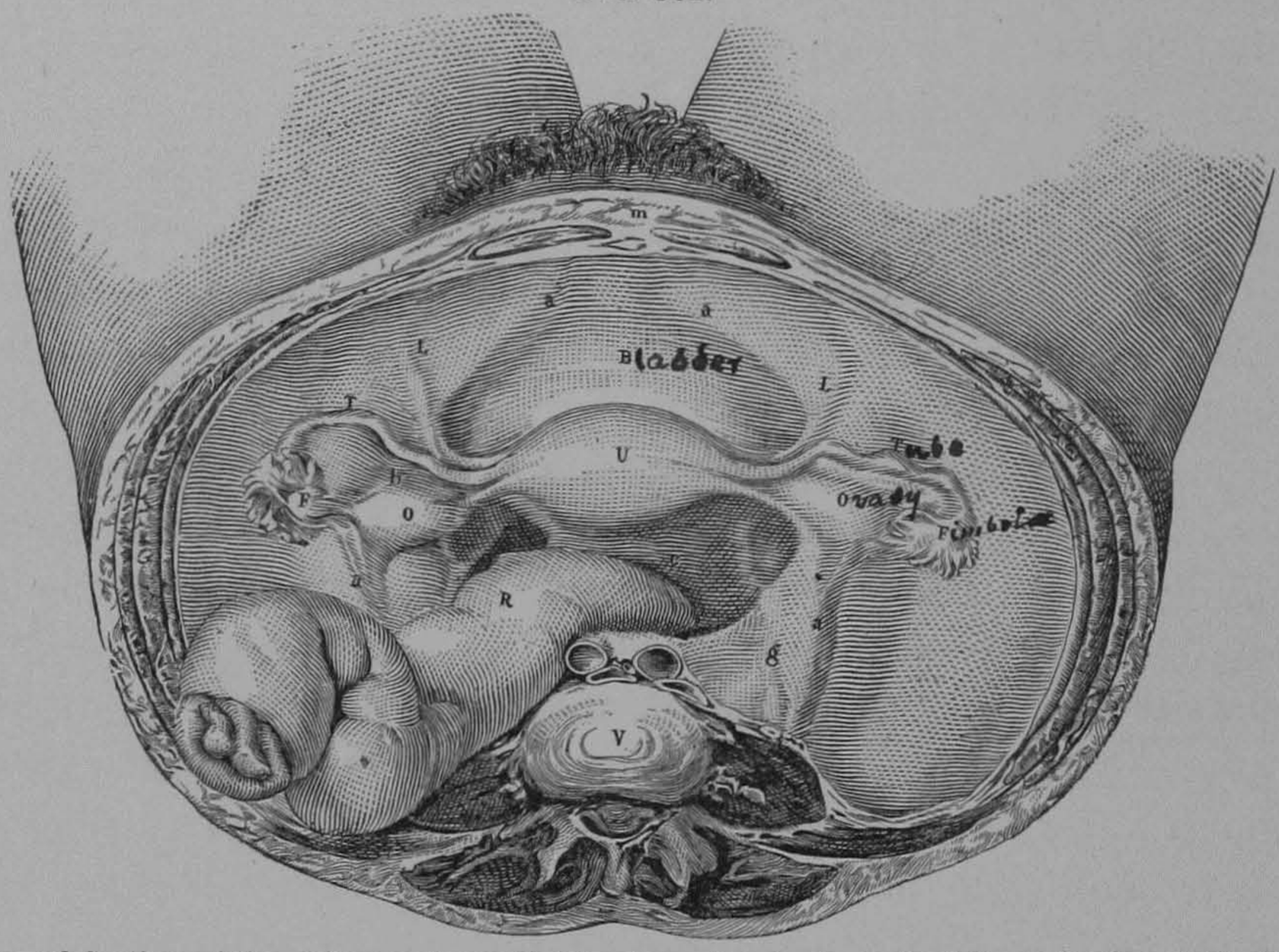
DISEASES OF THE OVARIES, INCLUDING TUBAL ANOMALIES AND BROAD-LIGAMENT CYSTS.

Anatomy and Physiology of the Ovary.

The ovaries in the human female are situated, one on each side of the uterus at the level of the brim of the true pelvis, in the posterior fold or leaflet of the broad ligament. The other two leaflets

Fig. 301.



Horizontal Section of the Abdomen immediately above the Crests of the Ilii: *B*, fundus of bladder; *U*, uterine body; *O*, ovary; *L*, round ligament; *T*, Fallopian tube; *V*, sacrum; *R*, rectum; *C*, utero-sacral ligaments; *g*, ureter.

of the ligament are formed superiorly by the Fallopian tube and anteriorly by the round ligament. When the woman is in the erect position and the uterus in its normal situation, the ovary lies upon the ligament and looks upward and backward. The ovary is about an inch and a quarter long, three-quarters of an inch in width, and half an inch thick, convex upon the posterior and flattened upon the anterior surface, resembling in shape and size an almond; the external extremity is blunt and rounded, the internal pointed, pro-

jecting toward the ovarian ligament. It is connected with the uterus by the latter ligament, which is about one inch long.

The normal ovary weighs from ninety to one hundred and thirty-five grains. It is but partially covered by peritoneum, as is demonstrated by the contrast between the columnar epithelium of its posterior surface and the pavement epithelium of the peritoneum. The ovary consists of an external cortical portion, composed of cellular elements, and an internal medullary or fibrous portion, through which the blood-vessels, lymphatics, and nerves are distributed. The blood-vessels and nerves enter through the lower portion, which is called the hilum.

At the fourth month of intra-uterine life the germinal epithelium and the stroma undergo a process of adhesion, by which masses of epithelium are aggregated in the stroma, forming tubes. Some of these tubes possess outlets to the surface of the organ. Some cells in the tubes early attain to considerable size, have a nucleus, and form the ova. The ova become isolated, and by further proliferation of cells acquire a receptacle—the Graafian follicle. The germinal epithelium is divided by vascular stroma into two layers—an outer, composed of thin columnar cells, with one or two rows of round cells, which contain primitive ova, and an inner, thicker stroma between two layers of cells, which subsequently forms the tunica albuginea.

The ovum originally consists of a nucleus and nucleolus, with a small amount of protoplasm. It is never situated in the centre of the follicle, but occupies the side most distant from the surface of the ovary. The number of ova in an ovary have been estimated as numbering from 36,000 to 400,000. It is evident that Nature has made provision for the loss of a large number in a rudimentary form.

The formation of ova and egg-balls terminates with fetal life, but the isolation of the ova and transformation of egg-balls into follicles may be continued a couple of years later.

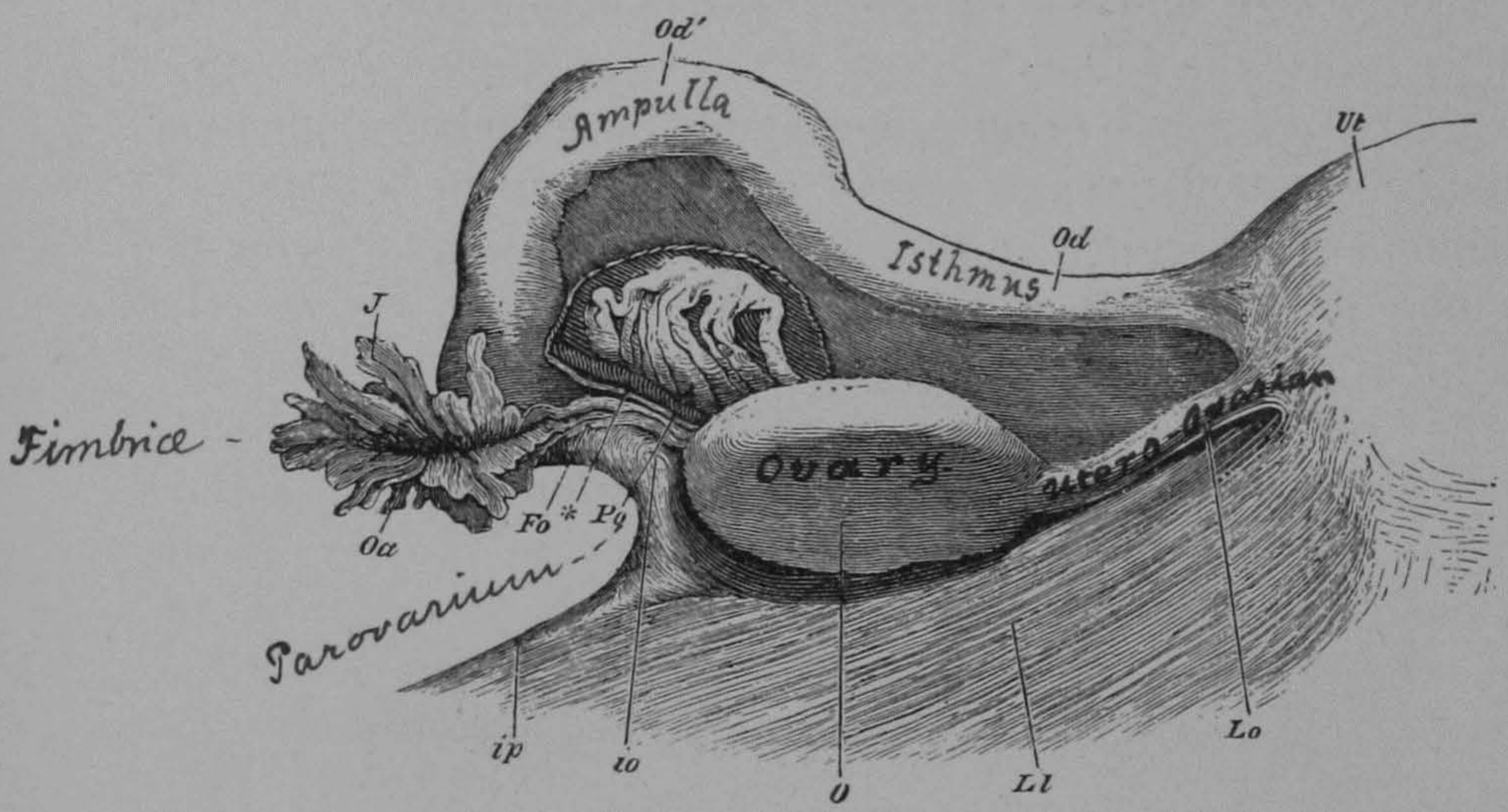
The blood-vessels of the ovary are derived from the ovarian artery, analogous to the spermatic in the male, which comes off from the aorta. It anastomoses with the uterine, a branch of the internal iliac artery.

The right ovarian vein enters the inferior vena cava at an acute angle and is supplied with a valve. The left enters the left renal vein at an angle and is without a valve. To this anatomical fact is

attributed the greater relative frequency of disease of the left ovary. The nerves enter the hilum as two fine twigs from the ovarian plexus.

Puberty.—At birth the ovary is flattened and elongated. As puberty approaches it assumes an olive shape, which indicates the sexually mature female. This period is characterized by the advent of the intermittent discharge known as menstruation, supposed to be synchronous with ovulation. That these processes are not neces-

FIG. 302.



Ut, uterus; *O*, ovary; *Oa*, infundibulum and abdominal aperture of the Fallopian tube and fimbriæ; *Fo*, fimbria attached to the ovary; *Po*, parovarium; *io*, marginal fold of broad ligament continued on to the infundibulum (infundibular ovarian ligament); *ip*, the same fold connecting the former with the pelvis; *Od*, isthmus of the Fallopian tube; *Od'*, ampulla; *, fimbrio-ovaric groove, lined by mucous membrane covered by ciliated epithelium; *Ll*, muscular striæ under posterior layer of broad ligment; *Lo*, muscular utero-ovarian ligament.

sarily interdependent is evident from the fact that women become pregnant before the first occurrence of the menses, and, indeed, some have given birth to several children without ever having menstruated. Numerous cases are upon record where women have become pregnant after the occurrence of the menopause.

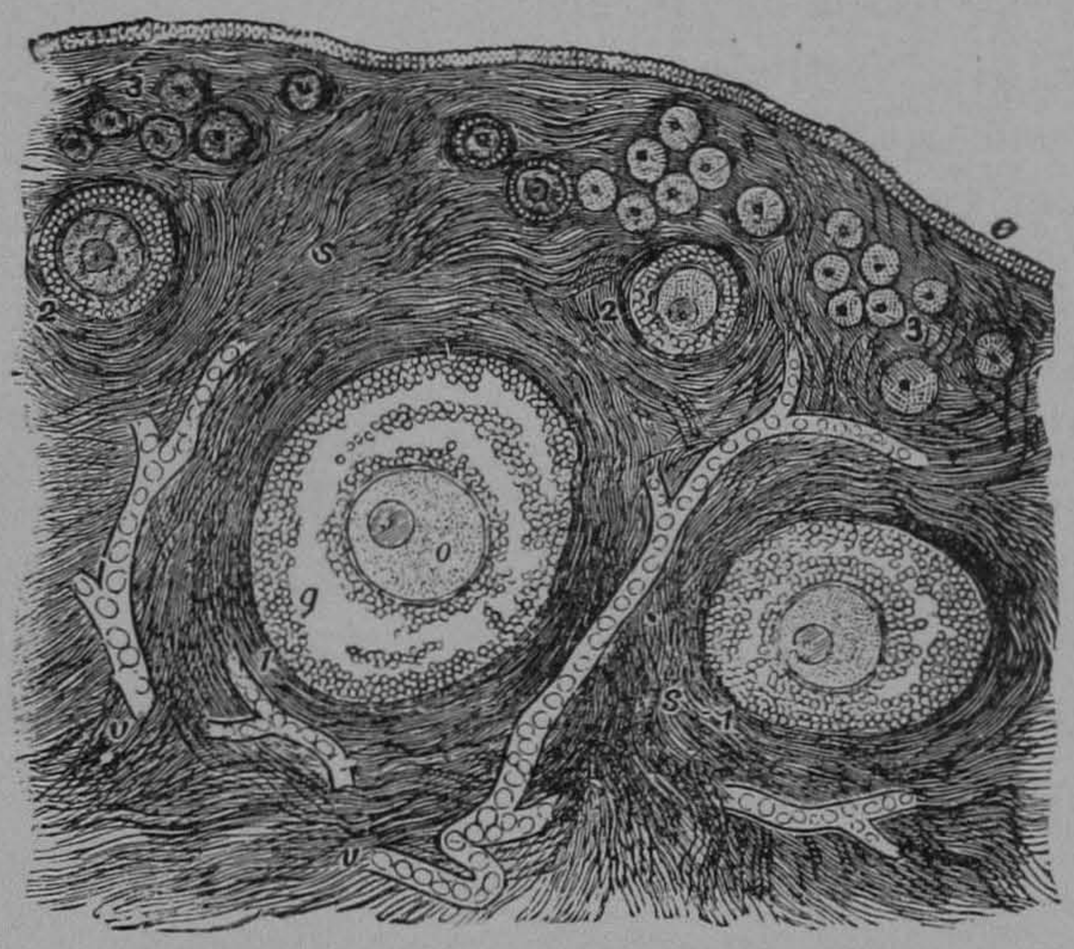
Puberty generally takes place between the thirteenth and fifteenth years. A well-established corpus luteum has been found in the ovary of a child which died at nine years.

