.—General heart treatment for a weak patient.

1. Half-lying Chest-lift-stroking.
2. Half-lying Leg-kneading + General nerve-pressures + passive foot-rolling.
3. High-ride-sitting or Sitting Circle-turning (resp.).
4. Arm-lean-sitting Back-hacking or vibrations.
5. Crook-half-lying Abdominal kneading (gently).
6. Half-lying Arm-kneading + general-nerve-pressures + passive wrist-rolling.
7. Half-lying Chest-lift-shaking.
8. Half-lying Local Heart-treatment.

It is suitable to add Chest-liftings here and there during the treatment. When the patient is rather better Standing Arm-lifting and other easy active breathing movements may be used. As strength begins to return, Active Foot-bending, -Stretching or Foot-rolling should be given, also Fore-arm-bending, -stretching after Wrist-rolling. Finally one should add light Alternate-turning and Back-raising.

Valvular Disease.

By valvular disease, or so-called *organic heart disease*, we mean such changes in one or more of the valves of the heart that either the valves *cannot close perfectly* = incompetence ; or that the orifices between the auricles and the ventricles, or between the ventricles and the great arteries, *have become obstructed* = stenosis.

Causes.—1. *Inflammation in the valves* due to bacteria, often of the same variety which causes acute rheumatism. The settling of these bacteria in the tissues is probably facilitated by the mechanical irritation to which the valves are always exposed. Through the inflammation ulcers are produced, and when these heal, scars are formed, which cause the contraction of one or more of the flaps of the affected valves, so that their margins no longer meet. This produces incompetence of the valves.

If the ulceration arises in the margin of two segments lying close to each other, they may become adherent in the process of healing. This is how stenosis arises.

2. *In the aortic valves* defects may also arise, by arterio-sclerosis in the walls of the aorta attacking the valves, so that they become stiff, and are consequently not able to open fully (stenosis). Through the sclerosis of the arteries, the aorta itself may lose its elasticity, and remain per-

manently dilated, so that the margins of the valves do not reach each other, and incompetence arises.

Organic valvular disease is chiefly met with in the left side of the heart, probably because the pressure there is greater. In fœtal life the pressure is greater in the right side of the heart, therefore organic valvular disorder, arising during this period, is generally met with on the right. Patients with this kind of heart disease generally die young.

In adults the common kinds of heart disease are :—

1. *Mitral incompetence.*
2. *Mitral stenosis.*
3. *Aortic incompetence.*
4. *Aortic stenosis.* These may, however, be combined in every possible manner.

Mitral Incompetence (*Regurgitation*).

If the mitral valve does not close firmly, the following disturbances may arise :—

1. At the contraction of the left ventricle, part of its contents flows back to the left auricle. The volume of blood which is pressed into the aorta is then less than under normal conditions, so that the expansion of the aorta is lessened, the pressure there becomes lower, and the blood flow in the systemic circulation delayed, so that the above-mentioned *general disturbances of the circulation, due to heart disease,* arise with their accompanying symptoms.

2. As some of the blood rushes back to the left auricle, it becomes partly filled. The blood from the pulmonary veins cannot then so easily empty itself into the auricle as under normal conditions. The result of this is *an excess of blood in the pulmonary veins and capillaries, and slowing of the circulation in the pulmonary system.* This causes lessened exchange of gases between the air in the alveoli, partly

through the retarded blood circulation, partly through the dilatation of the capillaries and consequent diminution of the air space in the alveoli. The result of this is an increased amount of carbon dioxide in the blood, and increased cyanosis and shortness of breath.

Compensation in Mitral Incompetence (*Regurgitation*).

The disturbances in the circulation which arise through mitral incompetence may be neutralised, or as it is expressed, may be *compensated*, through certain changes and modifications of the heart and its action, particularly by certain parts of the heart increasing in strength. That is to say, *if the power of the right ventricle is increased*, the blood is driven more powerfully through the pulmonary system, the pulmonary veins empty themselves more completely into the left auricle, which must then become dilated so as to be able to hold both the blood which flows from the pulmonary veins, and that which regurgitates from the left ventricle. When the over-filled left auricle empties itself into the left ventricle, *this also becomes somewhat dilated.* It therefore contains more blood than under normal conditions ; some of this blood rushes back into the auricle at the contraction of the ventricle, but the quantity sent into the aorta is of the same volume as under normal conditions, so that normal pressure is maintained and the disturbances in the circulation disappear. *The musculature of the left ventricle must, however, become stronger than normal* to cope with the increased volume of blood.

Therefore, by *hypertrophy of the musclar wall of the right ventricle, dilatation of the left auricle and ventricle, and slight hypertrophy of the muscular wall of the left ventricle, mitral incompetence may be compensated.*

If the patient lives under favourable hygienic conditions, and if the heart is husbanded and helped in its work, *nature herself will bring about these changes in the heart.* Patients with heart disease may thus during long periods appear perfectly healthy, and not show any sign of disturbed circulation. *Now and again, however, the heart gets fatigued* owing to its increased work; general symptoms of *back pressure* arise, the heart must be rested and helped so that it may again be able to hypertrophy and increase in strength. A heart patient therefore may need treatment from time to time.

Mitral Stenosis.

The disturbances in the circulation attendant upon this form of valvular disease arise in the following way:—

1. On contraction, the left auricle cannot empty itself completely, owing to resistance at the valvular orifice. A less quantity of blood than normal is thus sent into the left ventricle, with the result that when it empties itself into the aorta this becomes less distended than under normal conditions, so that the pressure there is lowered, and the blood flow in the systemic circulation is slowed. Hence arise the *general disturbances of the circulation in heart disease.*

2. As the left auricle does not empty itself completely, the same disturbances arise in the pulmonary circulation as in mitral incompetence, and consequently also similar symptoms (cyanosis, breathlessness, etc.).

Compensation in mitral stenosis might be brought about:—

1. By *increasing the strength of the right ventricle,* which would overcome the circulatory disturbances in the pulmonary system.

2. By *dilatation of the left auricle.*

3. By *increasing the strength of the left auricle,* so that it can surmount the impediment of the constricted valve.

This last, however, can only take place to a slight extent, owing to the thinness of the musculature of this part of the heart under normal conditions.

No dilatation or hypertrophy of the left ventricle need arise in this form of heart disease, and frequently no symptoms arise.

Aortic Incompetence (*Regurgitation*).

This form of valvular disease affects the circulation in the following manner. When the left ventricle relaxes some of the blood regurgitates through the imperfectly closed valve to the left ventricle, the pressure in the aorta is in consequence suddenly lowered and the flow of blood is slowed so that the above-mentioned *general disturbances of the circulation* arise.

On the other hand *no disturbance arises in the circulation of the pulmonary system,* as the mitral valve is undamaged, and prevents the blood from the ventricle passing back into the left auricle. In this form of heart disease, cyanosis and difficulty in breathing are, as a rule, much less marked than in mitral disease.

Compensation of aortic incompetence is effected partly by *dilatation of the left ventricle,* enabling it to hold both the blood that comes from the left auricle and that which flows back from the aorta, partly also by *hypertrophy and increased strength of the muscular wall of the left ventricle,* enabling it to send out its increased volume of blood into the aorta with greater force. For this reason *the pressure in the aorta is at first considerably above normal,* so that although

this pressure is afterwards diminished by a certain quantity of blood rushing back into the ventricle, the remaining pressure is sufficient to drive the blood with normal rapidity through the systemic circulation.

Aortic Stenosis.

The consequence of this defect is that *much of the strength of the left ventricle is used up in surmounting the resistance of the constricted valvular opening.* For this reason the blood is driven into the aorta with less force, *the pressure there becomes less than normal, so that general disturbances of circulation appear.* No disturbances arise in the pulmonary circulation.

Compensation in aortic stenosis is effected by *an increase of strength and development of the muscular wall of the left ventricle to such a degree that, after surmounting the resistance of the valve, sufficient power is left to propel the blood with normal power into the aorta.* As the muscles of the left ventricle are in themselves strong, they can more easily be made to develop further, and consequently the heart itself can more easily compensate for valvular defects of the aorta.

Thus we see that, in all the different valvular defects, there arise general disturbances of the circulation peculiar to heart disease with their associated symptoms.

The Treatment of Valvular Defects.

This follows the principles already mentioned in the general treatment of heart disease.

In *defects of the mitral valve,* one should, however, particularly aim at such movements as *promote the pulmonary*

circulation, and encourage the exchange of gases in the lungs. Breathing exercises must be given with caution, remembering that the heart is already over-loaded with blood.

In valvular defects the heart muscle is often healthy and one should, therefore, when the heart becomes stronger and the patient feels better, *increase the reserve power of the heart* by giving active resisted movements. In this connection special attention should be paid to all that has been said concerning the general treatment of heart disease.

Example.—Treatment for a patient with mitral incompetence :—

1. Yard-sitting 2-Arm-rolling (Resp.).
2. Half-lying Leg-kneading.
3. High-ride-sitting Circle-turning (Resp.).
4. Half-lying Foot-rolling, -bending, -stretching.
5. Heave-grasp-standing Chest-clapping.
6. Crook-half-lying Abdominal kneading.
7. Hips-firm-stoop-stride-sitting Back-raising.
8. Half-lying Arm-kneading + General-Nerve-pressures.
9. Half-lying Knee-bending, -stretching.
10. Half-lying Hand-rolling, -bending, -stretching.
11. Arm-lean-standing Back-hacking or vibrations.
12. Sitting Chest-lifting.
13. Half-lying Local Heart-treatment.

Between Movements.—Sitting Chest-lifting. Standing 2-Arm-lifting-outward-downward with deep-breathing.

Idiopathic Hypertrophy of the Heart.

Morbid Changes.—Hypertrophy of the heart muscle, especially that of the ventricles, is sometimes found without *any* valvular defect, or general arterio-sclerosis or any chronic renal inflammation. Thus it is a hypertrophy

which is not connected with any disease, but due to a cause which has had a direct effect on the heart.

Causes.—1. *Repeated physical overstrain.* Often arising from injudicious training, which is the danger in sport and in public competitions.

According to recent investigations by X-ray photography Professor Jundell demonstrated that among athletes one frequently finds hearts that are not at all enlarged. This is connected with the fact already mentioned that muscles by training learn to absorb the nourishment brought to them with the blood, in a much higher degree than untrained muscles are able to do.

2. *Rich diet, and particulary beer-drinking,* increases the action of the heart in a reflex way, increases the fluids of the body, causes obesity.

3. *Repeated emotions.*

4. *Hereditary predisposition* must also be taken into account, because the influences above mentioned do not affect every one in the same way.

5. *Adolescence.* The heart may develop before the other parts of the body, so that for a time it is too large. "Juvenile hypertrophy."

Symptoms.—1. *Forcible action of the heart.*

2. *Enlargement of the heart.*

These symptoms "per se" are not morbid, but only indicate a strong heart, but if the causes continue to act, overstrain of the heart will gradually set in, and with it diminished power of the heart's action and lowered pressure in the aorta, and hence—

3. *The general symptoms of heart disease.*

In the cardiac hypertrophy of adolescence, the general symptoms of heart disease do not appear, but only a powerful and rather irregular action of the heart.

Treatment.—1. *Preventive.* By avoiding the causes, particularly strong and sudden physical exertion.

2. When overstrain of the heart has arisen, general heart treatment should be given (see p. 184), first without, afterwards with easy active movements, when the patient has sufficiently recovered to be able to stand them.

3. *Cardiac hypertrophy in adolescence* is treated by *general strengthening treatment* to promote the general development of the whole body. Active movements may and should form part of the treatment; but they must be carefully adapted to the strength of the patient. One should also give movements and manipulations which have a soothing effect on the heart's action, for instance, local heart treatment, etc.

Example.—Treatment for juvenile *cardiac hypertrophy.*

1. Heave-grasp-standing Chest-expansion.
2. Reach-grasp-standing Heel-raising Knee-bending.
3. Yard-walk-standing Plane Arm-carrying (gently).
4. Reach-grasp-standing Head-rolling + Neck-raising.
5. High-ride-sitting Alternate-turning + Chest-lifting.
6. Arm-lean-standing Back-vibrations.
7. High-reach-gr.-st. Leg-backward-drawing.
8. Reach-gr.-stp.-std.-sit. Back-raising in different planes.
9. Stretch-sitting 2-Arm-bending, -stretching.
10. Half-lying Foot-rolling, -bending, -stretching.
11. Stretch-grasp-standing Forward-drawing.
12. Local Heart treatment.

Between Movements.—Standing 2-Arm-lifting outward-upward, outward-downward.

Dilatation of the Heart.

Morbid Changes.—Weakening of the musculature, and dilatation of the chambers of the heart without hypertrophy.

Causes.—1. *Accidental and violent physical overstrain.*

2. *Acute infectious diseases,* as influenza, diphtheria, etc. through bacterial poison affecting the musculature of the heart, and weakening it, a condition preceding degeneration (see below).

3. Great general weakness.

Symptoms.—The general symptoms common to heart disease, more or less pronounced (see p. 182).

Treatment.—General heart treatment first without, then with, active movements, if the cause has been overstrain. If the cause has been an acute infectious illness active movements should not be included in the treatment, since there is generally some degeneration of the muscle. When this has eventually subsided (indicated by a considerable increase in the patient's strength) active movements may be used to increase the strength of the heart.

Fatty Infiltration of the Heart.

Morbid Changes.—Increased deposit of fat in the connective tissue around the heart and between its muscle fibres. The action of the heart is hampered, and its power to propel the blood lessened.

Causes.—Obesity (see "Constitutional Diseases," p. 106).

Symptoms.—1. The usual symptoms of obesity.

2. A sense of weight and oppression in the chest. The patient feels a tightness in the chest.

3. The general symptoms of heart disease.

4. The heart sounds are muffled and weak.

Treatment.—As long as the patient is weak, and has swelling of the feet and legs, and there are other symptoms of bad circulation, *general heart treatment* should be given, but as soon as the heart has begun to recover, and the

patient's strength has increased, *one passes on quickly to active movements,* and finally to vigorous gymnastic exercise and the treatment of obesity.

Example.—Treatment of "*Fatty Infiltration of the Heart.*"

The symptoms of heart weakness have passed off.

1. Half-lying Chest-lift-shaking.
2. Half-lying Leg-kneading.
3. Half-lying Fore-arm-bending, -stretching.
4. Half-lying Foot-rolling, -bending, -stretching.
5. High-ride-sitting Trunk-rolling + Chest-lifting.
6. Heave-grasp-standing Chest-clapping.
7. Hips-firm-close-sitting Alternate-turning.
8. Crook-half-lying Abdominal-kneading + Petrissage of the fat abdominal walls.
9. Hips-firm-stoop-stride-sitting Back-raising.
10. Half-lying Arm-kneading.
11. Half-lying Leg-rolling + outstretching.
12. Stretch-sitting 2-Arm-bending, -stretching.
13. Half-lying Local Heart treatment.

Between Movements.—Standing 2-arm lifting outward-upward, outward-downward.

Degeneration of the Heart Muscle.

Morbid Changes.—Degeneration of one kind or another, most frequently fatty degeneration of the muscle fibres, so that the working power of the heart becomes very considerably lowered.

Causes.—1. *Acute infectious diseases,* for instance, diphtheria, influenza, etc., through bacterial poisons.

2. *Poisoning,* especially by *phosphorous, arsenic* and *alcohol.*

3. *Old age.* Pigment atrophy.

4. *High degree of anæmia,* through lack of oxygen, as has already been described under Anæmia (p. 96).

5. *The more severe forms of heart disease,* through lack of oxygen in the blood, which causes fatty degeneration, not only of the heart, but also in various other parts of the body.

Symptoms.—The "general symptoms of heart disease," particularly weak and irregular action of the heart, dilatation of the heart, swelling of the feet and lower legs and great general debility.

Treatment.—General heart treatment is given with extreme caution, and *without active movements* for a considerable time. Complete rest may be necessary for three to six months or even longer.

Cardio-Sclerosis and Angina Pectoris.

Morbid Changes.—Arterio-sclerosis of the coronary arteries and their branches. There is thickening of the walls of the small arteries, and their lumen is narrowed, so that *the nutrition of the heart muscle deteriorates, and its strength is diminished.* One or other of the arteries may become completely blocked, and thus nutrition is cut off from that part of the heart muscle which received its blood supply from the obstructed artery. The smaller arteries of the heart are so-called terminal arteries, *i.e.*, they form no anastomosis with each other. That part of the heart muscle which is thus cut off from the circulation *degenerates and dies, and is replaced by connective tissue* owing to the dead part acting as a foreign body and causing chronic irritation of its surroundings. Such processes often arise in several places in the heart, and weaken it extremely.

Causes.—Arterio-sclerosis and its causes (p. 202).

Symptoms.—1. The general symptoms of heart disease, through weakening of the heart muscle.

2. *The pulse is generally slow* and irregular.

3. More frequently than is the case in other forms of heart disease there are *sudden attacks of pain in the heart* and great distress in breathing (*angina pectoris*).

Such patients *generally die suddenly and unexpectedly from paralysis of the heart.* Relatives should be informed of this beforehand, but not the patient himself. Otherwise the gymnast and gymnastic treatment may fall into disrepute and undeservedly bear the blame should the patient unfortunately get an attack of paralysis of the heart during or immediately after treatment.

Treatment.—General heart treatment without active movements, and given with extreme caution. Avoid chill.

Nervous Palpitation of the Heart.

Morbid Changes.—None. There may be—

A. *Increased action of the heart.*

B. *Subjective sensation of increased action of the heart.*

In the former case, there is a kind of *hyperæsthesia of the heart*, so that its action is increased to a considerable degree by circumstances which under normal conditions would very slightly accelerate it, *e.g.*, slight exercise, taking food, emotions, etc.

In the latter case there is general hyper-sensitiveness in the patient, so that he imagines he has marked palpitation of the heart, though on examination the heart is found to be working normally.

In both cases, the actual cause of the disturbance is often general *nervousness, hysteria, or neurasthenia*, and the

treatment should be *in accordance with the cause.* One should always give movements which calm the heart's action, as Strokings, *Tapôtement à l'air comprimé,* Vibrations, etc.

Inflammation of the Pericardium (*Pericarditis*).

Morbid Changes.—Inflammation of the pericardium, with changes similiar to those in bacterial synovitis. Serous sero-fibrinous, fibrinous, sero-purulent, or purulent exudation, and more or less abundant deposit of fibrin on the inner surface of the pericardium. Afterwards this fibrin becomes organised through endothelial cells and blood vessels growing in from the pericardium, and white corpuscles migrating, multiplying and depositing intercellular substance, so that the fibrin gradually becomes converted into connective tissue which unites the two layers of pericardium. The heart's action is thereby considerably hampered. In connection with pericarditis atrophy and degeneration of heart muscle often take place, partly due to disturbances in the circulation and nutrition, and partly to the effect of bacterial poisons.

Causes.—1. *The same bacteria which cause acute rheumatism.*

2. Other acute infectious diseases (*i.e.,* their bacteria).

3. Inflammation of the surrounding parts, which spreads to the pericardium, as pleurisy and pneumonia, inflammation of the ribs, vertebræ, mediastinum, heart, etc.

Symptoms.—1. The general symptoms of an infectious disease.

2. Swelling in the region of the heart due to distension of the pericardium.

3. The apex-beat is weak, but the pulse stronger than

one would expect from the weakness of the apex-beat, since the latter becomes less marked owing to the presence of exudation.

4. Some symptoms which are shown by percussion and auscultation, *e.g.*, increased dulness, friction sounds, etc.

5. *General disturbances of the circulation* like those which occur in heart disease. They are partly due to the action of the heart being impeded by the adhesion of the layers of the pericardium, and partly to the degeneration of the musculature of the heart found in certain cases.

Treatment.—There should be no question of gymnastic treatment before the acute inflammation and fever have subsided, and the patient has begun to recover. It is the same as *general heart treatment.* One should particularly bear in mind possible degeneration of the heart muscle, which is often met with, and in such cases no active movements should be given. When the treatment has been continued some time, and the patient's strength has increased, and the degeneration which may possibly have been present has been repaired, then one may add such movements to the treatment.

Note.—One should not make any attempt to loosen adhesions in the pericardium by Chest expansions, Shakings, or the like.

Diseases of the Blood Vessels.

Arterio-Sclerosis.

Morbid Changes.—A form of chronic inflammation of the tunica intima and media in the walls of the arteries, with thickening of their tissues through multiplication of cells and migration of white corpuscles. In addition, there follows degeneration of the cells and destruction of

tissue, so that small ulcers are formed on the inside of the arteries. Finally, calcareous deposits take place in the affected parts, so that the arterial wall becomes hard, rigid and brittle.

Causes.—1. *Old age.* The disease may be considered the result of all the irritations to which the walls of the arteries have been exposed during life.

2. *Hard physical work* and hypertrophy of the heart, because they produce mechanical irritation by raising the blood pressure.

3. *Poisons and irritating substances* which have entered the blood, particularly through the abuse of alcohol, or in gout, disease of the kidneys, lead poisoning, infections, syphilis, etc.

Symptoms.—1. *Tortuous course of the arteries,* and thickening of their walls.

2. *Enlargement of the heart,* particularly of the left ventricle, due to hypertrophy caused by the increased work, owing to thickening of the walls of the small arteries and consequent narrowing of their lumen.

3. This narrowing of the arteries, particularly when it develops to a high degree, is also accompanied by *considerable disturbance of the circulation,* which manifests itself partly by a *red-blue colour* of the hands and feet, partly by a *sensation of cold* in those parts. With still greater obstruction there are also *pains in the feet and lower legs,* sometimes also in the hands. When there is a particularly high degree of thickening of the walls of the arteries, the circulation and nutrition may become so deteriorated, notwithstanding the hypertrophy of the heart, that "*gangrene,*" *i.e.,* death of cells and tissues, may follow. This is most often the case with regard to the feet and legs—"*senile gangrene.*"

4. Arterio-sclerosis gives rise to a great many other

diseases, as *cerebral hæmorrhage, aneurysm, cardio-sclerosis, disease of the aortic valves,* etc.

Treatment.—In the treatment of arterio-sclerosis one should aim at improvement of the circulation and nutrition so as, if possible, to delay the progress of the disease, and to relieve the symptoms. For this purpose it is suitable to give a general treatment, similar to the general treatment in diseases of the heart (see p. 184), which may also include easy active movements, if the patient is not suffering from cardio-sclerosis or any other severe form of heart disease.

To relieve the distressing pains from which the patients often suffer, and to prevent threatening "gangrene," light effleurage may be tried.

Both gymnastic treatment and massage must always be given with the greatest caution.

Aortic Aneurysm.

Morbid Changes.—A fusiform or saccular dilatation of the aorta, generally situated in the ascending part of the vessel. Frequently there are considerable quantities of coagulated blood deposited on the inner surface of the wall.

Causes.—Arterio-sclerosis in the walls of the vessel.

Symptoms.—1. A *pulsating tumour.* The pulsation is most distinct in the second intercostal space, to the right of the sternum, and at the upper border of the manubrium sterni.

2. *The pulse in the radial artery is delayed in the left arm, weakened in the right.* It is later in those arteries which come from the aorta below the aneurysm, and is weaker in the arteries which come from the dilated part.

3. *General disturbances of the circulation*, as in heart disease, partly because the aneurysm often gives rise to valvular disease in the aorta, partly because the elasticity of the walls of the aorta is considerably diminished, so that the reserve strength of the ventricle is lessened.

Treatment.—The gymnastic treatment of a case of aneruysm of the aorta must be carried out with the greatest caution, because rupture of the aneurysm may easily occur. *It may, of course, only be given at the express order of a physician*. It should only aim at easing the circulation. All movements which directly affect the thorax and heart, as Chest-lifting, Chest-clapping, Circle-turning, etc., should be avoided. One must, therefore, restrict oneself to trying to promote and facilitate the blood circulation by light Arm and Leg kneading, passive circulatory movements, and possibly Chest-lift-stroking. The patient is often unable to bear Abdominal kneading because it rather impedes respiration. It may, moreover, be dangerous, as it increases blood pressure in the arteries.

Example.—Treatment in *aortic aneurysm.*

1. Half-lying Chest-lift-stroking or shaking (very light).
2. Half-lying Leg-kneading + General-nerve-pressures.
3. Half-lying Arm-kneading + General-nerve-pressures.
4. Arm-lean-sitting light Back-hacking or vibrations.
5. Half-lying Foot-rolling.
6. Half-lying Wrist-rolling + Passive Fore-arm-bending, -stretching.
7. Half-lying Chest-lift-stroking or shaking (light).

Varicose Veins (*Varix*).

Morbid Changes.—More or less marked dilatation of the veins, usually accompanied also by lengthening, so that their course becomes tortuous.

Often thrombosis occurs at the valves, in consequence of the slowing of the circulation caused by the dilatation. Varicose veins arise most commonly in the leg, particularly in the lower leg, because pressure on the veins is greatest there. When they appear in the veins of the rectum they are called "hæmorrhoids."

Causes.—1. *Prolonged standing and walking*, particularly standing. Sick-nurses, shop-assistants, bakers and waiters are on this account very liable to this complaint.

2. *Strong and prolonged physical exertion*, owing to the tendency to hold one's breath, which hinders the systemic circulation.

3. *Pressure on the veins* by garters, scars, tumours of the leg or in the pelvis, a gravid uterus, etc.

4. *Tightly-laced corsets and tight-fitting clothing*, as they hinder respiration, and consequently also circulation.

5. *Hereditary predisposition.*

Symptoms.—1. A feeling of tightness, and often pain, in the region of the dilated vessels.

2. Visible dilatation, and tortuous course of the veins.

3. *Swelling and œdema* of the feet and lower legs due to increased pressure in the capillaries and veins.

4. *Cellulitis* due to the impaired circulation.

5. *Tendency to ulcers of the leg* and difficulty in getting them to heal, also due to slowing of the circulation and the consequent deterioration of nutrition.

6. *Cramp in the calf of the leg*, especially in the case of intramuscular varix. In these cases the consistency of the muscles is of a doughy character.

7. *Sometimes marked, well-defined tenderness* due to inflammation (phlebitis) or to the formation of a thrombus.

Treatment.—1. *Effleurage.* Must be given with caution, and immediately interrupted if the patient has local tender-

ness anywhere, as this generally means that a thrombus is being formed.

2. *Vibration* has also been applied with a certain degree of success. It is thought that the effect is due to improved tone of the non-striated muscle-fibres of the vein walls.

3. *Movements to help the circulation* should also be given. Leg-rolling, Knee-pumping, easy active Foot and Leg movements and Breathing movements.

4. Elastic stockings or bandaging of the lower leg should also be advised.

Thrombosis of Veins.

Morbid Changes.—The obstruction of a vein by a deposit of fibrin on the inner surface of its wall, whereby the return of blood to the heart within the region of the obstructed vein becomes very considerably hampered, but still not entirely checked. Should complete blocking take place, then all circulation would cease also in the arteries, and gangrene would set in.

The reason why the circulation does not become completely checked is that those branches of the veins which entered into the thrombosed vein above and below the thrombus are connected with each other (anastomose), so that the blood can get past the thrombus by a circuit. This is called "collateral circulation." That such a condition may be brought about, the veins which have their orifices below the thrombus must be dilated, so that the valves do not close firmly and thus allow the blood to "regurgitate." This dilatation is brought about by the arteries continuing to supply blood, so that the pressure is strongly increased in the veins peripheral to the thrombus.

Causes.—1. *Inflammation in the wall of the veins, or its*

surrounding area. The wall of the vein which has undergone morbid changes acts as a foreign body on the blood, so that it coagulates, and deposits fibrin on the inner side of the affected vein.

2. *Slowing of the circulation* through—

(*a*) General debility, for instance, in severe illness, particularly in infectious diseases.

(*b*) Heart disease or weakness of the heart.

(*c*) Long confinement in bed, for instance, after severe operations, particularly in the abdominal cavity, probably because the diaphragmatic respiration in such cases becomes considerably weakened to avoid pressure on the abdominal cavity. The impaired respiration in its turn brings about a weakened circulation.

(*d*) Pressure on a vein, so that the circulation is impeded.

(*e*) Dilatation of veins (varices), so that their canals become dilated, and slowing of the circulation follows.

(*f*) Phlebitis. The wall of the vein becomes roughened by inflammation and so fibrin tends to be deposited.

In all these cases of slowed circulation in the veins, the valves remain half open, and a small quantity of blood remains stagnant in the valve pockets. This blood coagulates (possibly helped by the lowering of nutrition in the walls of the veins), and by a continual deposit of fibrin on the first formed thrombus it increases in size, reaches beyond the edge of the valve and gradually obstructs the vessel.

Symptoms.—Through the excess of blood and the pressure arising in the veins and capillaries situated peripherally to the thrombus:—

1. A sensation of tension in the tissues, also pain.
2. Dilatation of veins and capillaries.
3. Cyanosis.

4. Swelling and œdema.

5. Diminished or complete loss of power of motion.

6. Generally a tender cord-like swelling in the vein in the region of the thrombus can be felt.

Course and Result.—1. *Resolution, i.e.*, complete dissolution of the thrombus by the blood and the white corpuscles, whereby the circulation again becomes normal.

2. *Organisation and canalisation of the thrombus.*—From the walls of the veins endothelial cells and small arteries grow into the thrombus; white blood corpuscles migrate, multiply and deposit intercellular substance, so that the fibrin plug is gradually transformed into a connective tissue plug traversed by blood vessels. These dilate and open up at both ends of the thrombus directly into the veins, so that the plug thus becomes traversed by a canal system. The canals, *i.e.*, the vessels, become gradually dilated and allow the blood a passage through the thrombus, although certainly a somewhat obstructed one.

This result is what most frequently occurs, but it generally takes about two to three months' time before the organisation of a thrombus has so far progressed that it becomes firmly fixed to the wall.

Only after this time can one begin treatment by massage without danger of embolism.

3. *Liquefaction of the thrombus by suppuration* arises if the bacteria which gave rise to the inflammation causing the thrombus, or from any other source, have gained entrance to the thrombus. The liquefied parts of the thrombus are then diffused by the blood-stream, along with the bacteria, and cause suppuration in many parts of the body. This generally ends in death (pyæmia).

4. *Embolism, i.e.*, a portion of the thrombus becomes detached and is carried away in the blood-stream.