While it is indisputable that ovulation may occur without menstruation, it is to be doubted, notwithstanding the views of Tait, whether menstruation ever takes place in the absence of both of the ovaries. The cases in which menstruation has continued after the ovaries were removed are those in which a portion of the ovarian

stroma was overlooked where it extended downward upon the ovarian ligament, or accessory ovaries were present, or there were tufts of ovarian stroma spread over the adjacent pelvic peritoneum.

The mature human ovum measures $\frac{1}{120}$ of an inch in diameter. It is provided with a germinal vesicle which has a diameter of $\frac{1}{300}$

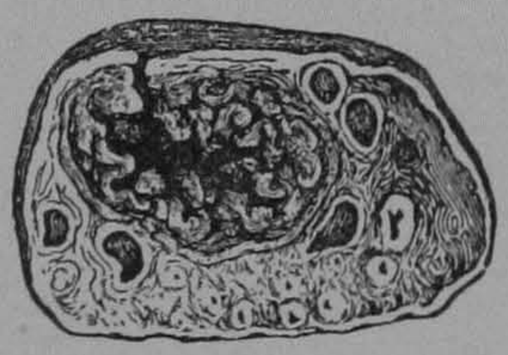
FIG. 303.



Section of Ovary.

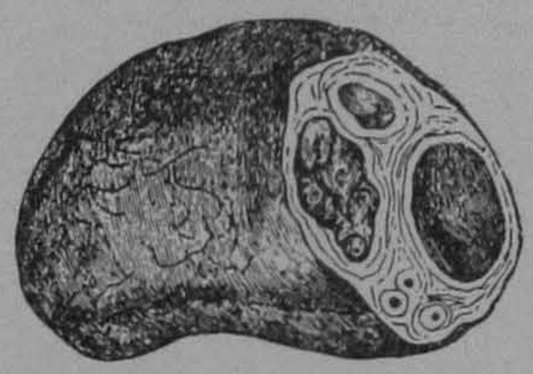
of an inch, and within it a germinal spot whose diameter is $\frac{1}{3000}$ of an inch. As the ovum matures it moves from the centre to the periphery of the follicle; induced by the secretion of liquor folliculi contained in its discus proligerus, it is impelled against the thinned wall. This wall consists of two layers—an outer, the stroma of the

FIG. 304.



Typical Corpus Luteum, fifteenth day from the beginning of menstruation.

FIG. 305.



Freshly ruptured Follicle, twenty days after the beginning of the last menstruation.

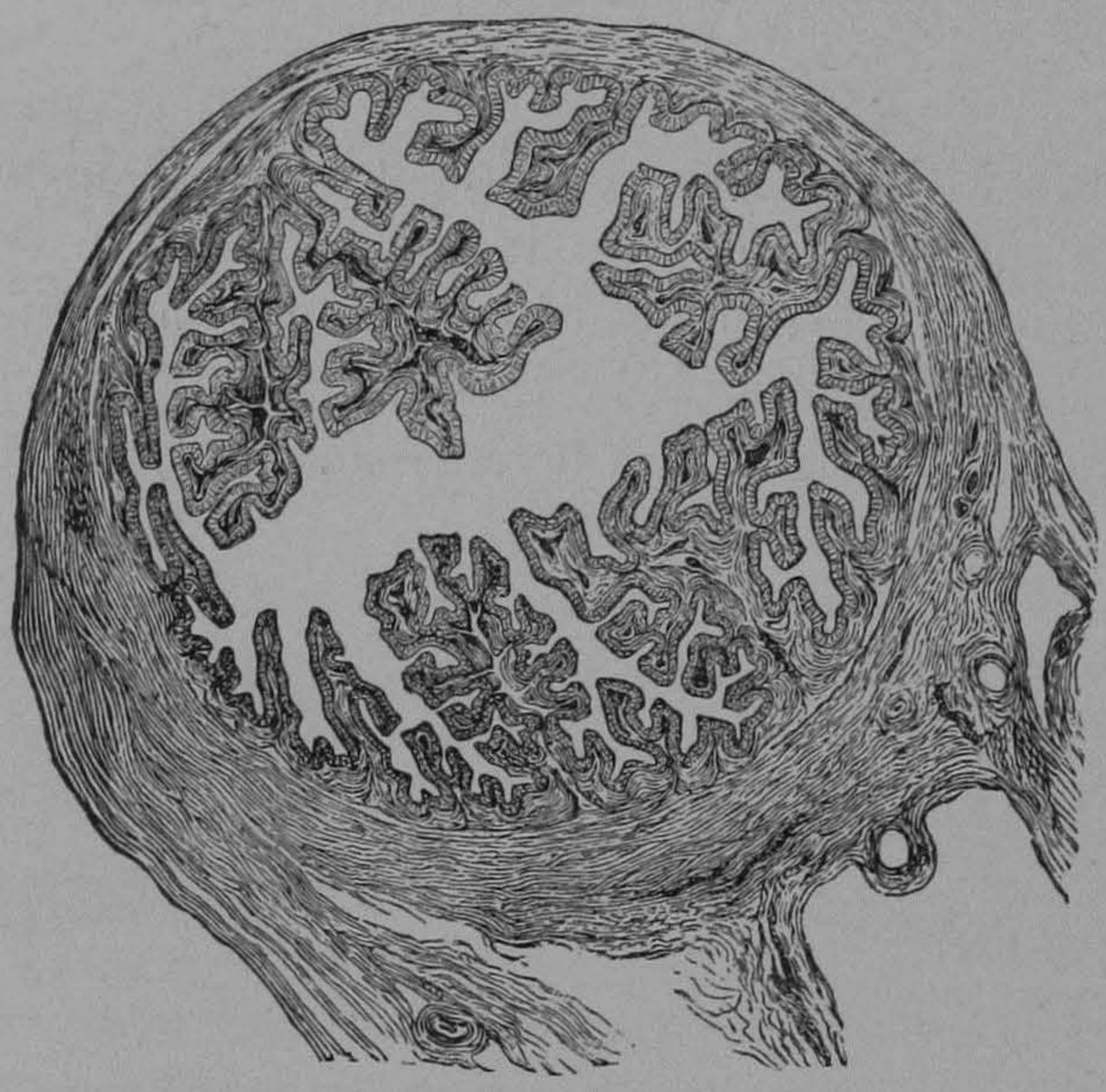
ovary, and an inner, the follicular epithelium. The ovisac is most vascular at the point of rupture, and as the ovum escapes into the peritoneum or oviduct the ruptured vessels bleed and fill up the space with a clot. This clot, as it contracts, becomes known as the corpus luteum. If fecundation of the ovum has occurred, the act

of conception leads to greater vascularity and the formation of a large clot, designated the true corpus luteum to distinguish it from the false or small, less durable formation of ordinary unfecundated ovulation.

The true corpus luteum is largest about the eleventh week, and continues to the end of pregnancy. The false rapidly becomes smaller and presents a bright and shining centre. The successive rupture of matured follicles leaves cicatrices upon the surface of the ovary.

Fallopian Tube.—Projecting from each side of the fundus of the uterus, just posterior to the round ligament, and occupying the superior fold of the broad ligament, is the Fallopian tube. Its average length is about four inches, and its greatest width is at the outer extremity, called the fimbriated extremity, infundibulum, or morsus diaboli. Its orifice is called the ostium abdominale, and is surrounded by four or five large and eight or ten small fimbriæ, which are continuous with the mucous lining of the tube, and one of which, the fimbria ovarica, extends to the ovary. The narrow-

FIG. 306.



Transverse Section of the Fallopian Tube of a Macaque Monkey.

est portion of the tube is the inner or uterine end, an inch long, which is known as the isthmus. Its orifice is called the ostium internum. The diameter of the isthmus varies from one-twelfth to one-sixth of an inch, while the diameter of the ampulla, or outer

portion of the tube near the ostium, is from one-fourth to one-third of an inch. At its origin the tube is directed upward and backward; the ampulla curves upon itself until the infundibulum or fimbriated extremity is directed toward the ovary. The fimbria ovarica has upon its upper surface a groove bordered by small fringes or fimbriæ. Along this furrow passes the ovum to the oviduct as it

FIG. 307.

Recess of the Tubal Mucous Membrane of the Panolian Deer.

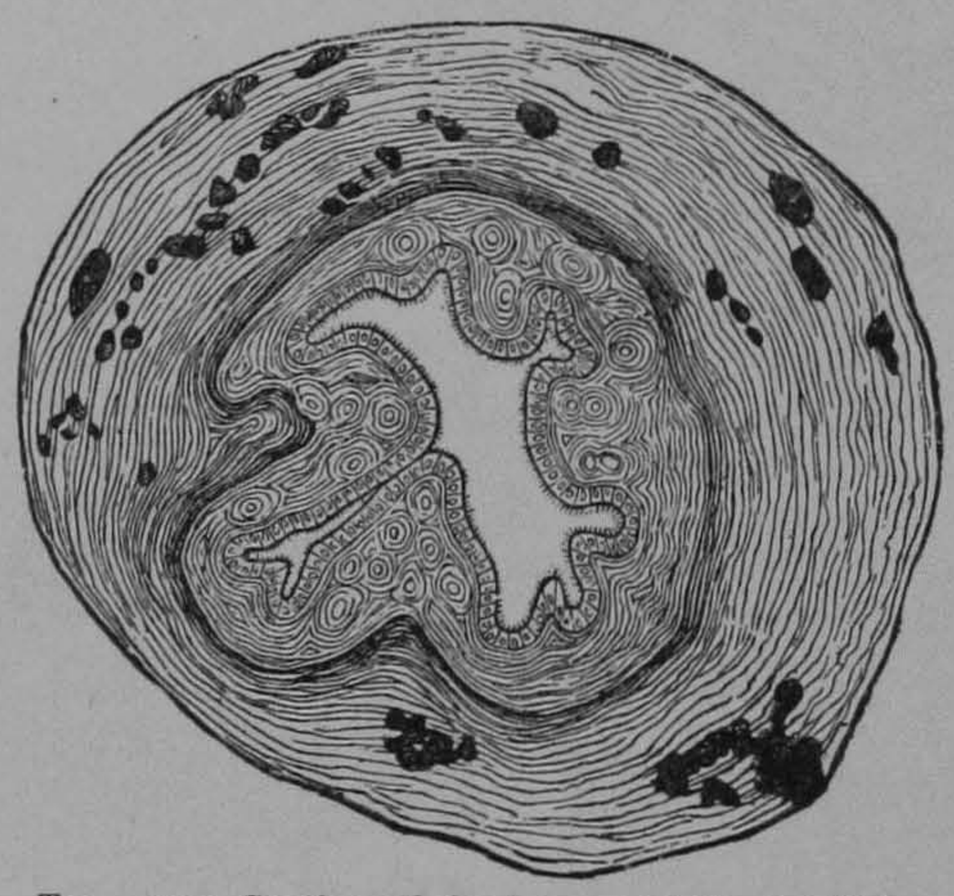
escapes from the ovary, doubtless facilitated by the current produced by the wave-like motion of the cilia.

The Fallopian tube has three coats or layers—the peritoneum, which does not completely encircle it, forms the mesosalpinx; the muscular consists of longitudinal and circular fibres; the internal coat consists of the mucous membrane. The latter contains no glands, and is thrown into longitudinal furrows and projections. Comparison of Figs. 306, 307, and 308 shows that the arrangement of the folds of the tube in the lower animals is much more complex than it is in the

human female. These folds possess the characteristics of glandular structure. The membrane is lined with ciliated columnar epithelium. "The function of the latter," says Tait, "is to expedite the passage of the ovum to the womb, and to limit the opportunity for entrance of the spermatozoa." This theory obligates conception, as a rule, to occur in the uterus, but the repeated occurrence of ectopic gestation, in cases in which careful examination has failed to disclose any abnormal condition of the membrane between the gestation-sac and the uterus, goes far to discredit the theory.

The most important change taking place at puberty is in the structure of the tube. It becomes more vascular, its muscular structure is developed, and the epithelial layer is fully formed. These changes result in the functional movement through which

FIG. 308.



Transverse Section of the human Fallopian Tube.

pregnancy is rendered possible. As has already been noted, ovulation has repeatedly occurred prior to puberty, but the ovum has been lost in the peritoneal cavity. Ovulation may continue after the menopause, though the ovaries have become atrophied, but the tubes will then have become straightened, and again fail to carry the ovum to the uterine cavity.

The ovary and tube are situated in the folds of the broad ligament, the superior fold being occupied by the latter. The ligament is continued to the ileo-pectineal line by the infundibulo-pelvic ligament. Between the tube and ovary, and within the fold of the broad ligament, is an embryonal body, which consists of a number of small tubes and cysts, and is known as the parovarium or organ of Rosenmüller. It is most probably the remains of the Wolffian

body. The tubes of which this body is composed sometimes extend into the hilum of the ovary, and thus afford, according to some authorities, a congenital source of origin for some forms of ovarian cyst. A small, thin-walled cyst, known as the cyst or hydatid of Morgagni, hangs from the posterior surface of the Fallopian tube by a long pedicle. It has no pathological significance.

Malformations of the Ovary and Tube.

Congenital absence of both ovaries occurs but rarely. When this malformation occurs, it is generally associated with defective development of the uterus. In such patients the physical changes in conformation incident to puberty do not occur, and the individual more closely resembles in appearance the male. When one ovary is absent, there is likely to be a deficiency in the development in the corresponding half of the uterus and tube. In a number of cases there has also been an absence of the corresponding kidney. A third or accessory ovary is very infrequent.

Doran asserts that small fibro-myomata in the ovarian ligament have been mistaken for supernumerary ovaries. Small islets of ovarian tissue have been found upon the peritoneum. Such a condition or the incomplete removal of an ovary undoubtedly has been the cause of menstruation subsequent to oöphorectomy.

Where the ovaries are absent or marked failure in their development has occurred, the sexual functions are never performed normally. The absence of one ovary or its serious involvement by disease constitutes no obstacle to either sexual intercourse or conception. It is very important to determine, if possible, that the ovaries are absent or rudimentary, as when these conditions are once recognized, the absolute futility of any measures to establish menstruation is demonstrated.

Malformations of the Tubes consist chiefly in defective development of the fimbriæ at their abdominal ends. The tube may be unusually short or have supernumerary ostea or openings. These openings may be provided with fimbriæ or the latter may be absent. An unusually convoluted tube is sometimes observed, evidently due to its defective development, resembling the condition seen in women prior to puberty. At times the convolutions of the tube form actual strictures, which contract its cavity sufficiently to render the woman sterile.

Displacements of the Ovary and Tube.

Hernia through the inguinal canal is a rare condition. It is generally found upon the left side. Hernia of the ovary may occur without the presence of any other organ in the hernial sac, unless it be the Fallopian tube. The presence of the ovary is generally secondary, however, and results from adhesions to the omentum and the intestines.

Most probably the first surgical removal of the ovaries was performed by Potts for ovarian hernia. The displaced organs may readily be mistaken for glands or labial tumors. The constant presence of a tumor, its physiological character, the dull, sickening pain, and extreme nausea, should aid in the diagnosis. The ovary has also been known to make its exit through the crural canal, the greater sacro-sciatic foramen, and the umbilicus. Such displaced organs may become cystic. Chenieux has reported a cyst of this variety in the right buttock which was mistaken for a lipoma.

Treatment.—Taxis should be judiciously and carefully exercised, the ice-bag or the sand-bag may be applied, and after reduction has been effected, a truss should be worn. If the symptoms are annoying and reduction cannot be accomplished, the sac should be incised and the ovary replaced or removed, according to its condition.