A free body accompanying the blood-stream is called an "*embolus*." It may either become fixed in the heart, and be the cause of death by hindering the heart's action, or else it may pass through the heart and reach the lungs, where sooner or later it sticks in some pulmonary artery. Thus, one of the larger or smaller arteries becomes obstructed, and nutrition is cut off from a larger or smaller area of the lungs; the power of resistance of the cells is considerably diminished, so that the bacteria which accompany the inhaled air get a chance to settle in the tissues and cause pulmonary inflammation.

Treatment.—*Must not begin before organisation is satisfactory, i.e.*, two or three months after the formation of the thrombus. It should only consist of light effleurage to promote the collateral circulation. *No friction must be given over the thrombus*, which must on the contrary be avoided. The affected parts of the body (usually the legs) should be carefully bandaged for several years.

Later on, one gives general movements helping the circulation.

Phlegmasia Alba Dolens or White Leg

is a term applied to swelling of the leg which comes on most commonly after a confinement. The limb is white, tense, shiny, hard and painful. The condition is due to thrombosis of one of the larger veins of the leg, or to blocking of lymphatics, or both.

Treatment.—As for thrombosis.

Œdema.

Œdema is a swelling which pits on pressure, due to the presence of fluid in the tissues, exuded from the blood vessels and lymphatics. It is commonest in the lower limb.

Causes.—1. Much standing combined with poor circulation from anæmia, etc.

2. Heart disease, weak heart, kidney disease.

3. Pressure on veins from constipation or other cause.

4. Varicose veins.

Treatment.—The position of the limb both at rest and during treatment is important. The limb should be raised and in an easy position. Massage, especially effleurage, is given cautiously as the skin is easily broken. Gentle kneading and passive movements are given.

Raynaud's Disease.

A functional disease of the vascular system.

Morbid Changes.—Spasmodic contraction of arterioles, lessening the circulation in the affected parts. The fingers are affected symmetrically, more rarely the toes.

Causes.—1. More frequent in women.

2. Age, fifteen to thirty.

3. Patients always of nervous type, sometimes also

4. Anæmic.

5. Exciting causes, chill and emotion.

Symptoms are of three degrees of severity.

First Degree.—Local syncope—one or more fingers white, cold, numb, insensible to touch. This lasts a few minutes or several hours. Recovery often painful.

Second Degree.—Local asphyxia—fingers livid or black. Pressure produces pallor, but lividity returns slowly. Adjoining parts often slightly swollen and mottled. Pain and anæsthesia. Recovery accompanied by tingling and pricking, colour changes to red, and gradually becomes natural.

Third Degree.—Symmetrical gangrene. This may begin

either with paleness or lividity. Fingers become black and insensible to touch. Blisters may form, which burst, leaving small ulcers. These heal quickly and lividity subsides. In other cases fingers or toes become black, shrivelled and gangrenous. Sloughing of skin or deeper tissues may take place. Pain is intense and paroxysmal. Pulse thin. Attacks at intervals of weeks or months.

Treatment.—Avoid exposure to cold and excitement. Treatment during attack, as for frostbite (see p. 27). Massage and general gymnastic treatment between the attacks to improve the circulation and strengthen the nervous system. Various forms of electrical treatment are efficacious.

Chapter IX

DISEASES OF THE RESPIRATORY ORGANS

Cold in the Head

(*Chronic Rinitis, Nasal Catarrh*).

Morbid Changes.—*In acute nasal catarrh* ordinary inflammatory changes arise in the mucous membrane of the nose, with swelling of the mucous membrane and *increased discharge of mucus, as well as degeneration and increased loss of epithelium.*

In chronic nasal catarrh similar changes arise, though less violent. In addition, there is usually thickening of the mucous membrane, partly due to increase of the connective tissue elements, partly also to hypertrophy of the glands and epithelium. This thickening of the mucosa may sometimes become specially pronounced in limited areas, so that tumour-like formations, so-called *polypi,* are formed. Prolonged catarrh may sometimes lead to atrophy and thinning of the mucous membrane.

Causes.—1. *Infection,* the way often being prepared by *chill,* whereby the resistive power of the cells is lessened. Also general weakness (anæmia) and hereditary predisposition may lower the power of resistance.

2. *Repeated irritation* of the mucous membrane by various kinds of dust, which accompany the inspired air and give rise to chronic inflammatory processes. Knife grinders and workers in potteries, also persons who must live in

dust-laden atmospheres, are particularly liable to this complaint.

Symptoms.—In *acute* nasal catarrh there arise :

1. *Pain and a sense of tightness* in the nose. Sneezing.

2. Through the swelling of the mucous membrane and the increased secretion of mucus the nasal passages become blocked, with consequent *lowering of the sense of smell and taste.*

3. *Distress, and increased difficulty in breathing* and dryness of the throat. As the patient cannot breathe through the nose, the inspired air is not sufficiently moistened.

4. *Tendency to bleeding from the nose,* owing to degeneration of the walls of the vessels.

5. *Deafness,* by the inflammation spreading to the mucous membrane of the Eustachian tube, which then becomes blocked. This causes the pressure on the two sides of the tympanum to become unequal and vibration is interfered with.

6. *Post-nasal catarrh* and secretion of mucus in the pharynx, by the inflammation extending to the mucous membrane of the pharynx.

7. *Various reflex neuroses,* such as migraine, vertigo, headache, asthma, etc.

In chronic rhinitis the symptoms are similar, but less severe.

Treatment.—*Acute nasal catarrh must not* be treated, as it may easily spread to the accessory cavities.

1. In treating *chronic nasal catarrh,* as in general in the treatment of chronic inflammation of the mucous membranes, one should first of all try *to lessen the congestion and promote circulation and nutrition,* in order to increase the resistive power of the cells and tissues, and to aid the

healing process. For this purpose movements which are depleting from the head are given, such as Head-rolling, Neck-raising, strong active leg movements, etc., also Neck massage.

2. By light vibrations directly on the mucous membrane, and by nose-root shaking, *a gentle mechanical stimulation of the cells is aimed at so as to increase their vitality and power of resistance.*

3. By local massage on the mucous membrane, especially by small frictions, one tries *to break up inflammatory products* and to excite and maintain a sufficiently strong healing reaction.

4. Finally, *general strengthening treatment may also be given*, especially if the patient is delicate and weak.

Nose Bleeding (*Epistaxis*).

Causes.—1. *Morbid changes in the mucous membrane* of the nose (catarrh, tumours, etc.).

2. *Morbid changes in the blood vessels*, so that they become brittle (*Hæmophilia, arterio-sclerosis, fatty degeneration* of the vessels due to anæmia, etc.).

3. *High blood pressure*, due to chronic inflammation of the kidneys, or in patients of plethoric habit. Congestion due to heart disease.

4. *Acute fevers*, such as typhoid and scarlet fever, etc., due to degeneration in the blood vessels, particularly in the walls of the capillaries often caused by bacterial poisons.

5. *Cessation of menstruation.* Vicarious bleeding.

Treatment.—This should be directed to the cause, rhinitis, heart disease, etc. Bleeding of the nose may be stopped temporarily if the patient is made to lie on his back with the head and upper part of the body raised, with

the arms in yard position and carried well back, so that the chest becomes widened as much as possible, without hindering respiration. Negative pressure in the thorax thus becomes increased, and the flow through the veins is facilitated, pressure is diminished, and the bleeding ceases.

Cold compresses on the nose are also effective, as cold produces contraction of the blood vessels.

Enlarged Tonsils and Adenoids

Enlargement of the tonsils and adenoids may occur separately, but generally together.

Morbid Changes.—The tonsils are hypertrophied and are sometimes septic.

Adenoids are overgrowth of the lymphoid tissue which is normally present at the back of the nose of all young animals. They may be felt by the finger as a soft pulpy mass.

Causes.—Childhood. Heredity. Bad hygienic conditions.

Symptoms.

1. Mouth breathing.
2. Snoring.
3. Vacant expression, partly due to disappearance of the naso-labial groove.
4. Tonsils large, as seen internally and felt externally.
5. Thin nasal discharge if adenoids are present.
6. Speech thick.
7. Frequent sore throats, colds in the head.
8. Nose either thin, pinched-looking from disease, or broad with thick mucous membrane.
9. Deafness is often present.

10. Sometimes diminution of taste and smell.

11. Chest deformity may arise from obstructed respiration.

12. Physical and mental development may be backward.

Treatment.—Good hygiene, food, tonics. The enlargement tends to become less as the patient gets older, but the condition may persist. General strengthening treatment with many breathing exercises may help and may prevent chest deformity arising. The gymnast must see that the patient breathes out as well as in.

Operation is often necessary. The condition is apt to recur unless operation is immediately followed by treatment with special reference to breathing.

Catarrh of the Larynx (*Laryngitis*).

Morbid Changes.—Acute or chronic inflammatory changes in the mucous membrane of the larynx, similar to those mentioned in rhinitis.

Causes.—1. *Chill*, which either directly produces irritation of the cells of the mucous membrane or else lowers their power of resistance so that the bacteria which accompany inspired air are able to settle and produce inflammation.

2. *Overstrain* of the vocal cords and their muscular apparatus. Of frequent occurrence, particularly among preachers, speakers, lecturers, etc.

3. *Irritation by dust in the inspired air.*

4. Irritation caused by alcohol and tobacco.

5. *Rhinitis, pharyngitis* and other *inflammations in neighbouring parts,* which extend to the mucous membrane of the larynx.

Symptoms.—1. Redness and swelling of the mucous membrane.

2. Hoarseness.

3. *Irritating cough*, but little expectoration (rather more in the morning).

4. *Irritation, a burning sensation, and tenderness of the larynx.*

In chronic laryngitis the symptoms are similar, but less severe.

Treatment of Chronic Laryngitis.—The same principles should be followed as in treatment of cold in the head.

Thus, one should help the circulation in the mucous membrane of the larynx by *massage of the throat*, and seek to break up inflammatory products by *vibrations* and *shakings of the larynx*, which also produces light mechanical stimulation of the cells, and thus increase the vitality of the cells and their power of resistance.

If the patient is delicate *general strengthening treatment* is also given.

Only chronic cases should be treated.

Chronic Bronchial Catarrh (*Bronchitis*).

Morbid Changes.—Inflammatory changes in the mucous membrane of the bronchial tubes, similar to those mentioned in connection with rhinitis and laryngitis.

Causes.—1. *Predisposition.*

2. *Chill.* Partly because cold has a directly irritating effect, partly because it lowers the power of resistance, which makes infection easier.

3. *Irritation by poisonous gases* or particles of dust in the inspired air.

4. *Disturbances in the pulmonary circulation*, due to diseases of the heart, lungs and kidneys, because the power

of resistance of the cells and tissues against infection is lowered.

5. Infection.

Symptoms.—1. *Shortness of breath*, due to partial blocking of the air passages caused by the swelling of the mucous membrane, and the coating of mucus on it.

2. *Cough*, generally with a fair amount of expectoration, tough and hard to begin with, then loose.

3. Wheezing, whistling sound if the phlegm is tough, bubbling if it is loose.

4. *General symptoms*, such as fatigue, perspiration, particularly at night, slight fever, constipation.

Treatment.—There can only be question of gymnastic treatment *in chronic cases*, but in such cases very good results have been obtained. On the whole, one follows the same principles as in the treatment of nasal catarrh, and catarrh of the mucous membrane of the larynx.

Thus one tries—

1. *To aid the pulmonary circulation*, so as to improve the nutrition of the lung tissue. This is carried out by inspiratory and expiratory movements.

2. *To increase the vitality and resistive power of the cells* by Chest-clapping, Screw-twisting, Vibrations, etc., all of which when they are used for the above-mentioned purpose should be given lightly and with small movements.

3. *To break up inflammatory products, and help expectoration of phlegm.* For this, the same movements and manipulations are used as in the previous group, but are given more strongly.

4. We should also try *to promote action of the bowels*, because loading of the intestines hampers respiration, and impedes the portal circulation.

5. *General strengthening treatment* is also given.

Example.—1. Sitting Chest-lifting in different planes.

2. Half-lying Foot-rolling, -bending, -stretching.

3. Stretch-half-lying 2-Arm-bending, -stretching.

4. High-ride-sitting Circle-turning.

5. Heave-grasp-standing Chest-clapping.

6. Hips-firm-high-ride-sitting Plane-twisting.

7. Crook-half-lying Abdominal-kneading.

8. Reach-grasp-stoop-stride sitting Back-raising in different planes.

9. Heave-grasp-standing Side-chest-shaking.

10. Half-lying Leg-rolling + Leg-out-stretching.

11. Yard-walk-standing Plane Arm-carrying.

12. Stretch-grasp-standing Forward-drawing.

If the patient is delicate, Active Arm and Leg movements are replaced by Arm and Leg kneading. The other active movements are omitted to begin with, or are given with slight resistance. Chest massage is useful including massage of respiratory muscles and effleurage to promote the respiratory reflex.

Whooping-Cough (*Pertussis*).

Whooping-cough is an infectious disease, caused by bacteria. These bacteria settle in the mucous membrane of the air-passages and cause inflammation, which to begin with is exactly like an ordinary bronchitis, but which, after about ten days, differs from it by the characteristic *violent attacks of coughing accompanied by so-called "whoops."* The attack consists of a series of short spasmodic coughs, followed by a long-drawn inspiration with partially closed glottis producing the "whooping" sound. The child is often sick after the attack.

Treatment.—So long as the fever and the acute stage of

the disease lasts, no gymnastic treatment is given. But later on, when the disease has entered a more chronic stage, such treatment has proved effective in shortening the course of the disease and in lessening the cough, which is apt to persist for a long time. It is given *on the same principles as for chronic bronchitis.*

Since the disease, as already mentioned, is very infectious —the expectoration is very liable to spread infection— great care should be taken when treating a patient that the gymnast does not further spread the disease. For this reason he should have a special coat to work in, or an overall, which completely covers his other clothes. It is obvious that he should not immediately visit any other patient, and that his hands should be carefully washed after treating the patient.

Of late, however, doubt has been expressed in many quarters as to the correctness of the older views held concerning the danger of infection of whoop-cough during the later stages, which are said to be almost harmless in this respect, whereas it is more and more emphasised, that *the first stage,* before the "whooping" has begun, *is the most infectious stage.* The illness lasts from six weeks to three months.

Emphysema.

Morbid Changes.—1. *The elasticity of the lung tissue is diminished.* For this reason expiration becomes less complete than under normal conditions, whereas inspiration, owing to the accompanying distress in breathing, becomes more and more deep.

2. *The air-cells thus become gradually dilated to a considerable extent,* and the capillaries in their walls are stretched so much that their lumen becomes diminished.

3. The nutrition of the lung tissues therefore deteriorates to such a degree that the alveolar walls become atrophied, and gradually obliterated to a great extent. The so-called respiratory surface in the lungs, the surface where the blood comes in contact with the air, is consequently diminished.

4. This leads to a lessened exchange of gases, so that there arises a lack of oxygen and an excess of carbonic gas in the blood.

Causes.—1. *Old age,* by the consequent weakening of all tissues, and therefore also of the lung tissue.

2. *Hereditary weakness* of the lung tissues.

3. *Abnormally frequent, and abnormally great distension of the walls of the air-cells,* by increased pressure in the bronchial tubes and air-cells. This occurs in certain occupations, for instance, in heavy labour, glass-blowing, playing wind instruments, sport, and physical strain of all kinds.