Prolapsus Ovarii.—Displacement of the ovary may be dependent upon, or independent of, the position of the uterus. When the latter organ is retroverted or -flexed, the ovary is no longer supported upon the broad ligament, but hangs from it. The ovary may rest in front of the uterus, but it generally lies beneath that organ in the cul-de-sac. The ovary may be displaced, while the uterus retains its normal position. The left ovary is most frequently displaced.

The prolapsed organ is exceedingly tender, and is the cause of dysuria, dysmenorrhea, and pain during coition and defecation. The pain during and following the marital act may be so great as to preclude its performance. The paroxysms may continue for more than an hour subsequent to defecation.

Etiology.—Prolapsus is generally a sequel of gestation; the broad ligament becomes extended and the infundibulo-pelvic ligament may give way. Enlargement of the ovary from chronic inflammation or perimetritis may be important factors.

Diagnosis.—By vaginal and rectal palpation a mass is deter-

mined which when movable can be displaced upward, or whose pedicle can be recognized when the tumor is pressed downward. It is exceedingly sensitive, and pressure upon it causes a peculiar sickening sensation, similar to that produced by pressing an inflamed testicle.

In displacements complicated by severe inflammation the ovaries and tubes may be fixed behind the uterus.

TREATMENT.—The first consideration should be rest. The bowels must be carefully regulated and the marital relation be absolutely prohibited. The patient may be placed in the genu-pectoral position and the organs pushed up and maintained by a suitable pessary. The reinforced pessaries prove the most satisfactory, as their thickened posterior bar affords more efficient support and decreases the possibility of the organ being pinched between the pessary and the sacrum. The occurrence of this accident is attended with agonizing pain, rendering the patient unable to move until the pressure is removed. When various pessaries have been unsuccessfully tried, and the patient is incapacitated for her duties, abdominal section should be performed, and ovarian fixation effected, either by restoring the infundibulo-pelvic ligament or suturing the pedicle of the ovary to that part of the anterior parietes corresponding to the exit of the round ligament. This operation may be associated with ventro-fixation of the uterus, when retroversion of that organ complicates the displacement. Descent of the ovary alone never justifies extirpation. The latter procedure should only be considered when the displacement is associated with marked oöphoritis or peri-oöphoritis.

CONGESTION OF THE OVARIES.

The ovaries are physiologically congested in ovulation and during coition. This congestion in excess or prolonged becomes pathological. An over-congestion of the ovaries is not infrequent at the establishment of the menstrual function, especially in individuals in whom the mental faculties have been developed at the expense of the physical structure. Girls are often too closely confined to school and to the study and practice of music when Nature requires her forces in order to secure perfect development. Blood may extravasate into the follicles and stroma of the ovary, more frequently into the former. The hemorrhage into the follicles may distend the ovary to the size of a hen's egg or even to that of an orange. Later, this is converted into a pigment the consistency of honey, having a

rusty chocolate color. Winckel has reported similar conditions associated with heart disease, typhoid fever, phosphorus-poisoning, and in extensive burns. The follicle generally does not rupture, but the ovarian tissue is completely destroyed. A case came under the observation of the author in which each ovary was distended to the size of a small orange, and consisted of thin-walled cysts filled with dark grumous blood. Follicular apoplexy, as well as ovarian congestion, generally occurs in the sexually immature. It may terminate in absorption, or the ovary may rupture and a large hemorrhage take place into the peritoneal cavity, causing fatal peritonitis.

The principal symptom of congestion of the ovary is pain in the lateral regions of the pelvis for a week or ten days prior to the appearance of the flow, which becomes less or disappears with its cessation. The escape of blood relieves the engorged organs, and the only period of comfort is experienced during menstruation. The flow is prolonged and excessive, frequently amounting to a hemorrhage. The patient becomes weak, pale, and anemic.

DIAGNOSIS.—The existence of this condition should be suspected from the age, near puberty, the excessive and prolonged flow, anemic appearance, weakness, pain, and tenderness within the pelvis —which is generally more marked upon the left side—and not infrequently pain in the corresponding mammary gland. Follicular apoplexy is rarely recognized, as it presents no distinctive symptoms.

TERMINATION.—Ovarian congestion under proper hygiene and treatment may disappear. Where it continues, it is transformed into chronic inflammation. The collections of blood in follicular hemorrhage may be absorbed, leaving an enlarged cicatrix, or they may break down and destroy the ovarian structure, forming an ovarian hematoma. Extensive hemorrhage with rupture of the ovary may cause pelvic hematocele, or even death.

TREATMENT.—Attendance upon school, and particularly the study of music, should be discontinued; the reading of emotional literature interdicted; and out-door pursuits encouraged, such as horseback and bicycle riding and walking. City girls should be sent to the country or sea-shore. Regular action of the bowels should be secured, and a generous diet afforded, from which sweets and pastry must be largely excluded. A morning sponge-bath, followed by friction with a coarse towel, will be serviceable. Rest in

of Ergot ½ dram. Ergotine 2 grains in capsules. Triturate of Hydrastin in 1/8 or 1/4 grains 3 times a day (tablets or capsules) Potass. Bromid, grains 15. Potass chlorate, 5 grains.

bed for a few days prior to and during the entire menstrual period should be the rule. If the flow is excessive, the period should be preceded for a few days by the administration of one of the following remedies: fluid extract of ergot ʒss, ergotine gr. ij in capsule, or a capsule or tablet triturate of hydrastinin, gr. $\frac{1}{8}$ to $\frac{1}{4}$, three times daily. During the menstrual intervals potassium bromide, gr. xv, or potassium chlorate, gr. v, administered three times daily, with such tonics as quinine, strychnine, and the bitter tinctures should be given.

The anemia may tempt one to resort to the use of the salts of iron, but experience teaches that this remedy is of service only after the tendency to hemorrhage has ceased. Its earlier administration but aggravates the tendency to bleeding.

Oöphoritis and Perioöphoritis.

Inflammation of the ovary may be acute or chronic. Anatomical distinctions of parenchymatous, follicular, and interstitial are made, but such distinctions are rarely determined clinically.

Acute Oöphoritis.

In acute inflammation the ovary becomes enlarged, filled with cysts, or is œdematous; the cysts are filled with a cloudy serum looking like pus. The ovary may in a few days become three or four times its normal size. The cut surface will exude a large quantity of serous fluid, while in more severe grades a number of purulent yellow streaks will be seen starting from the hilum. A smeary mass will be discharged in some cases, while in others there will be the distinct pus-collection of an abscess. The organ may attain to the size of a man's head, though generally it is not larger than a hen's egg, when it produces the sensation to the examining finger of a firm mass. An inflammation of the ovary may progress to the formation of abscess, and subsequently the watery contents be absorbed, leaving a cheesy mass. In the milder forms of inflammation resolution may take place. The connective tissue undergoes retraction, depressing the surface here and there, producing premature involution or cirrhosis of the ovary. The ovary may be reduced to the size of a hazelnut. This form of inflammation is prone to affect both ovaries, while the abscess is usually found in but one. In perioöphoritis the capsule of the ovary becomes thickened; the entire organ is

bound down by perimetric bands of adhesions. The thickening of the capsule renders it less likely to rupture with the ripening of the Graafian follicle, and a small cyst remains. Under the influence of disturbed circulation a large number of follicles may mature at once, producing a cystic ovary. The partitions frequently break down, and a large cyst is formed.

ETIOLOGY.—The principal causes of acute oöphoritis are—injury, septic poisoning after parturition or abortion, gonorrhea, arsenical or phosphorus-poisoning, the exanthemata, acute rheumatism, and long-continued endometritis.

Sepsis, without doubt, is the most frequent cause; the next frequent is gonorrhea. Septic inflammation is very likely to result in abscess and a more or less extensive peritonitis. The left ovary is more prone to be the seat of such a destructive process, due, according to some authors, to the difference in its circulation. Gonorrhea produces perioöphoritis with a binding down of the ovary by adhesions.

SYMPTOMS.—The patient complains of intense, lancinating pain, generally over the left inguinal region, associated with extreme tenderness, elevated temperature, rapid pulse, and frequent chills. In perioöphoritis the symptoms are less marked than are those of mild peritonitis.

COURSE AND TERMINATION.—Acute oöphoritis may terminate in resolution and disappearance of the abnormal symptoms, the development of an abscess, its rupture, and the occurrence of a rapidly-fatal infective peritonitis, or the disease may become chronic.

TREATMENT.—The treatment should consist in absolute rest in bed, the administration of salines until free purgation is secured. Tincture of aconite, gtt. j–ij every hour, is of value. Leeches may be applied to the perineum and an ice-bag to the seat of pain, or, where better borne, hot fomentations with opium, morphine given by the rectum, or where pain is very severe the morphine may be given hypodermically. When an abscess forms, the only acceptable treatment is surgical, as considered in the chapter on Pelvic Inflammations.

CHRONIC OVARITIS.

Chronic inflammation is much more common than the acute disorder. It occurs during the period of sexual activity, and more frequently in the married. The ovary may be enlarged, presenting

a number of cysts with little interstitial growth or increase of the fibrous tissue of the organ; subsequent atrophy, known as cirrhosis, occurs. The ovary may be fixed in the pelvis by an extensive infiltrate, so that it is immovable and scarcely to be distinguished, or it may be movable and prolapsed into the retro-uterine pouch.

ETIOLOGY.—Chronic ovaritis may be the sequel of the acute disease and due to the same causes. It is produced also by excessive sexual intercourse, masturbation, sexual excitement without gratification, suppressed menstruation, and to operations upon the cervix.

SYMPTOMS.—Pain is an inevitable feature, experienced with the greatest intensity in the groin and with the greatest frequency upon the left side. It is persistent, increased by locomotion, by a misstep, or by jolting. It is greatly exaggerated as the menstrual period approaches. If the flow is free, amounting to a menorrhagia, the pain is relieved or may disappear; if it is but slight, the pain increases. When the pain from any cause is intensified, it extends down the thighs and over the sacrum. Not infrequently pain is felt in one or both mammary glands of such intensity as to lead the patient to suspect the existence of malignant disease. Symptoms of spinal irritation and attacks of migraine are frequent near the menstrual periods. Hysteria or hystero-epilepsy may be an accompaniment. Sterility is an almost constant result. The ovaries are generally tender to pressure, though they may not be to any considerable degree enlarged. When prolapsed behind the uterus with that organ resting upon them, they are sensitive to the slightest pressure, and cause pain in defecation, and especially in coition. Frequently the marital relations are so painful and produce so much distress that they are necessarily discontinued. Physical examination must be conducted with great care. When the organs are prolapsed and fixed behind the uterus by inflammatory exudate, the careless observer may mistake the condition for retroflexion of the uterus.

DIAGNOSIS.—The determination of large and sensitive ovaries, exaggerated distress for a week or ten days prior to menstruation, mammary pain, with painful defecation and coition, leave but little room for doubt. When the physical signs obtained by vaginal touch are obscure, rectal examination will be of great service and should be a routine practice. Where the abdominal walls are rigid or the pelvic organs very sensitive, an examination under

anesthesia may be of value in supplementing or confirming the diagnosis.

TREATMENT.—Where it is possible, the removal of the sources of irritation which have led to the production of the disease should be the first consideration. The marital relation should be suspended or infrequently practised; vigorous exercise or long standing upon the feet should be avoided. The patient should rest in bed during menstruation. Blood may be abstracted by leeches to relieve severe pain. Counter-irritation with iodine, blisters over the region of the ovaries, or mercurial inunctions may be beneficial.

Internally, the administration of the potash salts, as the iodide, bromide, or chlorate, alone or in association with the bitter tonics, as nux vomica and cinchona or their alkaloids, strychnine or quinine, often give marked relief.

Benefit has been claimed from the following:

℞. Auri et sodii chloridi, gr. $\frac{1}{20}$;
Extractum cannabis indicæ, gr. ss.—M.
Ft. cap.
Sig. Take one capsule three times daily.

FIG. 309.

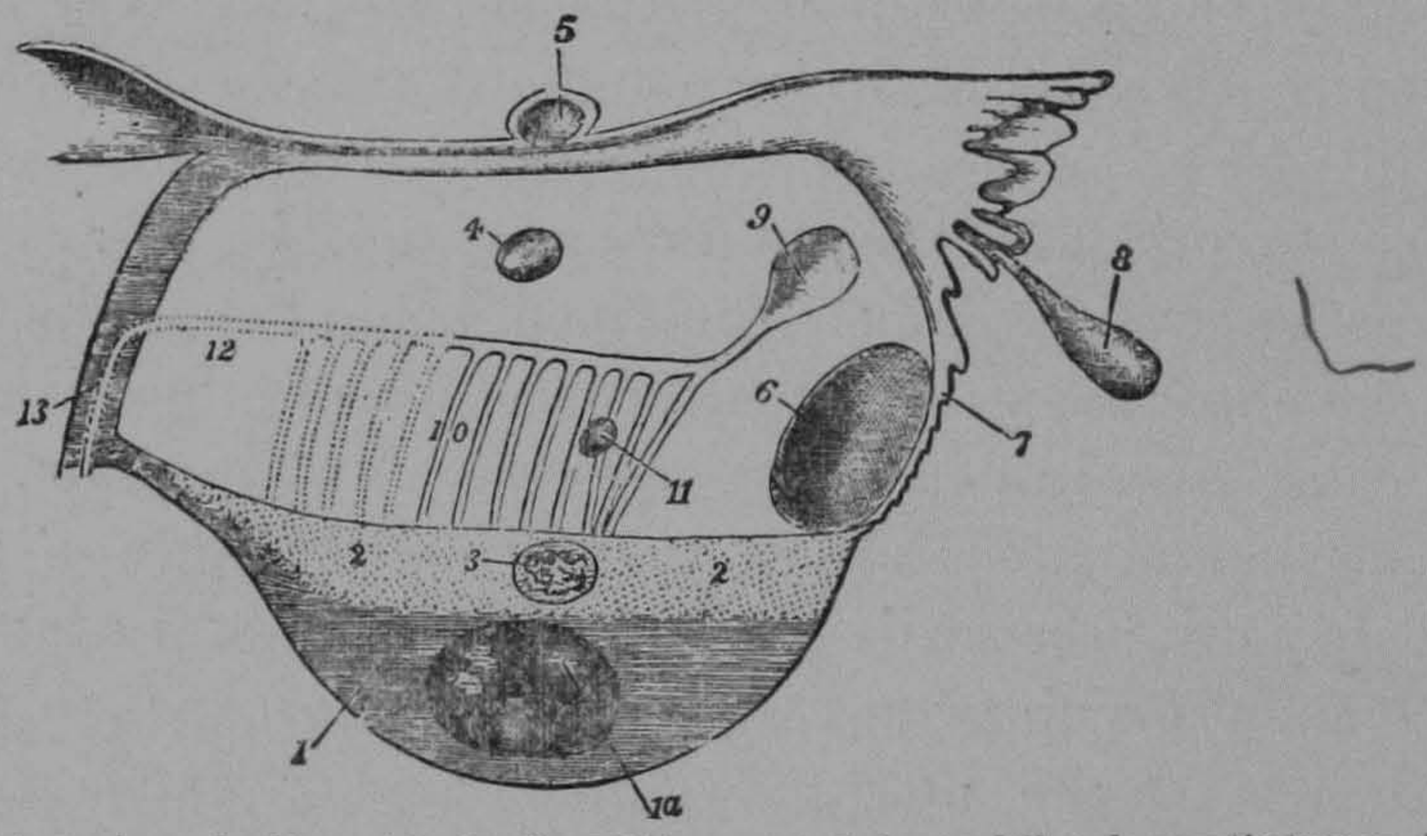


Diagram of the Structures in and adjacent to the Broad Ligament: 1, 1*a*, multilocular cystic tumor, developed in 1, parenchyma of the ovary; 3, papillomatous cystic tumor of the ovary in 2, tissue of the hilum of the ovary; 4, simple broad-ligament cyst, independent of the parovarium, 10, and the Fallopian tube; 5, a similar cyst in the broad ligament above the tube, but not connected with it; 6, a similar cyst close to 7, ovarian fimbria of the tube; 8, hydatid of Morgagni (this never appears to form a large cyst); 9, cyst developed from the horizontal tube of the parovarium; 11, cyst developed from a ventricle tube (cysts of this kind form the papillomatous tumors of the broad ligament); 12, 13, tract of the obliterated duct of Gaertner (papillomatous cysts are said to be developed along this tract).

Ichthyol has frequently been found of service; its beneficial influence may be secured by administration by the mouth, by suppository, either vaginal or rectal, and through abdominal inunc-

tion. Fixation of the ovaries may be overcome by the judicious use of pelvic massage. The severity of the attacks of pain may be much ameliorated by the administration of ten drops of tincture of pulsatilla, four times daily preceding the expected attack, and continuing it until the menstrual flow has been well established.

In severe cases, or where all palliative measures have failed to ameliorate the distress, and the general health is being gradually undermined, the offending organs should be removed.

Ovarian Neoplasms.

The neoplasms of the ovary may be divided clinically into cystic and solid growths. The cystic tumors include simple, proliferating, and dermoid cysts. The solid tumors are fibromata, sarcomata, and carcinomata, and are comparatively rare. Cysts may originate in any part of the tubo-ovarian structure, as the cortical, medullary, or parenchymatous structure of the ovary; in its inferior border or hilum; in the structures between the tube and ovary known as Rosenmüller's organ or the parovarian structures; and in the hydatid of Morgagni, the extremity of the canal of Müller. Cysts are developed also in the folds of the broad ligament, and are known as broad-ligament cysts. The cysts may be unilocular with limpid contents, or multilocular with contents varying in different cysts, some clear and

Fig. 310.

Broad-Ligament Cyst, Fallopian Tube and Ovary.

limpid, others thick and viscid or discolored with the admixture of blood, pus, or fat. The broad-ligament cysts are generally unilocular, containing clear fluid; those originating in the hilum, papillary; and in the parenchymatous tissue of the ovary, glandular.

The cysts may be divided pathologically into simple, proliferating, dermoid, and parovarian, or, according to size, into small and large cysts.

Under small cysts may be described, first, small residual cysts developing from Morgagni's hydatid or the horizontal canal of the parovarium; second, follicular; third, cysts of the corpus luteum; and fourth, tubo-ovarian cysts.

The large cysts include, first, the glandular proliferous; second, the papillary proliferous; third, dermoid, simple or mixed; fourth, parovarian, including several varieties, as hyaline, papillary, and dermoid.

Cysts of the Hydátid of Morgagni.—Attached to the fimbriated end of the Fallopian tube is generally found a cyst varying from the size of a pea to that of a cherry. It is transparent and has a thin wall. This hydatid is the remains of the extremity of Müller's canal, and is rarely absent. The length of its pedicle varies in dif-

FIG. 311.

Cyst of the Organ of Morgagni.

ferent individuals. It is sometimes nearly an inch in length, and very thin; in other cases it is short and thick. Doran describes a supra-tubal cyst about the size of the former and of the same appearance and structure. It is supposed to be a micro-cyst of the broad ligament which has slipped under the serous membrane and attained this unusual position.

Micro-cysts of the Broad Ligament.—These are small cysts which develop in the structure or are suspended from Rosenmüller's organ: other cysts are found free and are of undetermined origin. Only those which originate from the vertical tubes of the parovarium have ciliated epithelium, and are likely to subsequently develop into

papillary growths. The others, and even those which start in the horizontal tube, may become detached from the broad ligament and hang by a slender pedicle. These micro-cysts may possibly be the starting-points for large cysts with either fluid or papillary contents.

Simple or Follicular Cysts.—These cysts are formed from unruptured Graafian follicles which become dilated. In an ovary which has not attained to twice its normal size may be found fifteen or twenty of these cysts. They were long considered as the only source of large ovarian cysts. It has, however, been discovered that it is only in rare cases that they attain to the size of a fist, or at the utmost to that of a man's head. They contain a light serous fluid with a specific gravity of 1005 to 1020. The cyst-wall is thin, has a light-gray color, and is in large part a transparent membrane. The disease is generally bilateral.

Etiology.—These cysts, even when of large size, are regarded as dilated Graafian follicles, because of the different gradations observed between them and the smaller cysts. In the smaller size ovula may be detected, which may have been destroyed or have escaped observation in the larger.

Dropsy of the follicle is occasioned by its failure to rupture with the increase in its fluid contents. The rupture may be prevented by its deep situation, thickening of the tunica albuginea, or deposits of peritonitic exudation over the surface of the ovary. It may also be caused by too slight a menstrual congestion, which, though increasing the secretion, is insufficient to produce rupture.

Cyst of the Corpus Luteum.—This cyst was first described by Rokitansky, who believed that the corpus luteum of pregnancy only could be transformed into a cyst, but such cysts have been found in the nulliparæ. They are generally not larger than a walnut, but cases have been described in which they have attained the size of an orange or an apple. Nagel even speaks of one which had reached the size of the adult head. Microscopical examination shows in the walls the bud-like papillæ characteristic of the corpus luteum. The recognition of this prevents their confusion with follicular cysts, or even with suppurative ovaritis.

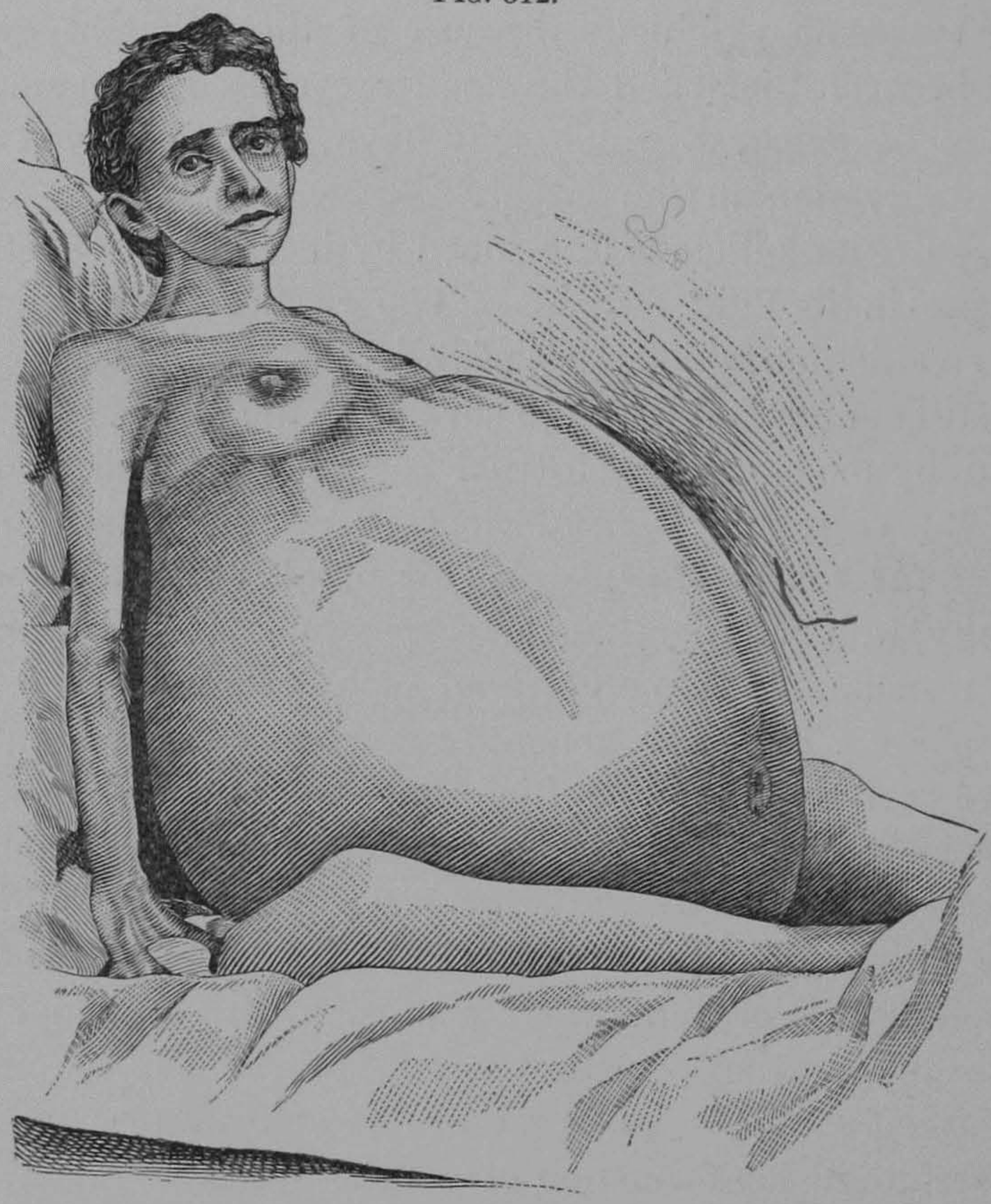
Tubo-ovarian Cysts.—The presence of an ovarian cyst not infrequently results in the formation of a tubo-ovarian cyst through its proximity to a distended tube. Tubal inflammation early results in fastening the ostium of the tube to the ovary by firm adhesions. A dilated follicle or a small cyst may readily rupture into a distended

tube, with which it is in juxtaposition, and form one sac, the smaller part of which is generally furnished by the tube. It does not usually attain to a large size. The Fallopian tube may remain permeable, and as the fluid increases the overflow passes into the uterus; a condition known as profluent ovarian hydrops is thus formed. It may be compared with the condition engendered by hydrosalpinx known as profluent hydrops tubæ. The open tube may act as a safety-valve, preventing the growth and over-distension of the cyst, and in some cases leading to its complete prolapse after every evacuation.

Large Cysts.—Proliferating Cystomata.

The term "proliferation," as applied to cysts, refers to those which are highly organized and abundantly supplied with blood-vessels.

Fig. 312.



Large Ovarian Cyst, weighing 149 pounds.

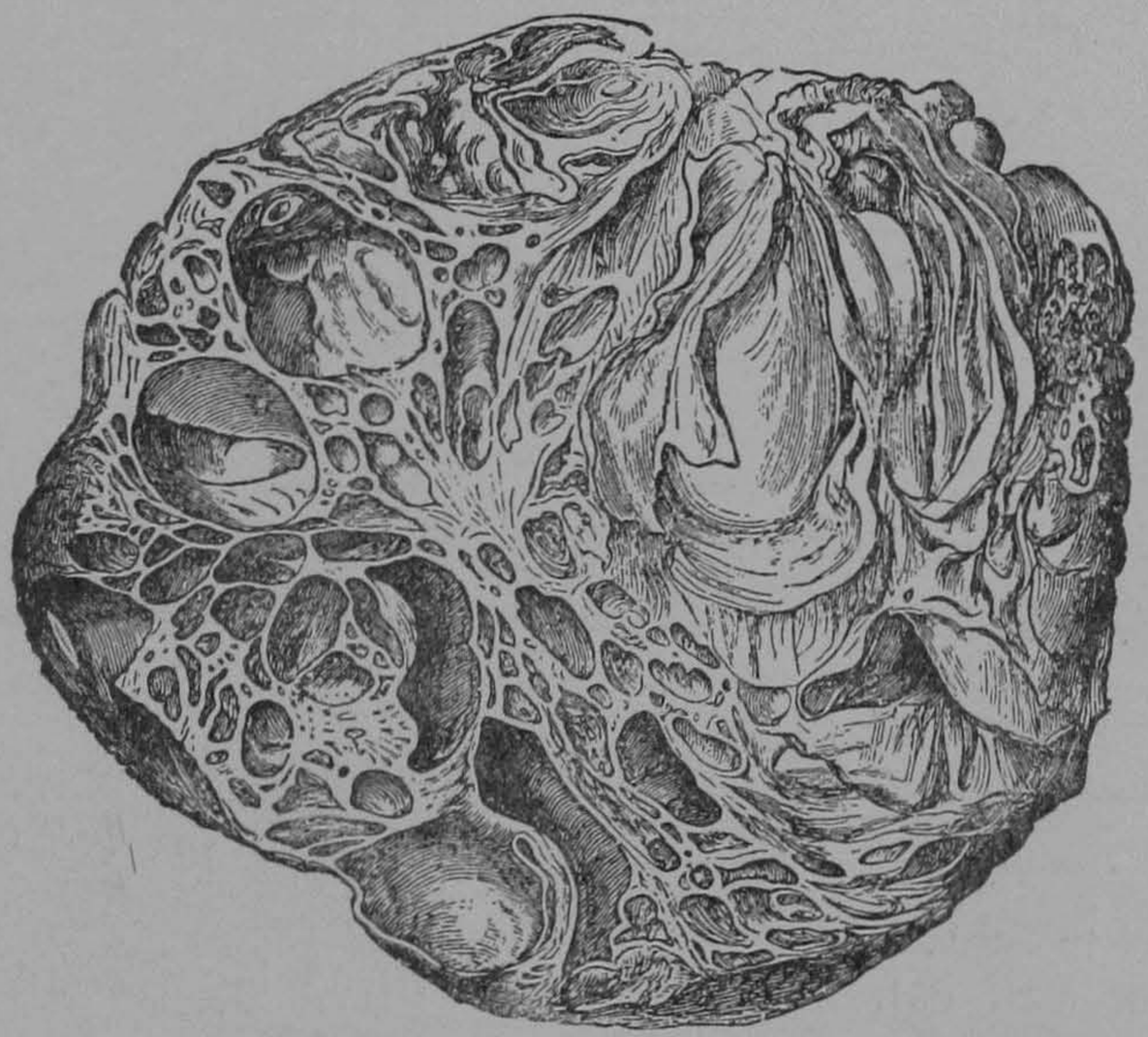
The term "proligerous cysts" is also applied to them, and indicates their faculty of budding and generating new cysts from or within

the original growth. In shape they may be spherical and regular in outline, simulating the presence of a single cyst, or irregular, presenting nodules, indicating a multilocular tumor.

They may vary from the size of an egg to that of a tumor weighing more than one hundred pounds, filling up the entire abdomen and encroaching upon the thoracic viscera. When exposed the cysts present a pearly-white, glistening appearance. The thinner portions are purple, green, or black according to the color of their individual contents. The external surface may be smooth and oily, covered with papillary growths or mucous vegetations. The tumor generally has a distinct pedicle. The consideration of the internal structure of ovarian cysts justifies their division into areolar, unilocular, and multilocular.

Areolar.—When an areolar cyst is opened it is found filled with spurs or trabeculæ of small cysts which have ruptured to form a large main cyst, or it may be made up of a large number of small

FIG. 313.