4. *Other lung diseases,* partly because they weaken the lung tissues, partly because they are accompanied by cough, which increases the pressure inside the air-cells, and causes distension of the walls.

Symptoms.—1. *Difficulty in breathing and cyanosis* from the lack of oxygen and excess of carbonic acid gas in the blood.

2. *Great distension of the thorax* and enlargement of the lungs (inflation). This is due to the diminished elasticity of the lungs, so that expiration becomes incomplete, whereas the difficulty of breathing induces the patient to make still stronger inspirations.

3. *Difficulty in the circulation* both in the pulmonary and systemic circulation, with all the accompanying disturbances of circulation and nutrition, etc., which are mentioned under diseases of the heart. In the pulmonary circulation, the difficulty of the circulation is caused by the destruction of

a great number of capillary vessels, so that the stream is narrowed. In the systemic circulation disturbances arise, because the negative pressure within the thorax is lessened owing to the lessened elasticity of the lungs.

4. Disturbances of the circulation arise also in the *portal system*, so that the liver becomes enlarged (through stagnation in the veins).

5. Even if the emphysema is not caused by any lung disease, it generally leads to bronchitis, which further aggravates the disease owing to the strain of coughing.

Treatment.—As patients who have emphysema in most cases suffer from bronchitis, their treatment must also be *similar to the treatment given in chronic bronchitis.* Owing to the special changes and symptoms which characterise emphysema, however, the following conditions should receive special attention :—

1. So as to improve, as far as possible, the condition of nutrition, and thereby counteract the slackness of the lung tissue, *movements should be given which promote the pulmonary circulation, i.e.*, respiratory movements which encourage both inspiration and expiration.

2. As expiration is weakened, one should aim at giving passive movements which promote expiration in particular, for instance, Chest-lift-shaking, Chest-lift-stroking, Heave-grasp-standing Forward-drawing, etc., as well as *active efforts to make deep expirations.*

3. *As dyspnœa is the symptom from which the patient suffers most, we should try to promote exchange of gases in the lungs* by strong Chest-clapping, Chest-lift-shaking, Side-Chest-shaking and Screw-twisting, etc., which movements and manipulations also help to loosen the phlegm in the bronchial tubes and to promote expectoration.

4. We may also try, as far as possible, by suitably adapted

mechanical *stimulation to act upon the cells and tissues of the lung.* For this purpose we make use of vibrations over the chest in the region of the lung and of the manipulations mentioned in the previous section as Chest-clapping, etc., which should, however, in such a case be modified, both in regard to the size of the movement, and in regard to the strength with which they are carried out.

5. As the general circulation is likewise interfered with, *movements promoting the circulation* should also form part of the treatment.

6. To prevent accumulation of the intestinal contents which would hamper breathing, *movements and manipulations should be given to promote peristalsis.*

7. Finally the movements and manipulations should be amplified and arranged so that the patient receives a *general strengthening treatment.*

Example.—Treatment for emphysema :—

1. Half-lying Chest-lift-shaking.

2. Half-lying Lower-leg-kneading or Foot-rolling, -bending, -stretching.

3. Sitting Fore-arm bending, -stretching.

4. Hips-firm-high-ride-sitting Screw-twisting.

5. Hips-firm-close-sitting Alternate-turning.

6. Heave-grasp-standing Chest-clapping.

7. Hips-firm-stoop-stride-sitting Back-raising.

8. Heave-grasp-standing Side-Chest-shaking.

9. Crook-half-lying Abdominal-kneading.

10. Yard-sitting-Arm-rotation-with-rod (light resistance) or Arm-kneading.

11. Half-lying Leg-parting, -closing.

12. Half-lying Chest-lift-shaking.

If the patient is weak, all active movements should be omitted, or given passively.

Asthma.

Morbid Changes.—In genuine asthma we know of no definite morbid changes. The disease is thus, properly speaking, a neurosis. *It is characterised by violent attacks of distressed breathing (dyspnœa), between which attacks the patient is generally quite well.*

The distress in breathing depends in most cases on a *nervous cramp in the non-striated muscles of the smallest bronchioles,* whereby both the entrance of air into the alveoli and its output are rendered difficult, the latter even in a higher degree than the former. Thus both inspiration and expiration are rendered difficult, but particularly expiration.

Most patients with "asthma" who come for gymnastic treatment suffer from chronic bronchitis, and when this for one reason or another (for instance, "a chill") accidentally spreads to the finer bronchial tubes, attacks of dyspnœa often arise similar to those caused by asthma, because the inflammatory swelling of the mucous membrane, in conjunction with deposits of mucus on its surface, renders the entry of air into the alveoli difficult.

Causes.—1. *Hereditary predisposition.*

2. *Reflex* from morbid changes in the mucous membrane of the nose. Usually in the upper nasal passages.

3. So-called *idiosyncrasies, i.e.,* morbid sensitiveness to certain irritations, for instance, the odour of certain flowers or animals may produce asthmatic attacks, also certain articles of food.

4. A characteristic form of such idiosyncrasy is the so-called *hay-asthma,* which appears in certain persons when they get into the neighbourhood of new-mown hay. It is either caused by a special kind of bacteria—the hay-bacillus

—or by pollen which acts as a strong irritant on the mucous membrane of the nose and bronchial tubes.

5. *Chronic bronchitis*, as already mentioned.

Symptoms.—1. The attack is usually preceded by certain *premonitory symptoms* (prodromata), such as a cold in the head and sneezing, nervous yawning, unpleasant sensation in the larynx or in the epigastrium.

2. *The attack itself consists of dyspnœa combined with anxiety, a feeling of oppression, cyanosis and cold perspiration.*

The patient raises himself, supporting himself with his hands against a table or something similar, so that the muscles of the shoulders may help in breathing.

3. During the attack *whistling sounds are heard in the bronchial tubes*, due to the air passing through the narrowed tubes.

4. *Over-expansion of the lungs* is produced because there is more difficulty in expelling the air from the alveoli than in drawing it in.

5. Patients with chronic bronchitis often have a whistling, wheezing sound in the chest between the attacks.

The attack may last from a few minutes to some hours, and sometimes comes very frequently, at other times after long intervals.

Prognosis.—Often bad.

Treatment.—1. *Morbid changes in the nose should be treated by a specialist.*

Massage of the mucous membrane may be tried also. Vibrations and Nose-root-shaking. Special attention should be paid to the upper nasal passages.

2. Treatment similar to that of chronic bronchitis.

3. During the attack itself in some cases the dyspnœa may be eased by Chest-clapping, and by *movements which help expiration.*

Inflammation of the Lungs (*Pneumonia*)

Morbid Changes.—An acute inflammation caused by bacteria with consequent changes in the lung tissues, *i.e.*, in the walls of the alveoli. A fibrinous exudation from the blood vessels together with migrated white and red blood corpuscles fills the alveoli, making any exchange of gases impossible. The larger the area of lung attacked, the more dangerous is the disease.

Causes.—1. *Bacteria* of two or three varieties.

2. *Chill*, or other cause, which lowers power of resistance in the lung tissue.

Symptoms.—1. Usually the disease begins with *one violent attack of shivering* (" a rigor ").

2. " *Stitch* " *in the side or back.*

3. *High fever*, headache and other symptoms of an infective disease.

4. Rapid, panting respiration.

5. *Rust-coloured or blood-stained* dry expectoration.

6. A so-called " crisis " usually takes place about the seventh or eighth day of the disease. After a short, sharp rise of temperature to 104 degrees, or even 106 degrees, there is a sudden fall down to or below normal. This is accompanied by profuse perspiration. After this the patient becomes peaceful and usually falls into a natural sleep.

The crisis is caused by antidotes to the bacterial poison having been manufactured in the body.

The expectoration now becomes looser, the other products of inflammation break up and are absorbed and the patient gradually recovers. If a crisis does not take place death will probably supervene.

Note.—In some exceptional cases the " crisis " does not

take place, but the disease is protracted and recovery slow, the inflammatory changes in the lung tissue very slowly returning to normal conditions. It is *in such cases more especially that gymnastic treatment is advisable.*

Treatment.—Gymnastic treatment *must not begin before the fever has gone, or at least is low,* 98·6 to 100 degrees. It must, to begin with, be very gentle, and must principally aim at *increasing the patient's strength, which has been much lowered by the illness,* and thus also lessen the danger of subsequent tuberculosis. For this purpose one gives :—

1. *General strengthening treatment,* in the main similar to the example given in connection with anæmia (p. 99). In this treatment, however, the following conditions should receive special attention.

(*a*) We must try to *improve the circulation and nutrition of the lungs* in order to facilitate the resolution of inflammatory products, and promote the healing process as a whole. This is brought about by respiratory movements, both active and passive, which promote inspiration and expiration.

(*b*) We should also try to *increase the patient's breathing power, and thereby promote the entry of air into the alveoli,* which are *obstructed by mucus and other inflammatory products.* For this purpose respiratory movements should be given, *passive* as well as *active.*

(*c*) Finally, we *should promote, as far as possible, the loosening and expectoration of mucus and other inflammatory products.*

This can be effected, as in bronchitis, by movements and manipulations which produce vibration all through the thorax—for instance, Chest-clapping, Screw-twisting, etc.

Treatment as a whole is given on the same principles as in bronchitis.

Example.—After-treatment of *pneumonia*, the patient still being very weak :—

1. Lying or half-lying Chest-lift-stroking.
2. Lying or half-lying Leg-kneading + General Nerve pressures.
3. Lying or half-lying Arm-kneading + General Nerve pressures.
4. Lying or Half-lying Chest-lift-shaking.
5. Crook half-lying Abdominal-kneading.
6. Sitting Back-hacking and vibrations over the chest.
7. Half-lying Foot-rolling, -bending, -stretching.
8. Half-lying Wrist-rolling, -bending, -stretching + Fore-arm-bending, -stretching.
9. Half-lying Chest-lifting and -shaking.

Pleurisy.

Morbid changes.—Inflammation in the pleura with changes similar to those described under pericarditis. Exudation into the pleural cavity, deposit of fibrin on the lungs and the internal surface of the pleura, adhesions becoming more and more dense between the lung and the chest wall due to the organisation of the fibrin.

These adhesions hamper respiration, as they prevent full expansion of the lung against the chest wall. *If there has been a thick deposit of fibrin*, and therefore a considerable amount of connective tissue, this may produce, by its subsequent *shrinking, contraction* of one side of the chest with resulting *scoliosis*.

When pus is formed in the pleural cavity the condition is known as empyema. In order to evacuate the pus a portion of rib is usually removed (resected). This condi-

tion is frequently followed by rapid sinking in of the chest wall and consequent scoliosis.

Causes.—1. *The same bacteria as cause acute rheumatism* pericarditis and other inflammations of serous membranes.

2. *Tubercle bacilli.* Phthisis of the lung often develops after pleurisy.

3. *Inflammation in neighbouring organs*, spreading to the pleura, as pneumonia, pericarditis, inflammation in the spine, ribs, lymphatic glands, etc.

Symptoms.—1. Begins slowly and insidiously, often with *several mild shivering attacks.* (Pneumonia begins with one violent attack of shivering.)

2. *General symptoms of an infectious disease*, fatigue, discomfort, feeling of illness, loss of appetite, headache, etc., low fever.

3. *Pain in the side*, tenderness and cough, but no expectoration.

4. *Shortness of breath*, owing to pain on deep inspiration. The patient therefore takes short, quick breaths.

No gymnastic treatment helps. After-results of pleurisy are :—

(*a*) *General weakness.*

(*b*) *Limited movement* on the affected side of the chest.

(*c*) *Incomplete respiration*, partly due to adhesions between the lung and the chest wall, partly due to compression of the lung by the exuded fluid.

(*d*) In severe cases, and especially in cases of empyema, *scoliosis* may arise, due to contraction of the connective tissue formed by organisation of the fibrinous deposit, and to sinking in of the chest wall.

Treatment.—No gymnastic treatment can be given before the acute stage of the illness is over and the fever gone or very low, so that the patient is quite convalescent.

When the patient has reached this stage, and gymnastic treatment is to begin, the first aim is to *restore the patient's general health.* For this purpose, *general strengthening treatment* is given, as in the after-treatment of pneumonia, but with this difference, that care and attention must be directed to *preventing* adhesions being formed, if possible, between the lung and the chest wall, and to *preventing their becoming too firm and tight* by giving cautious stretching if they have already been formed.

This is best done by passive respiratory movements, which, however, must be given very cautiously at first, since experience shows that recurrence *of the illness may easily be caused by giving too strong stretching.* Stretching must never be forced.

When the patient is somewhat stronger, the strength of the movements is gradually increased, so that the stretching of the adhesions is greater. For this purpose *special stretching movements* are now included in the treatment, as Circle-turning, Side-chest-shaking, Screw-twisting (in High-ride-sitting position), Side-flexions, Stretch-grasp-side-arch-standing, Side-chest-clapping, etc.

As convalescence advances and the patient's strength increases the above-mentioned sequelæ of the disease have to be guarded against more and more, namely, *limitation of chest movement, hampered respiration* and, finally, the *onset of scoliosis.*

To increase the mobility of the chest walls, *Circle-turning* or *Trunk-rolling* is given, also *active Trunk movements* round the sagittal as well as round the frontal and vertical axes, as *Side-bendings, Deep forward-downward-bendings, Trunk-rotations* of various kinds, etc.

To exercise the hampered respiration and increase its power, *passive and active respiratory movements are taken*

more strongly, as *Chest-lifting* in different planes, Chest expansions, Standing 2 Arm-lifting-forward-upward-outward-downward, etc., and Free-standing Side-bendings, the patient breathing out while bending towards the damaged side, breathing in while bending towards the healthy side.

If the above exercises are put in order of progression in regard to the stretching which they produce, one gets, approximately, the following series. Each individual movement, of course, can be given in a graduated way: Chest-lift-stroking; Chest-lift-shaking; Chest-lifting; Circle-turning; Trunk-rolling; Side-chest-shaking; Screw-twisting; Chest-expansion; Stretch-grasp-side-arch-standing Chest-clapping.

If in spite of the above treatment scoliosis threatens to develop, or has already developed, before the patient has begun treatment, the necessary treatment for scoliosis must, of course, be given.

Example.—I. After-treatment for *pleurisy*. The patient has sufficiently recovered to get up.

1. Sitting Chest-lifting.
2. Half-lying Leg-kneading.
3. Stretch-sitting 2-Arm-bending-stretching.
4. Half-lying Foot-rolling + -bending-stretching.
5. High-ride-sitting Circle-turning + Chest-lifting.
6. Hips-firm-close-sitting Alternate-turning.
7. Crook-half-lying Abdominal kneading.
8. Neck-firm hip-lean-walk-standing Side-bending.
9. Hips-firm-stoop-stride-sitting Back-raising.
10. Half-lying Arm-kneading.
11. Half-lying Leg-rolling + outstretching.
12. Heave-grasp-standing Chest-clapping.

Between Movements.—Sitting Chest-lifting; Standing 2-Arm-lifting-outward-upward-outward-downward.