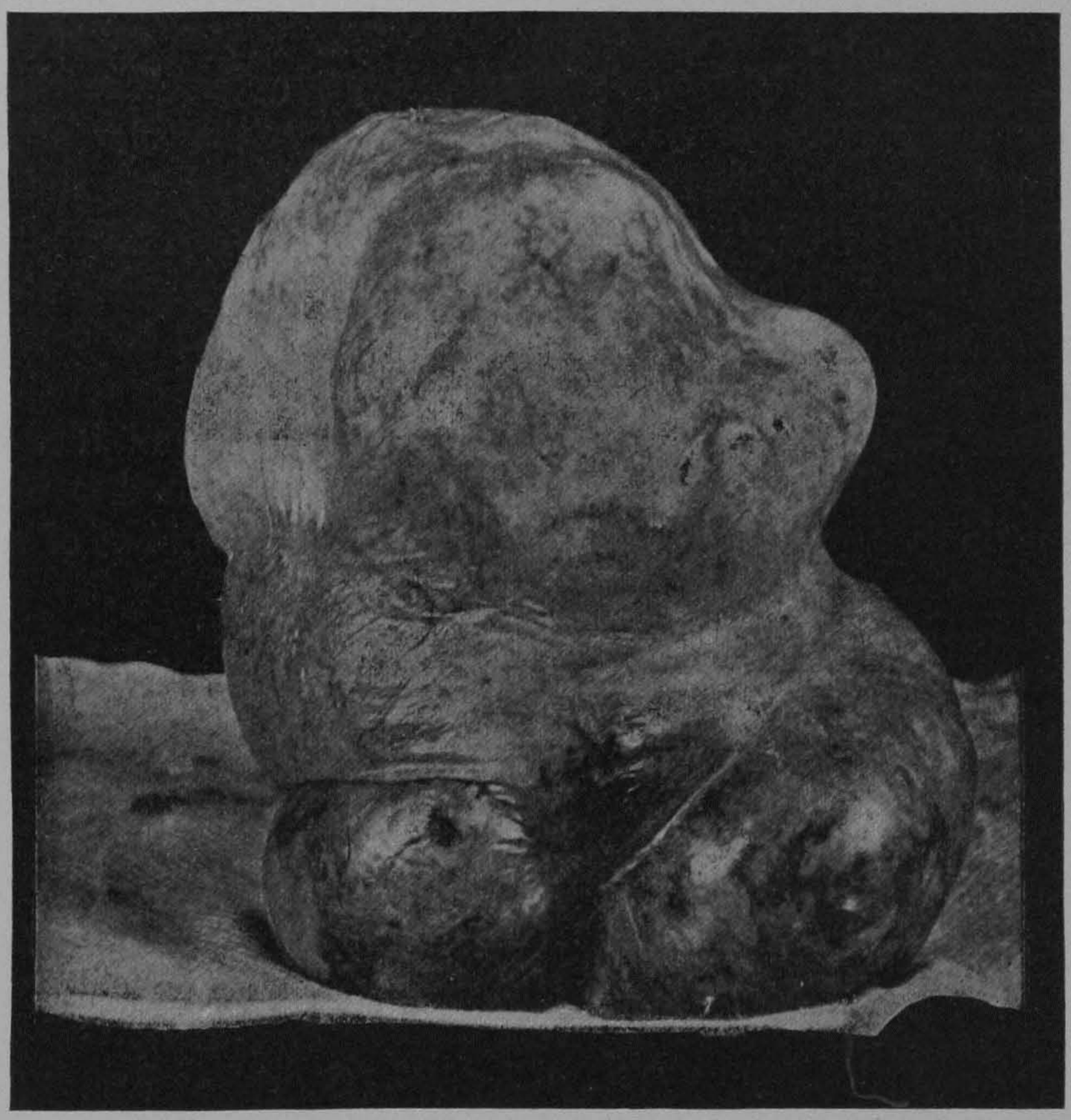
Proligerous Glandular Ovarian Cyst of areolar appearance.

cysts bound together by loose connective tissue almost gelatinous in appearance. In a tumor of this kind, removed from a young woman, a large number of small cysts were found. Although the tumor was as large as a pregnant uterus at full term, it contained no cyst larger than a good-sized plum.

Unilocular cysts attain to an enormous size, but are found to

contain evidences of previous division into smaller cysts, and it may be asserted that all unilocular cysts arise from the multilocular: even in the large tumors close examination will disclose small cysts in their walls.

FIG. 314.



Multilocular or Glandular Cystoma.

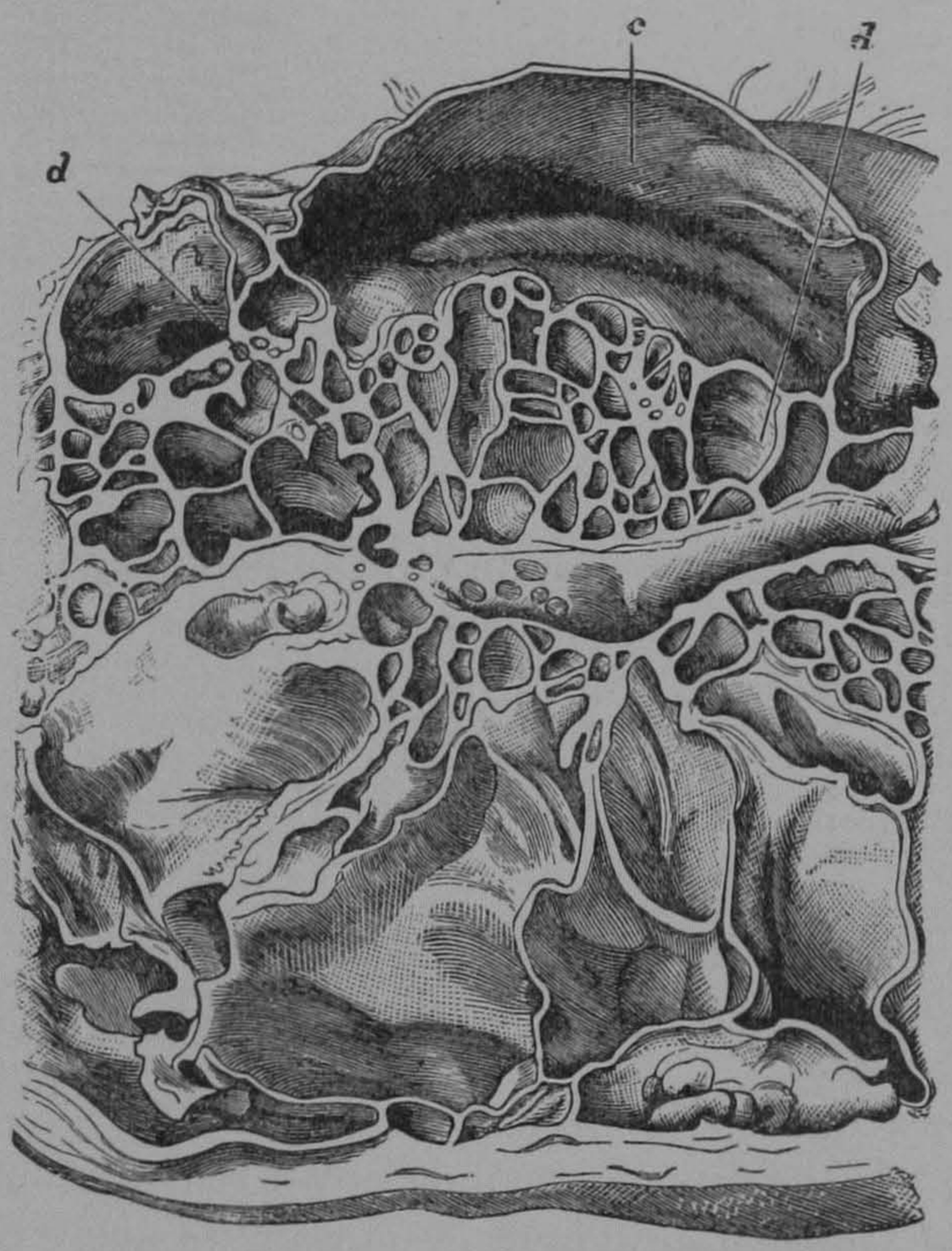
Multilocular cysts are so called because they contain a number of cysts of nearly equal size, so arranged as to present the appearance of one large cyst.

The cyst-wall can be divided into three layers—an outer and an inner of fibrous, and a middle layer of connective tissue. In the latter the vascular supply is distributed, and it sometimes contains vessels as large as the femoral vein. In areolar cysts these vessels can be seen coursing upon the surface, and when wounded may cause dangerous or even fatal hemorrhage. Large vessels are frequently found free in the gelatinous contents of large cysts, and remain after the destruction of the former septa. Such vessels may be the source of hemorrhage into the cyst.

The external surface of the cyst is covered by columnar epithelium differing from the pavement epithelium of the peritoneum. The internal surface is lined by low cylindrical cells. Section of the cyst-walls shows depressions of the endothelium resembling acinous glands with a narrowed opening. The lining membrane may be covered with vegetations formed from proliferated stroma, simulating myoma or fibro-sarcoma. These tufts are covered with a single layer of endothelium. Epithelial prolongations of a tubular form may penetrate from below upward, presenting the appearance of carcinoma.

The contents of the cysts often present marked contrasts in

FIG. 315.



Portion of an Ovarian Adenoma, showing the varieties of loculi: *c*, primary; *d*, secondary.

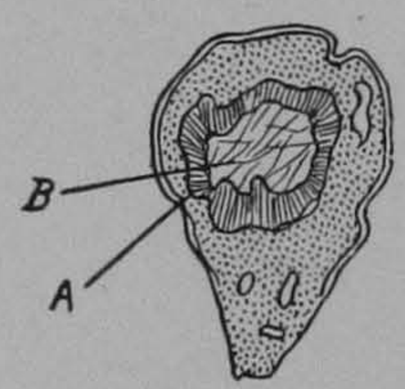
color or consistency; thus they may be found either almost colorless, straw-colored, green, purple, or black in color, thin, and thick, viscid, or gelatinous in consistency. The contents may vary in color and consistency in different cysts of the same tumor. The fluid in the smaller cysts is generally more consistent and becomes thinner as they increase in size, the result of changes in the structure of the epithelium.

Proliferating cysts may be divided into two classes: first, those in which the vegetations are derived from the epithelium and from glandular tubes, proliferous glandular cysts, or adenomata; second, those in which the connective tissue of the walls develops and projects as vegetations—proliferous papillary cysts. These cysts do not differ essentially in their origin.

The walls of the cysts may undergo the following degenerative or retrogressive processes:

1. CALCIFICATION most frequently take place in the inner layer of the main cyst-wall as deposits of granules or small plates of lime or the formation of psammatous bodies, as seen in the papillary cystomata. The calcification increases with impairment of nutrition, as occurs in gradual torsion of the pedicle.

FIG. 316.



Calcified Corpus Luteum: *A*, calcified portion; *B*, interior of the corpus luteum.

2. FATTY DEGENERATION occurs in the papillary cells, which are regenerated, while the desquamated fatty cells are destroyed. A similar change takes place in the connective tissue and walls. The process is enhanced by any impairment of nutrition. The pressure of cyst-contents induces this change in the septa, resulting in their partial or complete destruction. The presence of a large amount of fat in the fluids is indicative of slow growth.

3. ATHEROMATOUS changes, which generally take place in the inner layer of the wall.

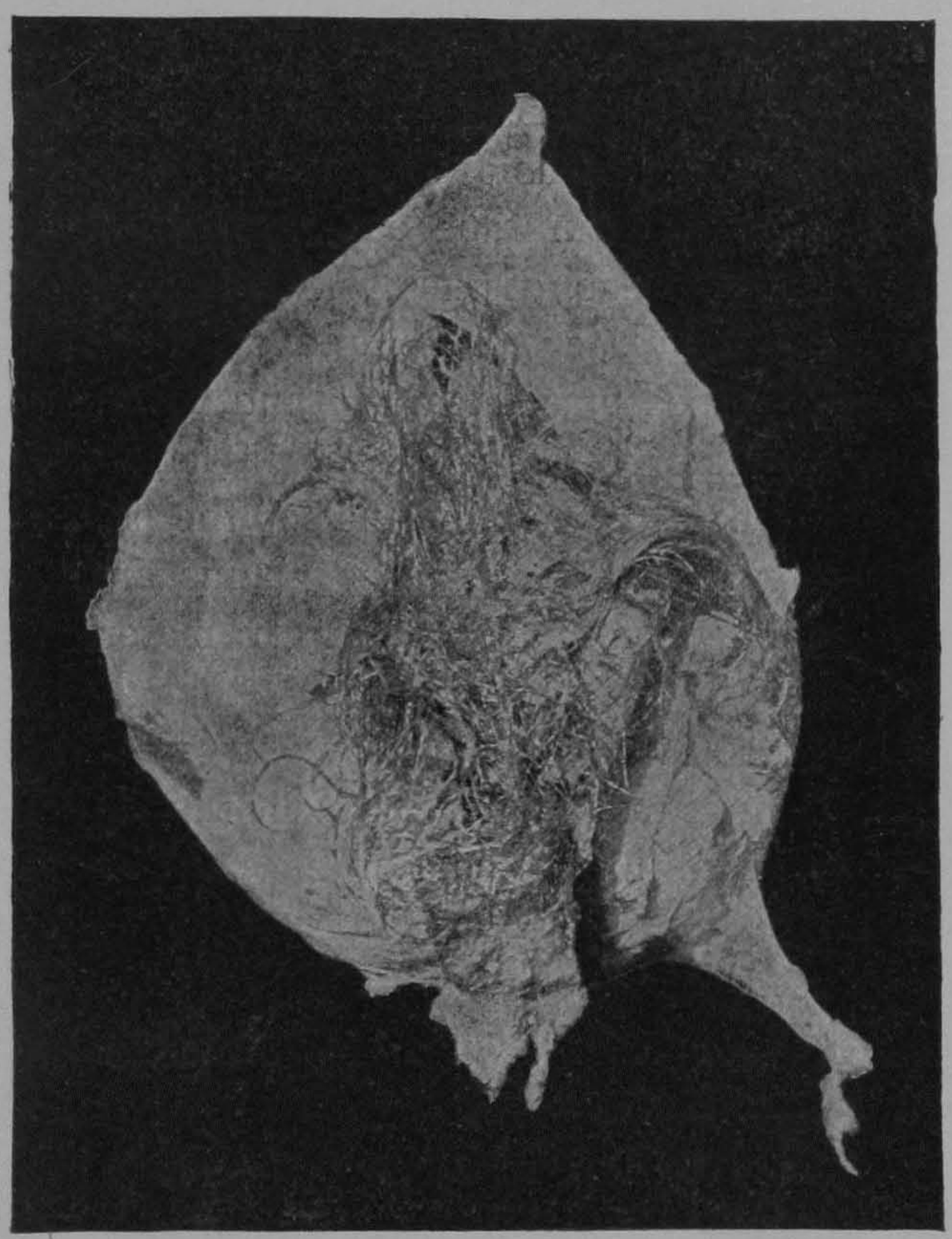
4. Changes due to infarctions in which whitish opaque bodies will be found in the septa surrounded by a red zone.

Papillary Cystomata.—These cysts were formerly regarded as a variety of the glandular. They are believed to have developed from the paroöphoron, in the broad ligament, or in the prolongations of its tumors into the hilum of the ovary. They differ from ordinary ovarian or oöphoritic cysts in that, first, they produce no effect upon the shape of the ovary until they have attained a large size; second, they burrow beneath the layers of the mesosalpinx, and when of large size separate the layers of the broad ligament beside

the uterus; third, their interior is filled with warty growths. These warts form cauliflower growths, or masses which over-distend and rupture the cyst-walls, from which they extend to the adjacent organs, particularly the peritoneum. The cysts rarely attain to large size, and in the majority of cases are bilateral.

When the cyst ruptures, the dendritic masses infect the peritoneum, producing growths upon the adjacent tissues. These are

FIG. 317.



Dermoid Cyst containing long red hair, removed from a light-haired woman aged 44 years.

reddish or pearly-white and glistening masses, or in some cases growths three or four inches long projecting in every direction and having the appearance of stems of coral. These masses have usually partly undergone calcification, so that they break easily and without bleeding.

These tumors are characterized by slow growth, by frequent and early pressure-symptoms, and generally by the early presence of ascites, which soon returns after puncture.

The writer has had a number of cases of the growths under observation. In a recent one the involvement was bilateral and beneath the peritoneum, dissecting it off from the posterior surface of the uterus and obliterating the retro-uterine cul-de-sac. A large quantity of ascitic fluid was drawn off, when the entire peritoneum, parietal and visceral, was found studded with small red masses. In another patient the entire surface of the uterus and broad ligaments was covered with dendritic masses three inches long, which had become partially calcified. Specimens of such growths are represented in the illustrations. The danger of peritoneal infection precludes tapping when there is any reason to suspect such a growth.

Ovarian Dermoids.—Dermoid tumors are those in which are found skin or mucous membrane associated with the structures generally connected with such tissues. The tissues most frequently found are hair, teeth, nails, sebaceous and sweat-glands, and mammæ, horn, bone, unstriped muscular fibre, and, in rare cases, a tissue resembling brain. The hair varies in color, length, and quantity. It is not always of the same color as that of the person from whom the tumor is removed. The sebaceous glands are numerous and produce an extensive accumulation of fatty material. The teeth are irregular, generally imperfectly formed, though presenting the structures of dentine and enamel. They vary in number from two or three to several hundred. They may dot the surface of a membrane or be inserted in thin spicula of bone. The bone is generally loose, ill-formed, and irregular.

These growths may appear at any age. They have been found in children at birth and in women of ninety years. A tumor removed from a girl aged eleven years had been noticed when but eight years of age. It involved both ovaries, and the fundus was imbedded in the mass. The neck of the uterus was made to form the pedicle. The tumor contained a large quantity of sebaceous material—hair, bone, teeth—and at one point a mass resembling one side of the upper jaw covered with mucous membrane and containing a row of teeth.

The specimen represented by Fig. 317 was removed from a woman aged forty-four years, who had given birth to six children. It contained hair and sebaceous material. Cullingworth reports a woman, in whom both ovaries were apparently involved by dermoids, who had given birth to twelve children and had three miscarriages—the last, three months before the removal of the growths.

PLATE XXXVII.

Dermoid Cyst Laid Open, showing Maxillary Bone containing teeth; the head of one of the long bones; skin with hair growing from its surface; serous membrane (probe passed underneath); mucous membrane of stomach directly next to serous membrane.

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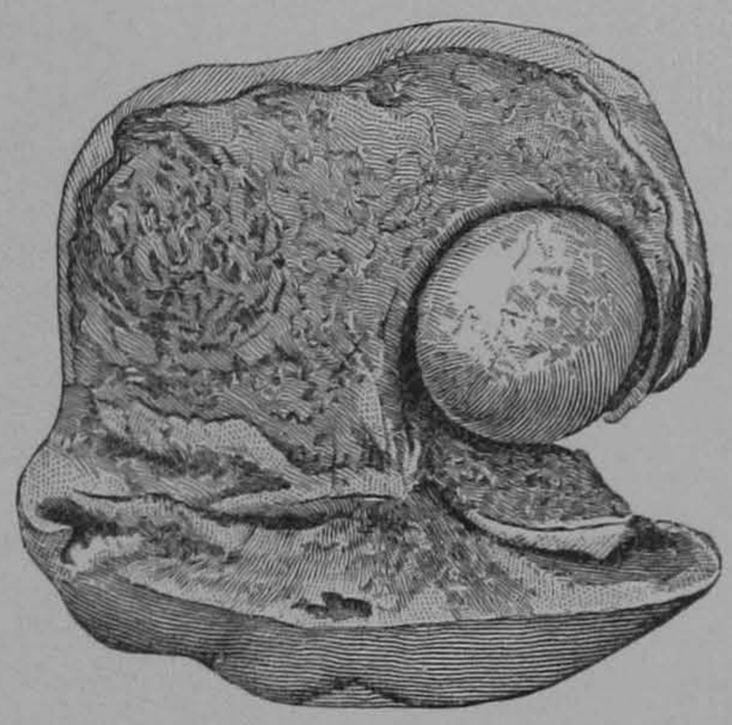
The rupture of ovarian dermoids is followed by peritonitis. The irritating character of their contents contraindicates puncture prior to their removal. The writer has seen a case in which an attempt at aspiration was followed by an attack of peritonitis which proved fatal, notwithstanding that aspiration was followed three days later by ovariotomy.

Solid Tumors of the Ovary.

The solid growths of the ovary comprise 5 per cent. of the cases which present themselves for operation, and may be divided into three groups: the fibro-myomata, sarcomata, and carcinomata. The first, *fibro-myomata*, are frequently divided into two groups: the fibromata and myomata. The former are rare, and comprise those growths in which the minute structure consists of wavy bundles of fibrous tissue closely packed, intermixed with small round cells. In a few instances these growths attain a large size. Williams described

Fig. 318.



Calcified Fibroma of the Ovary.

one which weighed seven pounds seven ounces; Doran, one of seventeen pounds. The *myomata* are more frequent than the former, but are not common. These tumors are prone occasionally to undergo calcareous degeneration, and are under these circumstances often mistaken for osseous tumors—a variety of ovarian degeneration which rarely if ever occurs.

Unstriped muscular fibre occurs in the ovary as a continuation of the ovarian ligament. Tumors of the ovary composed of this tissue sometimes attain to a large size. Sutton mentions a specimen in the Museum of the Royal College of Surgeons removed from a woman aged 68 years, which weighed fifteen pounds two ounces.

Sarcomata and *Carcinomata* are fully described in the chapter on Malignant Diseases.

Parovarian Cysts.

Cysts of the parovarium may be divided into those which occur in the outer series of tubules free at one extremity and known as Kobelt's tubes, an inner set of vertical tubules, and lastly a large tube running at right angles to the vertical tubes may be occa-

Fig. 319.

Showing the Structure of Calcified Fibromata. The darker portions represent areas of calcification.

sionally traced downward to the vagina. This is Gärtner's duct. There are two kinds of cysts which arise from the parovarium; the most frequent are the small pedunculated cysts connected with Kobelt's tubules, which do not become larger than a pea, and consequently have no clinical importance. The most important are the sessile, which remain between the layers of the mesosalpinx, and as they enlarge burrow into it. In these large cysts the Fallopian tube becomes elongated. Small cysts are usually transparent; when they become larger than a cocoanut this appearance is lost. The fluid is clear, limpid, with a specific gravity of

1010 and an alkaline reaction. They are distinguished from the ovarian cysts, first, by the ease with which the peritoneal coat can be stripped off; second, by the ovary being generally found attached to the side of the cyst; third, by the cyst being unilocular; fourth, by the Fallopian tube being stretched over the cyst and never communicating with it; fifth, by the specific gravity which does not exceed 1010, and may be lower; and lastly, in the same specimens, by the tissue of the mesosalpinx which becomes gradually thickened. These cysts rarely occur before the age of sixteen; they probably form about 10 per cent. of the cysts which are subjected to operation. They generally do not form adhesions, and rarely suppurate even when tapped.

Pedicle.—In all varieties of cysts of the ovary or the broad ligament the presence, absence, or character of the pedicle is of great surgical importance. It may be thin, almost membranous; long and narrow, consisting only of the folds of the peritoneum or of peritoneum and elongated tube; or may be broad and thick, comprising the entire broad ligament. Its length and thickness will depend upon the proximity of the cyst to the uterus. The pedicle consists of two parts—the ovarian ligament and the Fallopian tube.

The thick pedicle may consist of the broad ligament, hypertrophied and reinforced by muscular tissue from the uterus. When there is no pedicle the tumor has developed wholly within the broad ligament The tumors of the broad ligament, some dermoids, and glandular cysts of the ovary are of this class.

In the recent removal of cysts of this character the peritoneum is separated from the posterior surface of the uterus, while the tumor dips down upon the left side of the uterus to the roof of the vagina, leaving a large membranous cavity.

ETIOLOGY.—Ovarian cysts may occur at any age, and are not infrequently found in the fetus. Doran describes fetal ovaries which contained cysts $\frac{1}{12}$ to $\frac{1}{6}$ of an inch in diameter, lined with cylindrical epithelium and filled with dendritic vegetations. Congenital ovarian cysts may be either unilocular or multilocular, unilateral or bilateral. Sutton analyzed 60 cases in children under fifteen years of age, in which he found 23 dermoid, 16 sarcomata, and 16 simple cysts. Thornton has observed cases in which malignant deposits were found in the pelvis two or three years after the removal of dermoid cysts, that contained soft white growths strongly resembling sarcomata.

Sutton arranges the group of malignant tumors in children—termed by some sarcomata, others carcinomata—under the term oöphoromata, because they seem to arise from the tissue of the oöphoron. Ovarian growths occur with greater frequency during the age of sexual activity, between the twentieth and fiftieth years. They are comparatively rare after sixty, and still more so before puberty. The unmarried seem to suffer with greater frequency from these growths. It is probable that the cessation of ovulation during pregnancy and lactation acts as a safeguard against their development, while menstrual congestion favors it. Several members of the same family have been affected. Each ovary seems to be attacked with equal frequency. It is estimated that the ordinary cystomata occur bilaterally in about 3 per cent., while the malignant, on the other hand, are found bilateral in about 75 per cent. Scanzoni has considered chlorosis during puberty as a main element in their development.

Symptoms.—The tumor usually develops insidiously, and may attain considerable size before it is discovered, being then, possibly, noticed by accident. The earliest symptoms are vesical tenesmus, constipation, pain in defecation, and the sensation of weight and pressure in the pelvis. As the tumor increases in size general nutrition becomes affected, due to the pressure upon the stomach and diaphragm. The patient becomes emaciated, grows weak, and suffers from violent abdominal pains, produced possibly by a partial peritonitis. Œdema may occur in one or both legs and extend to the vulva or lower abdominal walls. The patient may have intercurrent febrile attacks, and death may occur from exhaustion, or where the tumor fills the pelvis it may produce incarceration similar to that resulting from retroversion of the pregnant uterus.

Olshausen divides the subjective symptoms into four classes or groups: First, those produced by violent disease. This may be dysmenorrhea, but more frequently early and excessive hemorrhage. Excessive menstruation in bilateral tumors and tumors of the broad ligament is an early and obstinate symptom, due to the pressure upon the pelvic veins. Ergotin and other agents are useless in controlling the bleeding. This hemorrhage produces anemia. Sterility may result from the disease, partly from physiological and partly from mechanical causes. The fact must not be overlooked that conception has occurred with both ovaries occupied by large dermoid cysts. The presence of tumors may cause

pigmentation of the mammary areola and the linea alba, painful sensation in the breasts, and even enlargement of these organs, with the secretion of milk. Second, symptoms which result from depression or weight of the tumor. These are constant after it has attained to some size. When it is situated in the pelvis it may produce tenesmus or strangury by pressure upon the neck of the bladder. A large tumor may produce upward traction on the bladder and urethra, and cause vesical disturbances, and even retention of urine. Defecation is impeded by pressure, and becomes painful if the tumor is sensitive. The patient suffers from vague, dragging pains, rupture of the rete Malpighii, and consequent formation of linea albicantes, dilatation of the veins, œdema of the abdominal walls, compression of the stomach and intestines, and difficult breathing by pressure against the diaphragm. This pressure necessarily adds an increase of danger to any inflammatory trouble of the lungs. As a result of compression of the renal veins and ureters the patient may suffer from albuminuria or from suppression of urine by the compression of the ureters. The compression of the large abdominal veins causes marked œdema of the legs, though this is less frequent than in pregnancy. The tumor must be larger than the pregnant uterus to cause these symptoms. Third, symptoms of complicating disease. Of these the most frequent and important are those which arise from attacks of circumscribed peritonitis. These symptoms are usually found in large tumors where they extend above the umbilicus. Loss of a portion of the superficial epithelium of the tumor necessarily results in its adhesion to adjacent parts. The greater the pressure of the tumor against neighboring organs, the more readily will the friction produce adhesions. This is more likely to occur in the anterior surface of the tumor, producing adhesions between the tumor and anterior parietes. Next in frequency are omental adhesions, and then follow adhesions to the intestine, bladder, uterus, spleen, stomach, liver, and floor of the pelvis. These produce attacks of pain, lasting for days or weeks, with tenderness of the parts affected. Other complicating symptoms are pressure upon the intestines, producing intestinal irritation or obstruction; intestinal occlusion from pressure upon the rectum, or occasionally, after puncture, from twisting of the intestines where they have been adherent. Fourth, symptoms on the part of the general condition of the patient. The general health of the patient usually remains good until the digestion is

impaired by pressure upon the stomach. Then marasmus occurs, appetite is lost, the tongue becomes dry, there is persistent vomiting, and the features become sunken; the expression of the face with the enormously distended abdomen presents symptoms which usually indicate the presence of the disease.

Before taking up the study of the objective symptoms or physical signs of ovarian cysts we will enter upon the consideration of complications arising from changes in the cyst itself. These are—first, hemorrhages; second, suppuration and gangrene of the cyst; third, adhesions; fourth, torsion of the pedicle; fifth, rupture; sixth, metastatic deposits.

Hemorrhage into the cyst occurs from a variety of causes. It may take place in papillomatous cysts if the superficial vessels are greatly distended, or from the cyst-wall where the veins have ruptured by dilatation. The most frequent cause is from torsion of the pedicle. Moderate torsion interferes with the return of the blood through the veins, while the arterial circulation may still be maintained. It may take place from puncture through injury to a large vessel in the cyst-wall. Hemorrhage usually occurs slowly and in small quantities, and consequently is of no prognostic significance. Where copious, as in acute torsion of the pedicle, or where large vessels are punctured, it may seriously threaten life and produce profound and dangerous collapse.

Inflammation and suppuration of a tumor may be produced by a number of conditions. Thus they may result from infection through the intestinal canal, urinary bladder, Fallopian tube, or the admission of air in tapping. This may affect small as well as large cysts. Dermoids are especially prone to suppuration. The most common avenue of infection is through the Fallopian tube. Adhesions generally take place in the immediate neighborhood of its ostium, affording opportunity for inflammation to extend over the cyst, thus causing adhesions to the omentum, intestines, and parietal peritoneum. The intestines are sometimes the source of infection through adhesions of the small intestine or the rectum to the cyst-wall. As the adherent piece of intestine becomes compressed by the tumor, its wall becomes thinned, allowing the diffusion of intestinal gases. It may become so thin as to permit the gas to pass directly into the cavity of the cyst, causing putrefaction and converting it into a huge abscess; in some cases the inflammation has originated in an appendicitis. It was formerly supposed to be due invariably

to the accidental admission of air through tapping, but, as we have seen, it may occur independently of that cause. In acute cases, where inflammation results in early adhesions to the surrounding structures and viscera, marked symptoms arise, and unless the pus finds exit the patient dies. When exit is afforded, the patient may be worn out by the prolonged discharge.