II. After-treatment for *pleurisy*. Patient quite strong, able to go out, but respiration imperfect.

1. Sitting Chest-lifting in different planes.
2. Reach-grasp-standing Heel-raising Knee-bending.
3. Fall-standing Plane-arm-carrying.
4. High-ride-sitting Screw-twisting.
5. Half-wing-half-stretch-high-ride-sitting. Plane-twisting.
6. Reach-grasp-stoop-stride-sitting Back-raising in different planes.
7. Hips-firm-stride-standing Trunk-rolling (active).
8. Stretch-grasp-side-arch-standing Chest-clapping.
9. Half-lying Leg-parting-and-closing.
10. Yard-sitting 2-Arm-lifting-upward.
11. Stretch-grasp-standing Forward-drawing.

Between Movements.—Standing Alternate-side-bending (breathing in while bending from the affected side, breathing out while bending to the affected side). Standing 2-Arm-lifting-outward-upward-outward-downward.

Phthisis or Tuberculosis of the Lungs.

Morbid Changes.—Chronic inflammation caused by the tubercle bacillus in the mucous membrane of the bronchial tubes and in the lung tissues, *i.e.*, in the walls of the air-cells with their capillaries and connective tissue. The disease is divided into three stages: 1, the stage of deposit; 2, the stage of consolidation; 3, the stage of excavation.

1. *In the mucous membrane of the bronchial tubes* the changes are similar to those described under bronchitis, *i.e.*, the usual inflammatory changes with thickening of the mucous membrane, increased secretion of mucus and increased shedding of epithelium.

2. *In the lung tissues*, owing to the chronic inflammation and consequent multiplication of cells, *thickening of the walls of the air-cells takes place*, so that the air-cells contain less air. The walls of the blood vessels also become thicker, and therefore narrower. This is called *consolidation of the lung*.

During the first and second stage the patient may completely recover if he comes under good hygienic conditions. In this case the body is frequently able to overcome the bacteria, which are killed by the white corpuscles and by the antitoxins manufactured by the body, while the consolidated lung tissue becomes replaced by connective tissue, which remains as a reminder of the disease.

If the bacteria are not overcome the disease progresses and the inflammatory changes also. The blood vessels gradually become blocked in the oldest parts of the focus of disease, so that the nutrition of the lung tissue is here cut off, the tissue dies and becomes disintegrated or dissolved, partly by the action of the tubercle bacilli, partly by the action of other bacteria introduced with the inspired air. In this way *a cavity is formed* in the middle of the focus of disease, the consolidation of lung tissue goes on round its periphery, while the central parts are dissolved and the cavity enlarges. *In this stage of the disease hæmorrhages often take place*, due to larger blood vessels passing through the diseased area being affected by the process of disintegration, so that their walls break down during an attack of coughing or any strain. Hæmorrhage would take place more frequently were it not that the vessels often become blocked by thrombosis before the walls break. Even in this *stage of the disease* recovery may take place if the strength of the body can be maintained sufficiently for it to overcome the bacteria. In this case

the consolidated lung tissue around the cavity is gradually replaced by firm connective tissue, which shuts off the cavity from the healthy tissue. The contents of the cavity gradually dry up and become chalky. In such cases, however, there is always a danger of recurrence, since living bacteria are generally present in the closed cavity. If they are set free at any time the disease is liable to be lit up anew.

If, on the contrary, the bacteria are not overcome, the induration of the lung tissue goes on with simultaneous disintegration of tissue, so that, finally, so much of the lung is destroyed that life cannot go on.

Causes.—*Tubercle bacilli*, which generally gain entrance to the body with the inspired air. (See Tuberculosis of Glands, p. 110.) They are derived from *phthisical expectoration*, which has become dry and is blown about as dust in the air. But in order to produce the disease, *either the bacteria must be particularly strong* or the *resistance of the body must be lowered*. This lowering may be caused by :—

(*a*) *Heredity*, inherited low resistance to tubercle.

(*b*) *Bad hygienic conditions.*

(*c*) *Diseases which weaken the lung tissue*, as measles, whooping cough, pneumonia and other forms of lung disease.

(*d*) *General weakness* and lowering of health by sorrow, anxiety, and over-work.

(*e*) Narrow chest, long, small and flat or compressed, with projecting shoulder-blades. Movement is very slight in the upper part of such a chest, circulation and nutrition of the lung become lowered along with its power of resistance. Tuberculosis frequently begins in the upper parts of the lungs.

Symptoms.—1. *Obstinate dry cough*, worse in the spring and autumn, and caused by catarrh of the bronchial

mucous membrane. In the early stages it is associated with slight expectoration, later with copious expectoration, in which small white clumps are present which contain colonies of bacilli.

2. *Bad appetite*, obvious and *rapid loss of weight* (an important symptom), *general loss of strength*, so that the patient easily becomes tired and *short of breath*, but *not depressed in spirits* (unlike patients suffering from abdominal symptoms).

3. *Hectic fever*, the temperature rises in the evening; at the same time a sharply limited patch of bright redness appears on each cheek. At night the temperature falls to normal, generally with copious perspiration.

4. *Hæmoptysis* or coughing of blood. The blood is bright red and frothy.

Children who are affected by tuberculosis are generally precocious, with fair, transparent skin and exceptionally clear eyes.

Treatment.—1. *Preventive.* With patients who are predisposed by heredity, narrowness of chest, or preceding illness, one should try *to prevent the disease arising, by bringing the patient under as good hygienic conditions as possible.* In particular, they should have as much fresh air as possible. Out-door life, sleep before an open window, etc., but chills should be avoided. They should also have good, nourishing and sufficient food, so that they become fat. Rest from work is also part of the treatment.

Gymnastic treatment is given with advantage. This consists of "*General strengthening treatment,*" which includes passive and active respiratory movements to *develop the organs of respiration, i.e.*, expand the chest and make it more movable, and strengthen the respiratory muscles. Circulation and nutrition in the lungs as well as in the

body as a whole are thus improved, and the power of resistance increased.

2. *If the disease has already affected the lungs,* there is no question of gymnastic treatment.

3. If hæmorrhage has occurred a considerable time ago (several years), and if there is reason to believe that the disease has been shut in by formation of connective tissue, or has entirely disappeared, one must be very careful in giving exercises which have a direct effect on the chest, because these may possibly produce tearing of the enclosing connective tissue and so cause recurrence.

Note.—These points must be kept in mind if a patient who has had tuberculosis needs gymnastic treatment for any other disease, *e.g.*, heart disease.

Example.—Preventive treatment for a patient who has a narrow chest and a hereditary tendency to consumption. The patient is not weak.

1. Stretch-grasp-standing Chest expansion.
2. Stretch or Neck-firm-standing Heel-raising Knee-bending.
3. Yard-walk-standing Plane-arm-carrying (gently).
4. High-ride-sitting Circle-turning + Chest-lifting.
5. Hips-firm-close-sitting Alternate-turning.
6. Stretch-grasp-standing Forward-drawing.
7. Hips-firm-stoop-stride-sitting Back-raising with pressure between the shoulders.
8. Stretch-stride-standing Alternate-side-bending.
9. Stretch-sitting 2-Arm-bending-stretching.
10. Half-lying leg-parting-and-closing.
11. Stretch-grasp-standing Forward-drawing.

Between Movements.—Standing 2-Arm-lifting-outward-upward-outward-downward.

Chapter X

DISEASES OF THE DIGESTIVE ORGANS

Chronic Pharyngitis.

Morbid Changes.—The changes usual in chronic inflammation of a mucous membrane, *i.e.*, *thickening of the mucous membrane* uniformly or in the form of small granules. These consist of lymphoid tissue, which becomes increased by chronic inflammation. This lymphoid tissue, which resembles the substance of the lymphatic glands, is also increased in the tonsils, which lie between the arches of the fauces, and in the posterior part of the pharynx, the pharyngeal tonsil, and all of these are, as a rule, more or less swollen in pharyngitis. The mucous membrane is also covered with tenacious mucus.

Causes.—1. *Recurrent acute attacks*, frequently due to bacteria.

2. *Chronic irritation* by smoking, abuse of alcohol, dust-laden air, or by excessive use of the voice.

3. *Nasal catarrh or laryngitis* spreading to the pharynx.

4. Heart disease and Emphysema, by causing disturbance of the circulation, especially venous hyperæmia, which lowers the power of resistance and increases irritability of mucous membranes.

Symptoms.—1. *Redness of the mucous membrane* and visible swelling of the tonsils or granules in the mucous membrane of the pharynx.

2. *Dryness of the pharynx.*

3. *Coating of tenacious mucus* on the mucous membrane, especially troublesome in the morning in "clearing the throat."

4. *So-called "stomach-cough,"* or cough without expectoration, due to irritation of the larynx by mucous from the pharynx gaining entrance to it, its irritability being much greater than that of the pharynx. The inflammation may spread to the mucous membrane of the larynx and cause hoarseness.

5. *Obstruction of the back of the throat* by swelling and thickening of the mucous membrane, and especially of the pharyngeal tonsil, causing general troublesome symptoms, as—

(*a*) Blocking of the nose and consequent breathlessness.

(*b*) Deafness, by blocking of the Eustachian tube.

(*c*) Feeling of weight in the head.

(*d*) In children *lowering of intelligence* and slow development, probably the result of deafness.

Treatment.—One should try to *improve the circulation, break up inflammatory products and increase the vitality of the cells.* This may be done by effleurage of the front of the neck, local treatment of the mucous membrane by direct massage and vibrations, and by pharynx-shaking.

Movements depleting from the head.

Chronic Gastric Catarrh. Chronic Gastritis.

Morbid Changes.—The usual changes present in inflammation of the mucous membrane. But since the inflammation affects also the glands of gastric secretion and deranges their action, changes are also found *in the secretion of gastric juices.* These changes consist of diminution in quantity and changes in composition, the amount of hydrochloric

acid especially being diminished. There is also increased secretion of mucus. If the disease is of long standing, *thickening of the mucous membrane takes place*, as in other forms of catarrh, and in certain cases *atrophy*, especially of the glands.

Causes.—1. Predisposition, either congenital, or caused by general weakness and anæmia, or by some preceding illness, *e.g.*, an acute infectious illness.

2. *Repeated irritation of the gastric mucous membrane by errors of diet.* By this is meant :—

(*a*) The consumption of *substances which have an irritating effect on the gastric mucous membrane, e.g.*, alcohol, strong condiments, very acid or salt foods, etc.

(*b*) *Indigestible foods*, especially foods which remain for a long time in the stomach ; foods rich in cellulose (woody fibre), as root vegetables, peas, beans. These are with difficulty affected by the digestive juices ; also fats.

(*c*) *Too hot food.*

(*d*) *Too much food.*

(*e*) *Insufficient mastication.*

(*f*) *Irregular meal-times*, which lead to eating too much, too quickly, and to insufficient mastication.

3. *Diseases which cause disturbance of the portal circulation*, especially heart, lung, liver and kidney diseases, are often accompanied by gastric catarrh. Slowing of the portal circulation always produces congestion of the gastric mucous membrane, so that its nutrition and resistive power are lowered.

Symptoms. — Symptoms arise due to inflammatory irritation of the mucous membrane, and due to the disturbance of digestion caused by the changes in the composition of the gastric juice. Of these symptoms the *abnormal fermentation processes* mentioned below are of

special importance, since they lead to troublesome formation of gases, and give rise to poisonous substances which in turn produce general symptoms of poisoning and increase the catarrh by further irritation of the mucous membrane. In this way a " vicious circle " arises, the increased catarrh produces further changes in the gastric juice, which in turn increase the fermentation processes and so on, so that the trouble goes on increasing unless energetic rational treatment intervenes.

The most important symptoms are :—

1. So-called *dyspeptic symptoms*, loss of appetite, craving for strong spiced foods, lassitude, oppression or pains in the epigastrium, discomfort after food, flatulence, heartburn, parched throat, vomiting, nausea.

2. Furred tongue and bad taste in the mouth.

3. Lowering of general nutrition, although less marked than in catarrh of the bowels.

4. Constipation.

5. Depression.

6. *Various changes in the gastric juice*, especially diminution of the hydrochloric acid.

7. *Diminished gastric peristalsis*, partly due to inflammation and the increased pouring out of fluid, which hinders muscle activity, partly due to diminution of hydrochloric acid. *This causes the food to remain too long in the stomach*, so that fermentation and decomposition take place. More irritating substances are thus produced. Fermentation is encouraged by the diminution of hydrochloric acid and consequent incomplete disinfection of the contents of the stomach.

Treatment.—1. *Avoidance of irritating and harmful foods*, especially salted, acid and smoked food, alcohol, etc. The patient should *eat little and often*, and choose such food as

can quickly leave the stomach, and should chew it well. Liquid food is preferable at first.

The following is a list of easily digested foodstuffs :—

Milk (preferably raw, if one is certain that it is clean), gruel, porridge, egg (lightly cooked or raw), omelettes, soup (preferably chicken or veal), meat extract and meat juice, calves' brains, calves' sweetbread, poultry and game, raw meat or lean bacon, boiled fish, veal, roast beef, rusks.

2. *Medical gymnastic treatment* should be arranged in the form of "*General strengthening treatment*," in which the following special movements should be included.

(*a*) *Movements and manipulations which help the portal circulation* in order to improve the circulation and nutrition of the gastric mucous membrane, and so bring about its recovery. Circle turning, etc.

(*b*) *Movements and manipulations which help the breaking up of the inflammatory products* in the mucous membrane : Abdominal kneading ; Stomach-shaking ; Stomach-pit-shaking.

(*c*) *Manipulations which may have a stimulating effect on the gland cells and increase their vitality*, so that secretion of gastric juice is promoted. For this purpose the manipulations mentioned under (*b*) are used, but so modified as to the size and strength of the movement that they are more like vibration or tremble-shaking.

(*d*) *Movements which have a depleting effect* on the abdominal organs, as Heave-stoop-stride-sitting Alternate-turning ; Yard-stoop-stride-sitting Plane-arm-carrying, etc.

(*e*) *Movements and manipulations which promote action of the bowels :* Abdominal kneading, Leg-rolling with upward swinging of the knee, Sacral-beating, active abdominal movements, etc. (See "Chronic Constipation," p. 252.)

Example.—Treatment for *chronic gastric catarrh*, patient not weak.

1. Yard-sitting 2-Arm-rolling (resp.).
2. Half-lying Leg-kneading.
3. Stretch-stoop-stride-sitting 2-Arm-bending, -stretching.
4. Half-lying Foot-rolling, + -bending, -stretching.
5. High-ride-sitting Circle-turning.
6. Heave-stoop-stride-sitting Alternate-turning.
7. Crook-half-lying Abdominal-kneading + Stomach-pit-shaking and Stomach-shaking.
8. Hips-firm-stoop-stride-sitting Back-raising.
9. Arm-lean-standing Back-hacking + Sacral beating.
10. Half-lying Leg-rolling with upward-swinging of the knee + Leg-outstretching.
11. Sitting Fore-arm-bending, -stretching.
12. Sitting Chest-lifting.

Nervous Dyspepsia.

Morbid Changes.—None known. The gastric juice is of normal composition, and digests food normally, but nevertheless the patient has symptoms like those of chronic gastric catarrh.

Causes.—1. General nervousness, hysteria, neurasthenia and their causes, especially overstrain, worry or chronic emotions.

Symptoms.—1. The ordinary dyspeptic symptoms usually associated with chronic catarrh of the stomach. Also bad temper.

2. *Characterised by variations in the severity of the symptoms.* If the patient is worried he will be uncomfortable after a

plate of soup; if he is in a good mood he can stand a feast without inconvenience.

3. The patient is anxious and *thinks every kind of food unsuitable.* He therefore fasts and becomes thin.

4. Generally constipation, due to abuse of aperients.

5. Frequently other hysterical and neurasthenic symptoms, as depression, fatigue, slackness, restlessness, etc.

Treatment.—1. The patient should be cheered and encouraged *to eat properly*, and to take all kinds of food.

2. Gymnastic treatment consists of :—

(*a*) *General strengthening treatment.*

(*b*) Special movements, as *Stomach-shaking* and *Stomach-pit-shaking*, are given, as well as Abdominal kneading in the same way as for chronic gastric catarrh.

3. Otherwise the treatment must be adapted to the hysterical or neurasthenic condition which may be present.

Atony and Dilatation of the Stomach.

Morbid Changes.—Atony of the stomach means diminished elasticity and loss of strength in the non-striated musculature of the wall of the stomach. This gradually goes on to such definite relaxation that permanent dilatation is produced.

Causes.—1. *Chronic catarrh of the stomach.* The lowered circulation and nutrition in the wall of the stomach weakens the musculature.

2. *General muscle weakness*, either congenital or brought on by illness.

3. *Frequently repeated distension of the stomach* by too much food or drink.

4. Narrowing of the pylorus by scar tissue (after gastric ulcer), tumour, etc.

Symptoms.—1. The same as in chronic gastric catarrh.

2. On inflating the stomach by effervescent powders or aerated water, *the lower border of the stomach reaches down to or below the umbilicus.*

3. Owing to muscular weakness, peristalsis is lessened, so that the stomach cannot empty itself normally, and food remains there too long. This produces abnormal fermentation processes and gas formation, which are recognised by *flatulence* and *vomiting, especially in the morning.*

4. A *splashing sound* on shaking the stomach is also a characteristic symptom.

Treatment.—1. These patients should *take easily digested food in small quantities but frequently*, so as not to overload the stomach.

2. The gymnastic treatment is for the most part that of chronic gastric catarrh.

3. One tries especially to influence the muscular wall and cause it to contract.

(*a*) *By direct manipulation*, especially stomach friction and shaking.

(*b*) *By active abdominal movements*, which produce associated action in the muscular wall of the stomach.

Gastric Ulcer.

Since neither gastric ulcer nor cancer of the stomach should be treated by massage or medical gymnastics, and since they also form definite *contra-indications to abdominal-kneading*, it is advisable to mention the most important symptoms, the existence of which would lead one to suspect either of these diseases.

Symptoms of Gastric Ulcer.—1. Those commonly present

in gastric catarrh, especially *acid eructations*, due to increase of hydrochloric acid in the gastric juice.

2. *Vomiting of blood* (dark blood mixed with mucus; or "coffee-ground" vomiting. The blood colouring matter is changed to dark brown by the action of the gastric juice).

3. *Tenderness over a sharply defined portion* of the stomach.

4. *Black fæces*, due to altered blood colouring matter. (Blackness may also be due to medicine—bismuth or iron.)

5. *Severe pains in the region of the stomach*, especially if they are *closely connected with meal times*, if they are affected by position, and if they are felt through to the back.

It has been considered possible to distinguish gastric from duodenal ulcer by *the pains in duodenal ulcer ceasing immediately after a meal, but coming on again an hour later*, probably because the pylorus first closes and shuts off the irritating contents of the stomach from the duodenum, but opens again later when the gastric contents have become more liquid.

Note.—There is often marked scarring in the healing of gastric ulcer, and the scar may continue to cause pain, but there is no vomiting of blood.

Treatment.—*Gymnastic treatment must not be given* for gastric ulcer. Even after healing, when the patient may require treatment for dilatation of the stomach, due to the scar, or for constipation, the greatest care must be taken and the region of the stomach carefully avoided. No movements must be given which could stretch possible adhesions or tear the scar. For example, hanging must not be given for scoliosis; nor strong slowly performed active abdominal movements, such as Arch-twisting, etc.

Cancer of the Stomach.

Symptoms.—1. The usual disturbances of digestion, resembling gastric catarrh. Hydrochloric acid is often absent from the gastric juice.

2. *Blood- or coffee-ground vomiting.*

3. *A lump in the abdomen* in the region of the stomach.

Note.—This may apparently grow smaller or disappear owing to destruction of its central parts, although the cancer continues to spread peripherally.

4. *Emaciation and greyish pallor.*

Treatment.—Must *not* be treated. Treatment would make the patient worse and would hasten death.

Chronic Intestinal Catarrh (*Chronic Enteritis and Colitis*).

Morbid Changes.—Changes in the mucous membrane of the intestine similar to those in the mucous membrane of the stomach in gastric catarrh. The intestinal juice is altered in quantity and quality, causing disturbance of digestion. Owing to the disturbance of circulation and nutrition in the mucous membrane of the intestine *diminished absorption of food takes place*, so that general nutrition becomes lowered, and this in a much greater degree than in catarrh of the stomach.

Causes.—1. Predisposition.

2. Errors of diet.

3. Abuse of purgatives.

4. Disturbances of the portal circulation, due to *heart, lung, liver and kidney diseases.*

Symptoms.—1. *Alternating constipation and diarrhœa.* In acute catarrh diarrhœa is the most prominent symptom.

Constipation may be due to *œdema* of the intestinal muscles, or in old cases to *atrophy*.

Diarrhœa may be due to *increased peristalsis*, or to increased *quantity of fluid* in the intestine.

Increased peristalsis may be partly due to irritation of the wall of the intestine as a whole, or of its mucous membrane by irritating substances, partly due to *increased irritability of the mucous membrane*, due to inflammation, so that even the most harmless substances have an irritating effect.

Nervous influences, e.g., fear of a test or examination, etc., may cause increased persistalsis and diarrhœa, without any catarrh being present.

Increased quantity of fluid may be due to increased exudation from the capillaries or to diminished absorption.

2. Pains and turmoil in the bowels. Often tenderness.

3. Formation of gases due to abnormal fermentation, etc.

4. Uneasiness and noises in the abdomen, due to formation of gases.

5. *Depression of spirits and lowering of general nutrition.*

6. *The fæces contain undigested food material and mucus.*

In *catarrh of the small intestine* there are copious evacuations, less frequent and often not so fluid.

In *catarrh of the large intestine* (colitis), small loose motions are passed at short intervals.

In *catarrh of the rectum* the bowels act still more frequently and this is associated with painful straining. Often the first part of the motion is loose, the second more normal in character.

Treatment.—In *acute catarrh : Rest and starvation.*

In *chronic catarrh :* 1. *Diet, medicine—Carlsbad salts*, etc.

2. *Gymnastic treatment*, which aims at—

(*a*) *Helping the portal circulation* in order to improve nutrition in the mucous membrane and its glands.

(*b*) *Breaking up the products of inflammation in the mucous membrane.* Cross-abdominal-shaking, Lumbar-side-shaking, Cross-abdominal-stroking, Screw-twisting, Abdominal kneading and especially Colon friction.

(*c*) *Stimulating the cells of the mucous membrane and its glands.* Movements and manipulations similar to those mentioned under (*b*), but modified so that they are more like vibration or tremble-shaking.

(*d*) *Having a depleting effect on the abdomen.* Movements for back and shoulder muscles and the glutei, best given in stoop position.

(*e*) When *constipation* is present, movements should be given which *promote peristalsis.* Abdominal kneading; Leg-rolling with upward swinging of the knee; Sacral beating; Active abdominal movements, etc.

Note.—In constipation positions which have a *strongly* depleting effect from the abdomen should be avoided.

(*f*) When *diarrhœa* is present, a soothing effect on peristalsis may be produced by gentle tremble-shaking over the abdomen.

(*g*) *General strengthening treatment.*

It will be most convenient to arrange the treatment as it would be given during a period of diarrhœa, and note the changes which would be made for constipation.

Example.—Treatment for *chronic intestinal catarrh.*

1. High-ride-sitting Circle-turning (resp.).
2. Half-lying Leg-rolling + Leg outstretching.
3. Yard-stoop-stride-sitting Plane-arm-carrying. (In constipation Yard-walk-standing position.)
4. Hips-firm-high-ride-sitting Trunk-rolling + Backward drawing.
5. Heave-stoop-stride-sitting Alternate-turning. (In constipation Hips-firm-close-sitting position.)

6. Crook-half-lying Abdominal kneading, Cross-abdominal shaking, Lumbar side-shaking.

7. Hips-firm-stoop-stride-sitting Back-raising.

8. Hips-firm-stoop-stride-sitting Screw-twisting.

9. Arm-lean-standing Back-hacking. (In constipation Sacral-beating also.)

10. Stretch-stoop-stride-sitting 2-Arm-bending, -stretching. (In constipation Stretch-half-lying position.)

11. Crook-half-lying Knee-parting, -closing.

12. Sitting Chest-lifting.

If the patient is weak, No. 3 may be replaced by Arm-kneading and No. 11 by Leg-kneading.

Appendicitis.

Morbid Changes.—Inflammatory changes caused by bacteria in the mucous membrane and deeper layers of the intestinal wall and its peritoneal covering, with the changes characteristic of each tissue. In the mucous membrane there is catarrh, and when the inflammation has spread to the peritoneal coat a deposit of fibrin takes place as in pleurisy, causing adhesions between the affected part and its surroundings. These frequently prevent the inflammation from spreading over the whole abdominal cavity. By the subsequent organisation of the fibrin, the adhesions between the appendix and its surroundings (intestine, abdominal wall, etc.) become more or less dense. By rupture of adhesions recurrence may be brought about.

Note.—The inflammation often leads to suppuration and perforation of the intestinal wall.

Causes.—1. *Stagnation of the intestinal contents* which directly irritate the mucous membrane, and also cause disturbance of circulation and nutrition by pressure. The

resistive power of the tissues is therefore lowered, so that bacteria which are always present in the intestinal contents are able to settle down in the mucous membrane and cause inflammation which eventually spreads to the other parts of the intestinal wall and the peritoneum.

2. *Fæcal concretions and foreign bodies*, such as fruit stones, which have become fixed in the appendix, may cause inflammation in the same way. Occasionally cases have been seen which seem to have been caused by intestinal parasites, especially threadworms (oxyuris vermicularis).

3. It has also been found that *the shape of the appendix itself* is of importance in causing the disease, and especially that constriction at the base or elsewhere may lead to stagnation of the contents and therefore to inflammation.

4. *Acute intestinal catarrh* spreading to the mucous membrane of the appendix.

5. Appendicitis often arises *in close connection with injury* in the cæcal region or after a violent strain.

Symptoms.—1. *Generally, but not always, previous constipation* and dull pain in the right iliac region. Sometimes a preceding acute intestinal catarrh.

2. *Sudden increase of pain* with rapid lowering of the general condition. Often vomiting.

3. *Fever.*

4. *Marked tenderness over the region of the appendix* and rigidity of the abdominal muscles over that area—"*Défense musculaire.*"

5. *Tender thickening deep in the abdomen in the right iliac region.* This generally consists partly of accumulated fæcal matter and partly of inflammatory thickenings in the intestinal wall.

6. *It almost always recurs* unless operated upon.

Treatment.—Opinion is more and more definitely in

favour of *operation* as the best treatment for appendicitis, and that it should be performed as early as possible, preferably before the illness has run its course. In some cases operation does not take place and gymnastic after-treatment may be required. It may also be given after operation.

Gymnastic treatment is out of the question in the acute stage. The treatment is starvation, rest, ice, morphia—expectant treatment. When the fever is over, tenderness much diminished, and constipation relieved, gymnastic after-treatment may often be given. Its aim is then :—

(*a*) *To get rid of inflammatory products* in the peritoneum and the appendix.

(*b*) *To promote peristalsis* and to prevent accumulation of intestinal contents.

(*c*) *To stretch adhesions* between the appendix and its surroundings, as they often lead to recurrence.

This treatment is now seldom given except after operation, since otherwise one can never be certain as to the details of the morbid changes, *e.g.*, whether rupture of the intestine is threatening, or whether suppuration is about to take place.

Treatment consists of—

1. *Massage* over the thickenings in the region of the appendix. This should be given at first very gently, often only in the form of fine vibration. Later effleurage and gentle friction may be given. This is gradually and very cautiously strengthened so that no pain is produced, either during treatment or afterwards. The patient's temperature should at first be taken daily. *If the temperature rises, or if there is pain, treatment should be stopped at once.*

2. *Movements and manipulations which promote peristalsis*, but any direct effect on the appendix region is avoided.

3. *Direct stretching of adhesions* by manipulations performed across the anterior abdominal wall, small stretching movements being made in the direction required.

4. *General strengthening treatment*, all movements which strongly stretch the abdomen being avoided.

Chronic Constipation.

By chronic constipation is meant that the action of the bowels is sluggish or not every day, and that the patient has certain discomfort in consequence. But there are people for whom it is normal and not fraught with any discomfort whatever for the bowels to act every other day, or even at longer intervals. Such cases, of course, need no treatment.

Symptoms.—Besides sluggish evacuation—

1. Feeling of weight and tension in the abdomen.

2. Slight tenderness in the abdomen, generally along the course of the colon, due to stretching of the bowel by fæces.

3. Headache and indisposition, due to absorption of poisonous substances which are formed in the alimentary canal and are not got rid of owing to the constipation.

4. Depression (neurasthenia).

Causes.—These are of several different kinds. In mentioning them I am following for the most part what Dr. E. Kleen has written in his book on "Massage and Medical Gymnastics."

1. *Certain influences which do not arise from or directly affect the alimentary canal.* These are :—

(*a*) *Weak abdominal muscles.*

(*b*) *Strain of the abdominal muscles.* Abdominal pressure is then insufficient owing to pain in the muscles.

(*c*) *Unirritating diet, e.g.*, in patients who do not eat

bread, or for some reason only eat the most easily digested food.

(*d*) *Change of the accustomed diet or feeding arrangements, e.g.*, the diet for diabetes; limitation of fluid in obesity, cures etc.

(*e*) *Sedentary life or diminished amount of exercise.*

2. *Diseases of the stomach*, causing diminution in the quantity of chyme brought to the intestines, *e.g.*, stenosis of the pylorus, dilatation of the stomach.

3. Diseases of the bowels or other diseases, which either A. *diminish peristalsis, or* B. *increase the difficulty of the normal passage onward* of the intestinal contents.

A. *Diminished peristalsis* may be due to—

(*a*) Lowered muscular power.

(*b*) Disturbances of innervation.

(*a*) *Lowered muscular power in the bowel may be due to*—

(1) *Chronic intestinal catarrh.* Œdema of the connective tissue around the muscular coat impedes movement, and nutrition of the intestinal wall is lowered, so that the muscles become weak.

(2) *Degeneration or relaxation* of the intestinal muscles after severe general illness, especially infectious illness.

(3) *Inflammatory processes* in or near the bowel, partly on account of the resulting impairment of nutrition of the intestinal musculature, partly owing to adhesions which are frequently formed hampering movement of the bowel.

(4) *The weakness of old age or general weakness and slackness.*

(5) *After child-birth.* Owing to the diminished abdominal pressure the bowel becomes distended by gases and consequently weakened.