Symptoms are pain, tenderness over the region of the tumor, rapid and feeble pulse, great emaciation and exhaustion, with a temperature of 102° in the morning, 103–106° in the evening, or where the patients have become greatly exhausted the temperature may fall as low as 95°, especially when the pus is in considerable quantity. The urine may be found to contain albumen, and the cyst, through its communication with the intestine, may contain gas, producing a tympanitic note. Suppurating dermoids are not of infrequent occurrence, often cause extensive adhesions, and burst into the peritoneum, rectum, bladder, vagina, or even through the abdominal wall. Communication of such a tumor with the bladder excites profound distress. Portions of bone, teeth, locks of hair, or sloughs become packed in the urethra, and cause retention of urine and the occurrence of cystitis. Fragments remaining in the bladder are covered with phosphatic deposits and form a nucleus for the formation of calculi.

Adhesions, when extensive, are always a source of additional anxiety. When they have existed for some time between the intestines, colon, and cyst-wall, forming broad, fibrous bands of close adhesions, the task of removal is an exceedingly tedious, and occasionally an impossible one. The adhesions result from inflammation of the surface of the peritoneum, the exudation from which is slowly converted into fibrous tissue. If the parts remain in contact during the formation of the adhesions, what is known as a sessile adhesion is produced. If movement is kept up, the bands of adhesions are elongated, forming broad or narrow bands. The cyst may present a shaggy appearance from extensive adhesions. The older adhesions contain blood-vessels, which are of large size when the intestine or omentum is involved. The vessels thus formed are frequently so large that when a pedicle has been destroyed by torsion the tumor is still nourished by its new relation. The most dangerous adhesions are those in the pelvis, on account of their intimate relation with the iliac arteries and veins, and it is in many cases exceedingly difficult, if not impossible, to determine

their presence until operation is resorted to. In separating pelvic adhesions in a patient sixty-three years old, some years ago, using but very slight force, a large vein was torn open, and the patient lost so much blood before the hemorrhage could be arrested that she died a few hours later from shock.

Axial rotation, or *torsion of the pedicle*, occurs in probably 10 per cent. of the cases. It has been attributed to a variety of causes, as the alternate distension and evacuation of the bladder, passage of feces through the rectum, sudden movements, unusual exercise, the occurrence of pregnancy, delivery of the patient, and so on. It is more likely to occur in double ovarian tumor. It is possibly also induced by changes of position of the patient. The rotation varies from half a circle to as many as ten or twelve complete twists. The rotation takes place from right to left or left to right with about equal frequency, dependent, possibly, upon the side on which the tumor is situated. The tendency is to rotate toward the median line rather than from it. The effect on the circulation depends upon the amount of torsion as well as upon the thickness of the pedicle. A long, thin pedicle is the most frequently twisted. The veins are the first to suffer from the twisting, causing acute enlargement of the cyst from extravasation of blood into its cavity. The veins may rupture and hemorrhage take place into the cavity of the cyst—hemorrhage so profuse as to produce acute anemia and even death. On opening the abdomen of such a patient, the cyst will be found dark-colored, more particularly near the pedicle. The fluid in the cavity may be chocolate or dark-red in color. The most frequent effect of torsion is thrombosis of the vessels, extravasation of blood, and necrosis. Necrosis is followed by decomposition and putrefaction of the dead tissues.

Torsion may be acute or chronic. In the latter the changes are slow. Acute torsion is generally seen in small tumors. The larger the tumor, the more profound is the constitutional effect. Symptoms of acute rotation are frequently so marked as to leave no question as to the condition. When the patient complains of sudden and violent pain in the abdomen, vomiting, and the presence of acute swelling, one should suspect its occurrence. This is still more probable if the woman be pregnant. The rupture of the gravid Fallopian tube may induce symptoms which would be mistaken for torsion. The indications for prompt relief, however, are the same in each case. The symptoms in the chronic variety are not so marked.

The patients complain of a dull, sudden abdominal pain, and still maintain good health, with a tumor, however, which more rapidly increases in size. In these cases the prognosis is good if the adhesions are few or slight.

Rupture of the Cyst.—Rupture of the cyst may be sudden, as the result of a fall, blow, or injury, or gradual from change in the cyst-wall. In the latter the cyst becomes thinner, more particularly in the papillary proliferating cystomata. In such growths, as they increase in size, the accumulation presses upon their walls, which become thinned, until they give way at some point or until the papillary growths project through the thinned walls. Rupture of the cyst may take place into adherent viscera, but more generally occurs into the peritoneal cavity. The result of such a lesion is dependent somewhat upon the quantity and quality of the fluid contained. In the *unilocular* cysts the fluid is most innocuous, and may frequently produce no abnormal symptoms other than an increased diuresis. The patient probably passes several gallons of water in twenty-four hours. The abdomen, so prominent from the tumor, becomes flattened, flabby, and possibly the remnant of the cyst may be recognized upon palpation. Rarely the cyst-wall may shrivel and a radical cure be effected. In the multilocular cysts, and particularly the dermoids, rupture into the peritoneal cavity may be followed by infection, a rapidly developing grave peritonitis, and finally death. This termination is quite probable, not only in dermoids, but in those containing colloid material, or particularly where pus is present in the cyst. In dermoids the decomposing fat is eminently productive of inflammation. Death may be very rapid as a result of shock or the absorption of the deleterious material. In papillary cystomata rupture results in the infection of the peritoneal cavity and the formation of growths upon its surface, in some cases studding the entire peritoneum. Rupture is determined by disappearance of the tumor, diminution in its size, demonstration of free fluid in the abdomen, peritonitis, collapse, and diaphoresis or diuresis. Rupture into the peritoneal cavity may be mistaken for torsion; when into the intestines, it is recognized by the evacuation of colloid masses or chocolate-colored fluid; where the opening is high up, violent watery diarrhea may occur; when into the bladder, by vesical tenesmus and dysuria; or where dermoid, it is recognized by the peculiar contents of the cyst. External rupture is usually determined without difficulty. When pus or ichorous

material alone are discharged, it is sometimes difficult to determine whether it proceeds from a cyst or an abscess in the walls.

Metastasis occurs in cancer of the ovary extending to the peritoneum, causing ascites, or secondary nodules may be found in remote organs, as the liver, spleen, and, rarely, the kidney. In papillary growths the peritoneum becomes infected, and through the peristaltic action may infect the entire abdomen. So extensive is the infection, and so prone to occur after the removal of these tumors, that it has been sometimes questioned whether papillary tumors did not belong to the malignant class. Their structure, formation, and the fact that they are not always absolutely fatal renders this improbable. The dermoid element has also been found implanted in the peritoneal cavity. Small tufts, covered with hair, have been noticed growing from the surface of the peritoneum of the intestine. A similar covering with colloid material has been found in multilocular cysts.

In a case operated upon by the writer some years ago the entire peritoneal cavity was studded with a thick colloid material which could not entirely be scraped off.

Other complications of ovarian cyst are—

1. *Ascites.*—A small amount of ascitic fluid may be present with many cysts, but a large quantity is rare so long as the tumor retains its normal condition. Changes in its structure, especially if of malignant character, are prone to result in an increase of free peritoneal fluid. In malignant disease the fluid becomes darker, like prune-juice.

Large ascitic accumulations result from rupture of colloid or particularly of papillary cysts. Solid growths are generally attended with ascites. The presence of fluid in the peritoneal cavity is by no means an indication of malignancy, as it occurs in fibromata as well as in sarcomata and carcinomata. In the former it is probably due in part to the irritation of the peritoneal epithelium and in part to pressure upon the vessels.

2. *Intestinal obstruction or strangulation from pressure of the cyst* or adhesions to its surface, or torsion or volvulus from such adhesions takes place when the tumor has been reduced by puncture. The intestine may become occluded by extension of malignant disease.

Course, Duration, and Termination.—The rapidity of the growth of an ovarian tumor depends somewhat upon its character. Those of slow growth are usually cysts of the broad ligament,

fibromatous tumors, and the fibro-myomata of the ovary. Proliferating cysts, whether glandular or papillary, grow more rapidly. The latter grow so rapidly that considerable increase in size may be noticed in ten days. The intra-ligamentary cysts of papillary origin are generally of slow growth. At the end of years they may not be larger than a child's head. Such patients suffer from profuse menstruation, due to the pressure upon the veins obstructing the return circulation. In the later stages ascites is developed, which rapidly returns after tapping. It is difficult to determine the duration of the disease where undisturbed. In 60 to 70 per cent. at least of the proliferating cystomata the patient dies within three years after the advent of the first symptoms, and another 10 per cent. die within four years. The slow-growing papillary cystomata generally cause the death of the patient from marasmus, but the average duration of the disease is longer than in the proliferating variety. Such a patient has been punctured one hundred and five times in seven years, with the removal of twenty-five to forty pounds of fluid at each operation. The proliferating cysts may remain unchanged even for years. Patients suffering with ovarian cysts may heal spontaneously or pass into a condition which is equivalent to recovery. Spontaneous recovery generally occurs from rupture of the cysts. This favorable result occurs more particularly in simple cysts, but rarely, if at all, in the proliferating.

Torsion of the pedicle, or axial rotation, may bring about recovery in colloid tumors. Such a termination, however, is rare, and the recovery is not absolute, as there usually can be found a mass in the former position of the tumor. Spontaneous recovery, indeed, is rare, even in unilocular cysts, and in the proliferating cystomata is never looked for. Unless such patients are subjected promptly to surgical treatment, death occurs in the majority of cases from exhaustion, as a result of anorexia, impaired digestion, sleeplessness, and interfered respiration and circulation. Patients may suffer from bed-sores or intercurrent disease, which may rapidly prove fatal. Death is occasioned in other cases from peritonitis after torsion of the pedicle, rupture, or metastasis upon the peritoneum. Other fatal conditions may be intestinal occlusion and embolism of the pulmonary artery. The presence of ascites in considerable quantity is generally an unfavorable omen. Another cause of fatal result may be suppuration from puncture. This result was formerly very frequent. The presence of ascites must be

considered an unfavorable symptom when it is associated with papillary growths or rupture of a glandular tumor. A tumor which has not been long in existence and which undergoes sudden development, attended with rapid emaciation and cachexia, multiple adhesions, especially in the pelvis, and œdema of the lower limbs and the abdominal walls, with peritonitic complication, should indicate a malignant onset. In such cases the outlook for a successful operation is bad, although operation should be done wherever there is the least chance for success.

The PHYSICAL SIGNS of the patient are determined by inspection, palpation, percussion, and auscultation. In the examination of the patient she should be placed upon a bed or couch, the limbs drawn up, clothing loosened, all constricting bands removed, so that the abdomen can be thoroughly and completely exposed. It is well that the patient should have been previously directed to have the bowel and bladder emptied. After covering the lower extremities with a sheet, and bringing it over the lower part of the abdomen so as to avoid exposure of the genitalia, the abdomen is bared. The first general procedure in examination is that of inspection. By inspection we are enabled to determine the size of the growth, the height to which it rises from the abdomen, its position, whether symmetrical or one-sided, the smoothness of its outline, whether spherical or larger from side to side, the appearance of the skin, presenting the linea albicantes, darkened line down the centre—the linea nigra—discolorations of the skin indicating the application of counter-irritants and the presence of pre-existing inflammatory troubles. An irregular nodular appearance of the tumor would indicate that if cystic it consisted of a number of cysts causing irregularity of the surface. The dark line is generally considered a symptom of pregnancy, but when it occurs it is permanent in duration, so that it is only in the first pregnancy that it is of value. It should not be forgotten, however, that this increase of the local pigment occurs in women who suffer from ovarian cyst or uterine fibroids; the presence of linea albicantes has no significance as regards the question of pregnancy. They arise from any distension of the abdomen sufficient to cause rupture of the skin, and hence are found not only in pregnancy, but in ovarian cyst, ascites, and other conditions which are likely to cause abdominal enlargement, and may be entirely absent in women who have borne children.

Palpation is practised by placing the hand over the abdomen, in

cold weather the hands having previously been warmed. The abdominal cavity is carefully explored, the condition of the various organs investigated, and any enlargement of the abdomen, presence of a cyst or tumor, can generally be recognized readily. Palpation is practised by placing the hands now upon opposite sides of the abdomen and then close together, going over one portion after another, so determining the size, consistency, resistance, and regularity of the growths, the presence of outgrowths or nodules, and the sensation of crepitation or of friction. Placing the hand upon one side and striking gently with the other will elicit fluctuation, particularly when we are dealing with a large unilocular cyst. In multilocular growths the fluctuation wave would be shorter or may be entirely absent.

Percussion is of special value in determining the outline or extent of growths, their relation to the abdominal viscera, and their determination from other forms of abdominal distension. It affords an absolute means of differentiation of growths from distensions of the abdomen by free fluid or accumulations of gas.

Auscultation gives but slight information. It is of service in differential diagnosis, more particularly in its negative results.

Diagnosis.—The diagnosis of ovarian tumors may be divided into two divisions: first, the determination of such growths when small and situated in the pelvis; second, when large, filling the greater part of, or the entire, abdominal cavity.

The physical signs vary according to the size and position. In the former stage the tumor is entirely within the pelvis and its position varies. It may retain the normal situation, and as it increases in size may encroach upon the general abdominal cavity. Tumors when as large as a hen's egg, however, generally fall downward and backward into Douglas's pouch immediately behind the uterus. In rare cases they may be found in front or to one side. The ovary, but slightly enlarged, may retain its normal position. Its relation to the corresponding side of the uterus affords but little difficulty in determining its character by conjoined manipulation. Where its growth has been associated with peritonitic inflammation, it may be more difficult to determine its true character. Small tumors are usually firm to the feel, for the reason that they are too small to produce an elastic consistency. In a large tumor situated behind the uterus the diagnosis is determined by the circumscribed character of the growth. Elasticity is a valuable sign, which is gen-

erally absent in proliferating cystomata, and even in single cysts, and particularly dermoids, which afford a solid sensation to the touch. If we are unable to determine or separate the tumor from the uterus, and consequently to determine its pedunculation, this can be ascertained by Hegar's method, which consists in placing the patient upon her back, seizing the uterus by a pair of volsella forceps, and strongly dragging it down; at the same time we endeavor to feel the lateral borders of the uterus as far as the fundus with one or two fingers in the rectum, or we push the uterus downward and backward by means of the outer exploring hand, and thus outline its relations. When the tumor is not too large it can generally be outlined with the finger in the rectum and the hand over the abdomen. The greatest difficulty is experienced in those cases in which the tumor is adherent in the pelvis and surrounded by exudation or is incarcerated. Tumors which are situated entirely within the broad ligament, and formed unilaterally or bilaterally or in close apposition to the uterus, are less spherical and circumscribed, and less movable from the start. Small growths must be diagnosed from fibroids and tumors caused by disease of the tubes, particularly hydro-, pyo-, and hematosalpinx. The more acute history, marked tenderness, evidence of inflammatory exudation, thickening and matting together of the pelvic tissues, and increased pain, would eliminate pyosalpinx. In hydrosalpinx the tumor may be movable, present a sensation of elasticity or fluctuation, but it is oblong or gourd-shaped rather than spherical. It is closely attached to the uterus and presents a history of previous inflammation. Hematosalpinx is at first soft, and then becomes hard and dense from coagulation of the blood. It is situated to one side of the pelvis rather than posterior to the uterus.