(*b*) *Disturbances of innervation in the intestine* may be due to—

(1) *Diseases of the brain and spinal cord*—inflammation, hæmorrhage, tumour, etc.

(2) *Hysteria, neurasthenia, melancholia* and other neuroses.

(3) *Irritation and disturbed reflex effects* on the intestinal muscle, *e.g.*, from the uterus owing to the passage of stone, or in connection with gall-stones, etc.

(4) *Certain forms of poisoning, e.g.*, by opium, lead, etc., which affect the innervation of the intestinal muscle.

B. *Hindrance to the normal passage of the intestinal contents* is generally caused by :—

Narrowing of some part of the bowel by scar, pressure of a tumour, gravid uterus, adhesions, etc.

Sometimes the obstacle is merely due to contraction of the sphincter ani.

Treatment.—1. As far as possible one tries to discover the cause and to remove it, *e.g.*, muscle inflammation in the abdominal wall, faulty diet, sedentary life, chronic intestinal catarrh, contraction of the sphincter ani, etc.

2. The patient should be advised to eat plenty of fruit and fruit juice, and especially coarse bread, in order to produce mechanical stimulation of the walls of the intestinal canal.

3. Gymnastic treatment should consist of *general gymnastics*, with the following special movements included :—

(*a*) *Movements and manipulations* which produce direct *stimulation of the intestinal muscles* and compel them to contract, so that they are exercised and strengthened, *e.g.*, Abdominal-kneading, Abdominal and lumbar pressure, Cross-abdominal-stroking and -shaking, Lumbar side-stroking and -shaking, Leg-rolling with upward swinging of the knee.

(*b*) *Movements and manipulations which increase peristalsis either by associated movement or in a reflex way, e.g.*, Active abdominal movements, Sacral beating.

(*c*) According to long standing gymnastic experience, movements and positions which have a strongly depleting effect on the abdomen should be avoided.

Example.—Treatment for *chronic constipation* associated with lax abdominal muscles and sedentary life.

1. Stretch-sitting 2-Arm-bending, -stretching.
2. Stretch-grasp-standing Heel-raising Knee-bending.
3. Hips-firm-high-ride-sitting Trunk-rolling.
4. Hips-firm-high-ride-sitting Plane-twisting.
5. Reach-grasp-sitting Head rolling + Neck-raising.
6. Crook-half-lying Abdominal-kneading, Colon-stroking, Cross-abdominal and Lumbar-side-stroking.
7. High-ride-sitting Backward-bending.
8. Arm-lean-standing Back-hacking + Sacral beating.
9. Half-lying Leg-rolling (with upward swinging of the knee) + Knee-down-pressing.
10. Yard-sitting 2-Arm-lifting-upward and down-pressing.
11. Stretch-grasp-standing Forward-drawing.

Hæmorrhoids (*Piles*).

Morbid Changes.—Distension of the (varicose) veins in the mucous membrane of the rectum and around the anus, in the form of small or large lumps. Frequently there is also thickening of the connective tissue around the varicose veins due to chronic irritation. As in varicose veins of the legs, thrombosis may arise in the dilated veins, which then show firm and very tender lumps.

Causes.—1. *Hereditary predisposition.*

2. *Sedentary life*, partly by causing bad circulation and overfulness of the veins, especially in the portal system,

partly by causing chronic constipation, which again leads to straining and so hinders the circulation, and more especially increases the pressure in the abdominal veins.

3. *General disturbances of the circulation, and especially of the portal circulation.* This arises more particularly in connection with heart, lung, liver and kidney disease.

4. *Tumours in the pelvis* and pregnancy, by pressure on the pelvic veins.

Symptoms.—1. Blueish lumps of varying size in the mucous membrane and around the anus. These consist of dilated veins, and are in many cases soft and easy to compress, in other cases firmer and very tender (recent thrombosis), in others still firmer and more insensitive (older, organised thrombus).

2. *Pain on defæcation,* sometimes due to thrombi, but more often to cracks (so-called fissures) in the mucous membrane between the lumps already mentioned.

3. *Hæmorrhage,* due to rupture of the varicose veins, may be so marked as to cause severe anæmia and necessitate operation. Streaks of blood on the surface of the fæces are common, but not dangerous.

4. *Pain and difficulty on emptying the bladder,* due to varicosity of the veins in the mucous membrane of the bladder.

5. *Reflex pains in the sacrum.*

6. *Looseness of the skin around the anus,* generally associated with protrusion of the anal mucous membrane outside the anal opening.

Treatment.—The gymnastic treatment of piles should aim at—

1. *Helping the circulation* in general, and especially the

portal circulation. (See "General Treatment of Heart Disease," p. 184.)

2. As the patient generally leads a sedentary life, *general gymnastics* should be given.

3. *Movements and manipulations which help the action of the bowels* should be given, so that straining may be avoided as much as possible.

4. *Sphincter or anal massage* is the most effective special treatment. This is given partly to break up inflammatory products and infiltrations around the varicose veins, partly to produce contraction of the veins by mechanical stimulation of their walls.

Note.—Protrusion of the anal mucous membrane, which is often present, must be replaced before massage. If marked tenderness is present, and especially if firm knobs (thrombi) are felt, massage should not be given.

5. To lessen the overfulness of blood in the veins, *movements which have a depleting effect on the pelvis* should be given. (See "Profuse Menstruation," p. 272.)

6. Movements which have a repleting effect on the pelvis (see "Arrest of Menstruation," p. 270) should be avoided.

Example.—Treatment for hæmorrhoids in a patient who leads a sedentary life.

1. Stretch-grasp-standing Forward-drawing.
2. Half-lying Leg-parting, -inpressing.
3. Stretch-sitting 2-Arm-bending, -stretching.
4. High-ride-sitting Active Trunk-rolling + chest-lifting.
5. Reach-grasp-standing Neck-raising.
6. Heave-stoop-stride-sitting Alternate-turning.
7. Crook-half-lying Abdominal-kneading + Cross-abdominal-shaking.
8. Reach-grasp-stoop-leg-lean-standing Back-raising.

9. Arm-lean-stoop-standing Anal or Sphincter-massage and Rectal-vibration.

10. Yard-sitting Arm-rotation-with-rod.

11. Half-lying Leg-outstretching.

12. High-ride-sitting Circle-turning (resp.).

Prolapse of the Anus.

Morbid Changes.— Dropping of the rectal mucous membrane, which lies immediately outside and around the anal opening as a red tumour.

Causes.—1. Laxity of connective tissue around the rectum.

2. Constipation (straining).

Treatment.—1. *Replacement* is easily performed after smearing with vaseline, by exercising an even pressure from all sides towards the anal opening.

2. Swim-hanging Sacral-Beating.

3. Sigmoid-flexure-lifting.

4. Sphincter-massage and vibration.

5. Crook-half-lying Knee-closing with Pelvis-lifting (the adductors working concentrically and eccentrically).

Defective Action of the Liver, not associated with Gall-stones or Tumour, and Cirrhosis of the Liver.

Since medical gymnasts, at least in temperate climates, and especially in English-speaking countries, have frequent occasion to treat patients who suffer from defective action of the liver, it seems desirable to state here shortly the commonest morbid changes and symptoms which occur and the most important principles of treatment in such defects.

Morbid Changes.—Defective action of the liver is often associated with congestion, and when this has lasted for any length of time it may lead to increase of connective tissue and enlargement of the organ. In certain cases contraction of this connective tissue may take place, so that the liver becomes diminished in size and uneven on the surface. This condition is called "cirrhosis."

Causes.—1. Harmful substances brought in the blood to the liver and causing irritation. Among such substances are especially :—

(*a*) Alcohol and strong condiments.

(*b*) Poisonous and irritating substances formed by the abnormal fermentation processes in gastric and intestinal catarrh.

(*c*) Poisons, due to bacterial activity, especially in people who suffer from malaria.

2. Heart, Lung and Kidney disease, which cause congestion of the liver by the disturbance of circulation which accompanies them.

Symptoms.—1. Owing to the congestion and disturbance of circulation in the liver, *changes occur in the secretion and character of the bile.* Considering the great importance of the bile in regard to digestion and absorption, and especially in preventing decomposition processes in the bowel and in promoting peristalsis, it is easy to understand that the patient will suffer from :—

(*a*) Disturbances of digestion. The peptonisation of protein by the pancreatic juice, as well as absorption of fat in the bowel, is made more difficult.

(*b*) Formation of gases. By the more rapid decomposition processes.

(*c*) Indisposition, due to the poisonous substances which are formed in these processes.

(*d*) Constipation.

2. Since the portal circulation as a whole is hindered by the congestion of the liver :

(*a*) *Chronic gastric and intestinal catarrh* arise with their respective symptoms, so that the troubles already spoken of are increased.

As already mentioned, gastric and intestinal catarrh may precede and cause disturbed action of the liver. We now see that this in turn causes gastric and intestinal catarrh, or increases it if already present, so that a vicious circle is completed.

(*b*) The slowing of the portal circulation may cause hæmorrhoids and in more severe cases enlargement of the spleen and ascites (fluid in the abdominal cavity), owing to the marked increase of pressure in the veins and capillaries.

(*c*) For the same reason the veins in the skin round the umbilicus, which are connected with the portal circulation, are sometimes so distended that a resemblance to a " medusa head " is produced.

3. Œdema of the feet and legs may be produced by pressure of the enlarged liver on the inferior vena cava.

4. The enlarged liver can often be felt below the margin of the thorax. If shrinking takes place, its surface feels uneven and knobby.

Treatment.—1. First and foremost *the portal circulation must be helped as much as possible* by the movements we have at our disposal for the purpose : Circle-turning, Trunk-rolling, etc.

2. By vibrations over the liver we try also *to bring about contraction of the blood-vessels*, and to produce an *enlivening or stimulating effect on the liver cells* and their activity in order to improve, if possible, the secretion and character of the bile.

3. *We try to relieve constipation* by suitable movements and manipulations, especially Abdominal kneading.

4. *The gastric and intestinal catarrh* which is generally present must be noticed and treated as already described. (See pp. 238 and 246.)

5. Treatment is also directed to the *heart, lung or kidney* disease associated with the disturbed action of the liver.

Example.—Treatment for defective action of the liver.

1. High-ride-sitting Circle-turning (resp.).
2. Half-lying Foot-rolling + -bending, -stretching.
3. Half-lying Arm-kneading.
4. High-ride-sitting Trunk-rolling (gently) + Chest-lifting.
5. Hips-firm-high-ride-fall-turn-sitting Forward-turning.
6. Crook-half-lying Abdominal-kneading + Cross-abdominal and Stomach-shaking + Vibration over the liver.
7. Hips-firm-stoop-stride-sitting Back-raising.
8. Stretch-sitting 2-Arm-bending, -stretching.
9. Half-lying Leg-kneading.
10. Arm-lean-standing Back-hacking.
11. Sitting Chest-lifting.

Chapter XI

DISEASES OF THE GENITO-URINARY ORGANS

Chronic Nephritis (*Chronic Kidney Disease, Bright's Disease*).

Morbid Changes.—*Chronic inflammation in the substance of the kidney* with increase of connective tissue, degeneration and loss of renal epithelium. Diminished excretory power in the kidneys and consequent *accumulation in the blood of products of metabolism.*

Causes.—1. *Poisonous substances,* which are brought in the blood to the kidneys and are there excreted, causing in their passage irritation and inflammation. These substances may reach the blood by absorption from the alimentary canal, having been taken with food or as medicine, *e.g.*, alcohol, strong condiments, turpentine, arsenic, etc., or they may have been absorbed by the skin, *e.g.*, from a carbolic acid fomentation or other medical treatment. *Poisons formed by bacteria in infectious diseases,* as diphtheria, scarlet fever, influenza, etc., and *poisons formed in the body, in cancer and other wasting diseases,* may in the same way cause changes in the kidneys.

2. *Repeated soaking of the feet and legs and a damp dwelling* are often associated with the onset of kidney disease.

Symptoms.—1. Owing to the changes which arise in Bowman's capsules and in the epithelium of the renal tubules, these become pervious to albumen, so that *the urine contains albumen.*

2. Owing to the lowered power of excretion in the kidneys,

the quantity of urine is often diminished. In certain cases, however, it is increased, probably due to increased permeability of the walls of the renal tubules.

3. Owing to the lowered power of excretion of urine by the kidneys, especially due to changes in the epithelium, *accumulation of partially oxidised products takes place in the blood,* which by their poisonous character produce more or less severe disturbances of function in the body as a whole. The most important are :—

(*a*) *General weakness and anæmia* due to the toxic products of metabolism accumulated in the blood, and the disturbance of metabolism caused by them.

(*b*) *General arterio-sclerosis* due to irritation of the arteries by the products of metabolism accumulated in the blood. Arterio-sclerosis is accompanied by thickening in the walls of the arteries with consequent obstruction to the circulation, which in turn leads to *hypertrophy of the heart and the general disturbances of the circulation associated with heart disease.*

(*c*) *General dropsy,* especially of the feet and legs, due partly to degeneration of the arterial walls owing to the toxic products of metabolism, partly to disturbance of the circulation.

(*d*) *Brain symptoms.* Continued and severe headache, giddiness, etc., due to irritation of the brain by the products of metabolism accumulated in the blood.

(*e*) *Symptoms of intestinal catarrh,* owing to the products of metabolism being excreted partly by the intestinal mucous membrane and causing irritation in it.

Treatment.—Only in slight and definitely chronic cases can there be question of gymnastic treatment. It is then given for the most part as *general heart treatment,* in which easy active movements may be included. This aims at

facilitating and improving the circulation which is hindered by the thickening of the arterial walls, and at increasing the reserve power of the heart.

As special treatment, *gentle vibrations over the region of the kidney* have been tried, and gentle "Under-kidney-tremble-shaking," partly with the aim of producing contraction of the blood-vessels of the kidney, and so diminishing congestion, partly to stimulate the cells of the kidney, especially the epithelium. *If such treatment is attempted, it must be performed very cautiously.*

In this case also *general strengthening* treatment is given.

Example.—Treatment for *chronic kidney disease.*

1. Half-lying Chest-lift-stroking.
2. Half-lying Leg-kneading.
3. Sitting Fore-arm-bending, -stretching.
4. Half-lying Foot-rolling, + bending, -stretching.
5. Sitting Head-treatment.
6. High-ride-sitting Circle-turning + Chest-lifting.
7. Hips-firm-close-sitting Alternate-turning.
8. Crook - half - lying Abdominal kneading + Under-kidney-tremble-shaking (gently).
9. High-ride-sitting Backward-bending.
10. Arm-lean-standing Back-hacking + Vibrations over the kidney region.
11. Half-lying Arm-kneading.
12. Half-lying Knee-bending, -stretching.
13. Yard-sitting 2-Arm-rolling (resp.).

Movable Kidney.

One or both kidneys have sunk from their position in the upper and posterior part of the abdominal cavity, so that a more or less sharp angular bend of the ureter is

caused, which interferes with the flow from the pelvis of the kidney so that it is apt to become distended by urine. Most frequently it is the right kidney that has sunk, due to its position below the liver, which is more fixed and helps to press the kidney down.

Causes.—1. *Laxity of the connective tissue* and fat round the kidney, generally due to rapid emaciation or general laxity of the abdominal tissues—" Visceroptosis."

2. *Laxity of the abdominal muscles,* especially after repeated pregnancy.

3. *Violent strain or injury,* as by troublesome cough, vomiting, straining, a severe fall, etc.

Symptoms.—1. Pain and a feeling of pressure in the abdomen, often associated with nausea and discomfort, due to the difficulty in the passage of urine and consequent distension of the pelvis of the kidney and upper part of the ureter.

2. Sometimes *severe attacks of pain* arise, with shivering, slight fever and vomiting. They are caused by temporary absolute obstruction to the passage of urine by the ureter, when the kidney has for some reason sunk lower than usual. These attacks may resemble appendicitis, but the patient has little or no fever as a rule.

3. *General hysterical symptoms* if the patient is aware of the condition.

4. *The kidney can often be felt low in the abdomen.*

Treatment.—1. *Replacement of the kidney,* immediately followed by *Under-kidney-tremble-shaking.*

The patient should learn to do this herself when necessary so that the ureter can be straightened out and the pelvis of the kidney can empty itself. The distension and pains then become less or disappear.

2. *Gentle vibrations and hacking over the region of the*

kidney, to stimulate and give tone to the connective tissue, if this is possible.

3. *Active abdominal movements*, to strengthen the abdominal muscles, especially Stoop-high-ride-sitting Backward-drawing to the vertical.

4. General strengthening treatment.

5. A belt which exercises steady pressure upward and inward is often useful.

6. The patient should be encouraged to get fat.

7. *It is sometimes best to stitch up the kidney.*

Chronic Catarrh of the Bladder (*Chronic Cystitis*).

Morbid Changes.—Those common to inflammation of mucous membranes.

Causes.—1. *Bacteria*, either carried into the bladder by unclean instruments, or from the urethral mucous membrane or from the kidneys, where they have become separated from the blood in some infectious disease. For bacteria to establish themselves in the mucous membrane and develop there, either they must be particularly strong and virulent, or the resistance of the tissues must be lowered.

The establishment of the bacteria in the tissues is made easier by—

(*a*) *Chills*, which lower the resistive power of the cells and tissues.

(*b*) *Direct injury to the mucous membrane*, by trauma, damage by instruments or by stone in the bladder.

(*c*) *Incomplete emptying of the bladder*, which allows the bacteria to remain in the bladder and multiply in the residual urine.

2. *Irritating substances* which become separated from the blood and exercise an irritating effect on the mucous

membranes, *e.g.*, turpentine, the poison of Spanish blister, and the product of faulty metabolism.

Symptoms.—1. Feeling of weight and slackness in the bladder region.

2. *Painful frequent straining with micturition.*

3. General symptoms of malaise, mild shivering attacks, weakness, etc., due to poisoning, partly by the decomposition of the residual urine, partly by bacterial poisons.

4. The urine is alkaline and turbid with mucus, epithelium, pus and bacteria.

Treatment.—Nowadays gymnastic treatment for catarrh of the bladder is seldom considered. In any case it would not be used if there were any sign of the illness becoming acute.

An attempt at treatment might possibly be considered in mild but obstinate cases, especially those connected with enlargement of the prostate in old men.

Besides *massage of the prostate* and vibrations, both given through the rectum, such treatment consists of :—

1. General strengthening treatment.

2. Movements which have a depleting effect on the pelvis. (See "Profuse Menstruation," p. 272.)

3. Movements and manipulations which break up inflammatory products in the mucous membrane and produce slight mechanical stimulation of the cells, so that their activity and resistive power is increased.—Bladder-shaking ; Perineal-shaking.

Enuresis Nocturna

(*Incontinence of Urine during Sleep*).

Causes.—1. General weakness.

2. Congenital weakness of the sphincters.

3. The weakness of old age.

4. Disturbances of the brain and spinal cord, by disturbances of innervation and of the reflexes.

5. Abnormal irritability of the mucous membrane or musculature of the bladder.

6. Reflex irritation from other pelvic trouble, *e.g.*, stone in the bladder, worms in the rectum, etc.

7. Bad habits, due to neglect in upbringing.

Treatment.—1. *Diet.* No liquid food in the evening.

2. *Psychic treatment*, which partly consists of seriously telling the patient that he must try not to wet the bed, and that it is quite possible to control himself even during sleep. *No corporal punishment* must be given. *Hypnotic treatment* has had a good effect in many cases.

3. *Quick cold sponging of the perineum and sacral region* morning and evening should also be recommended.

4. *By waking the patient regularly at a definite time* once in the night he will get into the habit of waking himself at that time.

5. Gymnastic treatment should consist of :—

(*a*) "*General strengthening treatment.*" This alone has been successful. It should include abdominal kneading and possibly bladder shaking.

(*b*) *Gentle sacral beating* has a reflex stimulating and strengthening effect on the bladder sphincter.

(*c*) *Crook-half-lying knee-closing and out-drawing with pelvis-lifting* exercises and strengthens the sphincter by "associated movement."

Example.—Treatment for *Enuresis nocturna.*

1. Sitting Chest-lifting.

2. Half-lying Leg-kneading and General Nerve-pressures.

3. Yard-sitting 2-Arm-carrying-upward and down-pressing.

4. Hips-firm-high-ride-sitting Trunk-rolling + Alternate turning.

5. Crook-half-lying abdominal kneading and bladder shaking.

6. Crook-half-lying Knee-closing with Pelvis-lifting.

7. Yard-stoop-stride-sitting Back raising.

8. Arm-lean-standing Back-hacking + Gentle Sacral-beating.

9. Half-lying Arm-kneading.

10. Half-lying Foot-rolling, -bending, -stretching.

11. Stretch-sitting 2-Arm-bending, -stretching.

Paresis or Paralysis of the Bladder.

Causes.—1. Disease of the brain or spinal cord.

2. Unaccustomed and long-continued distension of the bladder.

3. Weakness after catarrh of the bladder.

4. Old age.

Symptoms.—1. *The bladder is enlarged* and often reaches up to the umbilicus.

2. *Incomplete emptying of the bladder*, so that more or less residual urine remains.

3. *Catarrh of the Bladder.* Almost unavoidable with constant emptying of the bladder by catheter. The presence of residual urine also helps to cause it.

Treatment.—1. Regular and complete emptying of the bladder by catheter.

2. *Gymnastic treatment :*

This consists of "General strengthening treatment," in which the following special movements are included : Bladder-shaking, Perineal-shaking, Crook-half-lying Knee-closing with Pelvis-lifting, Back-hacking + gentle Sacral-beating.

Absence of Menstruation (*Amenorrhœa*).

Causes.—1. Anæmia.

2. *Chill, particularly soaking of the feet and legs*, especially during menstruation, or cold bathing at that time.

3. *Emotions.*

4. *Pregnancy.*

5. Early phthisis.

Symptoms.—1. Menstruation does not take place.

2. *Restlessness and nervousness.*

3. If the trouble has been of long duration *symptoms* of "*plethora*" often arise, since the blood-forming organs regularly increase their activity at the ordinary time for menstruation.

4. Symptoms of anæmia, if this is the cause of the disturbance of menstruation.

Treatment.—In pregnancy and phthisis there is, of course, no question of treatment.

1. If anæmia is the cause, *general strengthening treatment* is given.

2. If some cause other than anæmia or pregnancy has produced the menstrual disorder, gymnastic treatment may be given with *special movements repleting to the pelvis.*

(*a*) *Vigorous leg-movements*, except those in which the glutei chiefly work.

(*b*) Active movements for the flexors of the hips, as Leg- and Knee-up-drawing, Knee-down-pressing, Backward-drawing, etc.

(*c*) Movements in a strongly arched position, especially Hips-firm-knee-stride-arch-standing Screw-twisting.

(*d*) Leg-rolling and strong Sacral-beating.

Example.—Treatment for *arrest of menstruation* :—

1. Stretch-arch-sitting 2-Arm-bending, -stretching.

2. Stretch - arch - instep - support - standing Heel - raising Knee-bending.

3. Reach-grasp-standing Head-rolling + Neck-raising.

4. Short-sitting 2-Leg-up-drawing.

5. Arm-lean-standing Sacral-beating.

6. Hips-firm-high-ride-sitting Backward-drawing.

7. High-ride-sitting Backward-bending.

8. Hips - firm - high - knee - stride - arch - standing Screw-twisting.

9. Half-lying Leg-rolling.

10. Yard-sitting Arm-rotation-with-rod.

11. Sitting Chest-lifting.

Painful Menstruation (*Dysmenorrhœa*).

Causes.—1. *Inflammation in the pelvic organs.* In such cases no gymnastic treatment is given. Gentle depleting movements may possibly be given, combined with medical treatment.

2. **Some hindrance to the escape of the menstrual discharge** from the uterus; too narrow or too long a cervix; a sharp bend in the cervix; abnormal density of the tissues.

In such cases, as Major Brandt has recommended, one or two weeks before the onset of menstruation *general treatment* may be given *with special movements which have a repleting effect on the pelvis.* He explained the effect of the treatment by the tissues becoming looser and softer due to the increased blood-supply, so that they yield more easily to the escaping blood.

Note.—One cannot promise a certain result from the treatment, but it is often effectual.

Profuse Menstruation.

Causes.—1. *General weakness and anæmia.* Lack of oxygen causes degeneration of the blood-vessels of the uterine mucous membrane.

2. *General circulatory disturbances* in heart, lung, liver and kidney disease, owing to the increased fulness of blood in the veins and the consequent increased pressure in the capillaries.

3. *Tumour in the pelvis,* especially in the uterus and its mucous membrane, due to the associated development of new blood-vessels.

4. *Displacements of the uterus,* by hindering the circulation in that organ.

5. *Other pelvic troubles,* owing to the increased blood flow to the pelvic organs which generally accompanies them.

Treatment.—1. Of causes—anæmia, heart disease, etc.

2. General treatment with special movements, which have an effect depleting from the pelvis.

(*a*) *Movements in stoop position.*

(*b*) *Movements for the glutei, back, arm and shoulder muscles.* Heave-grasp-stoop-stride-sitting Alternate-turning, Yard-stoop-stride-sitting Plane-Arm-carrying, and Stretch-stoop-stride-sitting 2-Arm-down-drawing are particularly effective.

For patients who are so weakened by the losses of blood that they are confined to bed, Major Brandt used the following treatment :—

1. Stretch-crook-lying 2-arm-rolling + Arm-down-drawing (twice concentrically and eccentrically).

Note.—The patient should not herself place the legs in position. This must be done by the gymnast, otherwise an effect repleting to the pelvis may be produced.

2. Lying Back-raising. The gymnast's hands are placed

behind the upper part of the patient's back, so that they also support the neck. The gymnast raises the patient while the latter resists. The patient then returns to lying position while the gymnast resists. The back is kept straight throughout.

3. Gentle massage (friction and vibration) over the uterus. This can be given through the abdominal wall.

4. Lying Back-raising (see No. 2).

5. See No. 1.

Note.—The treatment may be given during menstruation.

Example.—Treatment for profuse menstruation :—

1. Sitting Chest-lifting.
2. Crook-half-lying Knee-parting with Pelvis-lifting.
3. Stretch-stoop-stride-sitting 2-Arm-down-drawing.
4. Reach-grasp-standing Neck-raising.
5. Heave-stoop-stride-sitting Alternate-turning.
6. Hips-firm-stoop-stride-sitting Back-raising.
7. Arm-lean-standing Back-hacking.
8. High-reach-grasp-standing Leg-forward-drawing.
9. Yard-stoop-stride-sitting Plane-Arm-carrying.
10. Yard-sitting 2-Arm-rolling (resp.).

If the patient is weak, No. 2 may be replaced by Leg kneading and No. 9 by Arm-kneading.

CHAPTER XII

CLIMACTERIC—PREGNANCY—THE PUERPERIUM

Climacteric

By climacteric is meant the period in a woman's life when menstruation gradually lessens and finally ceases. This takes place as a rule between the ages of forty-five and fifty-five. Vasomotor disturbances frequently arise at the same time, consisting of *rushes of blood to the head*, sudden *feeling of heat, flushing, perspiration*, etc.

Frequently there is also a *tendency to corpulence* and a peculiar thickening and dryness of the skin. All these changes are closely connected with the cessation of ovarian activity, and are related to many similar disturbances which arise along with changes in the glands of internal secretion, *e.g.*, *cretinism* and goitre.

It should also be mentioned that in connection with the climacteric there is an increased tendency to the formation of tumours in the pelvic organs and elsewhere.

Treatment.—Experience shows that these troubles are favourably influenced both by general massage and by gymnastic treatment, consisting chiefly of *exercises to improve the general circulation and metabolism and counteract the* tendency to corpulence.

Example.—Treatment during *the climacteric :—*

1. Stretch grasp-standing Chest-expansion.
2. Half-lying Leg-parting, -inpressing.
3. Reach grasp-standing Head-rolling + Neck-raising.

4. Stretch-stride-sitting 2-Arm-bending, -stretching.
5. Hips-firm-high-ride-sitting Active Trunk-rolling.
6. Heave-stride-sitting Alternate-turning.
7. Crook-half-lying Abdominal kneading + Pétrissage of the fat masses in the abdominal walls and on the hips.
8. Neck-firm-high-ride-sitting Side-bending.
9. Reach-grasp-stoop-Leg-lean-standing Back-raising.
10. High-reach-grasp-standing Leg forward-drawing.
11. Yard-stride-sitting Plane-Arm-carrying.
12. High-ride-sitting Circle-turning (resp.).

Pregnancy

Pregnancy is, on the whole, a contra-indication to massage, more especially to abdominal massage. Massage of the gluteal region, thighs, abdomen or chest may excite uterine action and lead to abortion.

General massage is, nevertheless, sometimes undertaken for *excessive sickness in pregnancy*, when it is necessary to keep the patient in bed. In this case, the chest, thighs and lower part of the abdomen are omitted. Vibrations may be given over the stomach itself. Movements may also be given, but all repleting movements, and, therefore, all vigorous leg movements, must be avoided. Movements raising the arms above shoulder level are also avoided as tending to arch the back.

Varicose veins are sometimes troublesome during pregnancy. The patient should avoid constipation, should wear elastic stockings or bandages, and rest frequently with the legs raised. It is safer not to give effleurage.

Constipation should be treated by diet and, if necessary, by drugs.

The Puerperium.

General massage is sometimes given *to hasten convalescence*, when the pulse and temperature are normal. Movements are added gradually, as in the treatment of any convalescence. Movements to strengthen the muscles of the abdomen and pelvic floor are important.

Abdominal massage and movements are especially indicated *if the abdominal muscles have been weakened* by excessive distension or by repeated pregnancies. In this case, the recti muscles are often widely separated. Massage and manipulations in crook-lying position may hasten their approximation.

Constipation may also be treated by abdominal massage and movements, but repleting movements must be avoided.

If *the flow of milk* is insufficient it may be increased by—

1. Kneading of the chest, and especially of the pectoral muscles.

2. Kneading of the breasts.

3. Movements of the pectoral muscles concentrically and eccentrically.

Excessive flow of milk may be treated by—

1. Cutting down the supply of fluids.

2. Binding the breasts firmly.

3. Movements for the muscles at the back of the shoulders concentrically and eccentrically.

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PRINTED IN GREAT BRITAIN BY THE WHITEFRIARS PRESS, LTD.,
LONDON AND TONBRIDGE.