Large or Abdominal Cysts.—In a woman suffering from a large ovarian cyst the abdomen will be found distended more particularly at its lower part, quite prominent, and rising abruptly from the pubes. As the patient lies upon her back with the abdomen exposed, it will be seen to be sharply and definitely outlined, and generally symmetrically developed; if any difference, a little more prominent on the right side. Palpation may determine its outline, extent, and size. If there is a large single cyst, the surface will be smooth and regular, while in multilocular cysts it may present projections and irregularities. If made up of a number of small cysts, it will present a much more

marked resistance, although there is still a sensation of elasticity. The tumor may be moved from side to side or pushed upward and downward. Percussion discloses dullness over the entire surface of the tumor, with resonance above and possibly resonance in the flank upon one side. The resonance in this region is supposed to indicate that the tumor has developed from the opposite side or ovary, and as it increased in size has pushed the intestines upward and to the unaffected side. We cannot, however, with certainty determine in this way the ovary from which the tumor has arisen, as when the growth has increased in size it is likely to become prolapsed into Douglas's pouch and develop from there; consequently this does not afford a positive indication as to the source of origin.

Considering the conditions with which ovarian cyst may be confounded, it is well to begin with pregnancy, from its greater frequency and importance. It may seem unreasonable that pregnancy should be mistaken for an ovarian cyst; but there are a number of cases upon record in which the abdomen has been opened to find the distention caused by a pregnant uterus. In order to arrive at a correct diagnosis we need to carefully analyze the symptoms of the two conditions. In this we consider the history of the case. In pregnancy the enlargement of the abdomen is more rapid, and is generally attended by suppression of the menstruation, the sympathetic symptoms, nausea, vomiting, disturbed appetite, and a healthy appearance of the individual. Suppression of menstruation is not a constant symptom of pregnancy, as there are women who continue to menstruate during the entire period of pregnancy. It may be associated with ovarian cyst, particularly where both ovaries are completely degenerated. Error is most likely to occur, in early pregnancy, in the unmarried. In these cases the physician should carefully avoid announcing a diagnosis until a careful examination has been made, and even then should not be too hasty. If there is any doubt, he should defer expressing an opinion, and have the patient undergo an examination a few weeks later. The changes which occur will generally be sufficient to enable him to express a definite opinion. In pregnancy there is generally an absence of fluctuation. The same symptom may be absent in ovarian cyst with thick viscid contents, or in the areolar or glandular varieties made up of a large number of small cysts. Later, fetal movements and parts of the fetus may be distinguished, and the fetal heart-sounds

recognized. The latter symptom is one which is pathognomonic of pregnancy. Heart-sounds, however, are not always heard, owing to the position of the fetus and the large quantity of fluid or possible fetal death. Conjoined examination through the vagina or rectum should be a part of the procedure. By it we are enabled to determine the association of the abdominal distension with the increased size of the uterus. Gestation in one horn of a bicornate uterus may render diagnosis difficult. Careful examination by the vagina and rectum will show the association of the enlargement with the uterus, the other cornu possibly remaining small. Where there is the least suspicion of pregnancy the introduction of the uterine sound should absolutely be avoided.

Hydramnios.—Cases in which the liquor amnii exceeds two quarts have been mistaken for ovarian tumor. Large accumulations within the walls of the uterus give rise to fluctuation, the abdominal walls will be greatly distended, glistening, and the patient will suffer from all the discomfort arising from a marked abdominal distension from ascites or ovarian cyst. This condition generally comes on suddenly, and takes place about the sixth or seventh month of pregnancy, which prior to its occurrence has run a normal course. On examination the uterus will be found distended, possibly the cervix obliterated, the os open, covered with a dense membrane, and by manipulation we may be able to distinguish the symptom of ballottement; rupture of the membrane results in the discharge of a quantity of water and the emptying of the uterus. The existence of ovarian cyst of one or both ovaries does not necessarily indicate the non-existence of pregnancy, as so long as any ovarian stroma remains unaffected, ovulation and conception may occur. The increased quantity of blood directed to the pelvis during the progress of pregnancy may increase the rapidity of development of an ovarian cyst. The enlargement of the abdomen may be so marked as to indicate the necessity for interference with the process in order to prolong the patient's life. Careful examination will disclose the enlarged uterus either in front of or behind the ovarian cyst. In some cases the ovarian cyst may be situated in the pelvis and obstruct the vagina, rendering it difficult to reach the cervix. In the later months of pregnancy such cysts may be tapped, permitting the completion of gestation, or, if discovered early, ovariotomy may be performed. The occurrence of pregnancy does not seem to influence the mortality of the operation.

Physometra = gaseous uterine enlargement

III

Morbid collections within the uterus may be physo-, hydro-, or hematometra. Physometra is a collection of gases within the uterus, the result of decomposition, and is a very rare condition. Hydrometra is a collection of water in the organ which is more likely to take place in women of advanced age, due to the retention of the secretions from obliteration of the canal. Hematometra may result from occlusionof the cervix or vagina, with retention of menstrual discharges. It is more likely to occur near puberty. Examination by vagina or rectum is usually sufficient to demonstrate the cause. Other

IV

growths within the uterus which have led to difficulty in diagnosis are myomata or fibro-myomata. These growths are rare before the twenty-fifth year; indeed, not common before the thirtieth. They are more likely to be confounded with ovarian tumors on account of the very great size to which they attain, filling up the entire abdominal cavity and presenting a tumor larger than the pregnant uterus at full term. These growths are usually of slow development and irregular in outline. They are firm and without fluctuation. They may cause no disturbance of the menstrual function, as in the subperitoneal fibroids or marked menorrhagia as in the submucous. Vaginal examination discloses the close association of the tumor with the uterus. Generally movement of the tumor will cause movement of the cervix. Where the tumor is connected with the uterus by a long pedicle, it may be more difficult to determine its character. This may be accomplished by having the tumor, through the abdominal walls, drawn up by an assistant, while the cervix is drawn down by a volsellum in the hand of the examiner, who introduces the finger of the other hand into the rectum, and thus definitely determines the association of the mass with the uterus. If it can entirely be separated from that organ, it is evident the growth is ovarian. Auscultation usually discloses a blowing sound due to the coursing of blood through the large uterine sinuses—a condition which is absent in ovarian cysts. The conditions which are most difficult to determine are those in which a fibroid with long pedicle is œdematous, giving a sensation of elasticity, or an ovarian cyst with thick, viscid contents, or those cases of fibroid growth which have undergone cystic degeneration. The methods we have already mentioned of determining whether the growth is a part of the uterus may be exercised. Cases of doubt may be determined only during the progress of the operation.

V

Ascites.—There is generally little difficulty in arriving at a cor-

rect diagnosis in cases of uncomplicated ovarian cyst. Unilocular ovarian cysts probably more frequently than any others are confounded with ascites. It may be avoided by keeping in mind that in ascites, if the patient lies upon her back, the abdomen is likely to be flattened, broader from side to side—that there is less resistance, and upon palpation the abdominal wall can be depressed to a greater degree, displacing the free fluid. Upon percussion in ascites there is a zone of resonance at the summit of the distension, due to the intestines filled with gas floating to the surface, while there is dullness in the flank and over the sides. In ovarian cyst there is dullness over the surface of the distension, resonance above it and over one flank. In ascites the level of the fluid changes with the change of position, consequently the resonance changes; in ovarian cyst it is unchanged. Very marked abdominal distension may afford an element of uncertainty in the fact that the distension is so great that the mesentery is too short to permit the intestines to come in contact with the abdominal surface. In such cases depressing the abdominal walls, thus displacing the intervening layer of fluid, may afford resonance, while superficial percussion is dull. Entrance of gas from an intestinal communication or decomposition of the cyst-contents may render an ovarian cyst resonant. In these cases we will have to depend upon the resistance of the cyst to determine its presence. In cases of ascites, also, the history will be of advantage, as affording information of renal, cardiac, and hepatic disease. In ascites the wave of fluctuation may be followed around in the flank where it would be absent in a cyst. In inflammatory ascites or ascites from tubercular peritonitis the diagnosis may be difficult, and only determined after incision. Ascites may complicate an ovarian cyst; thus by depression a layer of fluid may be displaced, bringing the hand in contact with the tumor within. The amount of resistance will determine whether the tumor is solid or cystic. The occurrence of ascites complicating a cyst may generally be considered as an indication of malignancy or some degenerative process. The more marked the ascites, the greater the probability of malignancy. The uterus will be found freely movable in ascites, while in ovarian cysts it will be displaced either downward and backward or upward and forward. In ascites from ruptured papillary cysts the uterus presents on either side a dense thickened mass which should cause a suspicion of its true character.

Phantom Tumor.—Phantom tumor is a condition in which there

is an apparent tumor due to distention by gas. This may in some cases attain to considerable size, and when associated with the illusion of supposed pregnancy is known as pseudo-cyesis. It is more likely to occur in nervous sterile women. The form just spoken of occurs in cases of illicit intercourse in young individuals in whom there is a fear of pregnancy, or in older women in whom there is a morbid desire to have children. Such patients will experience the fetal movements and all the ordinary sensations of pregnancy. It is likely to occur at or near the climacteric, and is generally associated with a large increase of adipose tissue. Percussion over the abdomen is sufficient to disclose the fact that the apparent tumor is filled with gas. Palpation will generally elicit the absence of any tumor, or, if the swelling or distension remains permanent under pressure, it may be entirely removed by placing the patient under the influence of an anesthetic.

VII

Uterine Myomata complicating Ovarian Cyst.—The presence of a cyst of the ovary and a fibroid tumor of the uterus in the same patient is not infrequent. Where the ovarian cyst is large and situated in front of the uterine tumor, the diagnosis may be difficult, and only determined after puncture of the cyst or abdominal section. The author recently made a diagnosis of this condition in a patient with the following history: A woman æt. 33 years, married, had been suffering with abdominal enlargement for nearly a year, which for the last four months had increased more rapidly. She had been suffering from irregular hemorrhage; was pale and emaciated; she complained of severe pain over the abdomen, increased by exertion. The abdomen was distended about the size of a six months' pregnancy; upon the right side, a little below the level of the umbilicus, was a hard, firm growth, apparently closely associated with a tumor upon the left side which extended above the umbilicus. The left tumor was more elastic and apparently contained fluid. Moving the mass upon the right caused the cervix to move, while movement of the left tumor apparently had no influence upon it. The diagnosis was, right side, myoma; left side, probably ovarian cyst made up of small cysts. Upon preparation for operation she was found to present a softened, dilated cervix, a bloody discharge, and within the uterus a fetus which gave evidence of having been two weeks dead.

VIII

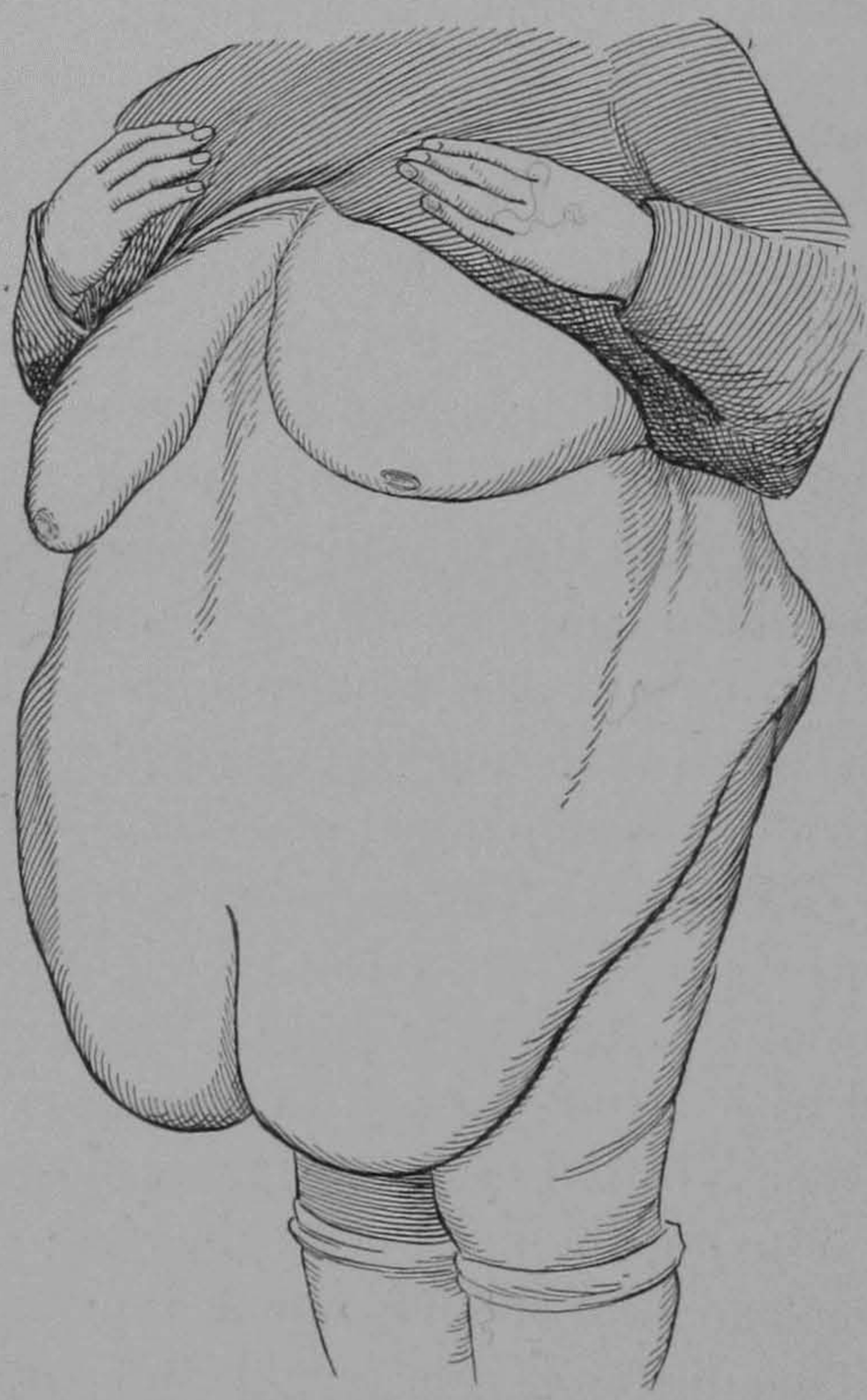
Obesity.—A large pendulous abdomen from accumulation of fat within its walls or fat in the omentum may be mistaken for an

ovarian cyst. The history of development, the general distribution of adipose over other parts of the body, while with ovarian cysts there is loss of adipose or emaciation, aids in the diagnosis. The thickness of the abdominal walls may be estimated by pinching up a fold of the skin and subcutaneous tissue.

Ventral Hernia.—In two cases the author has been called to see patients suffering from supposed ovarian cysts, when the condition was due to separation of the recti muscles and protrusion of the intestines covered only by skin and peritoneum. Palpation of the intestinal coils and resonant percussion should have excluded the diagnosis of a cyst.

Desmoid Tumors.—These tumors originate in the fascia or deeper

FIG. 320.



Fatty Abdominal Wall, Simulating Ovarian Cyst.

layers of the muscles. They are firm and resisting, are movable within the abdominal walls, above the surface of which they project to a marked degree. Vaginal or rectal examination aids in excluding them from a pelvic origin.

Tympanitis.—Abdominal distension, as in phantom tumors, whether local or general, is characterized by resonance. The latter is associated with symptoms of inflammation; the former occurs in nervous, hysterical individuals.

Fecal Tumors.—An accumulation of feces is sometimes called a fecal tumor. It generally takes place in the colon. If it occurs in the transverse colon, that organ may be displaced downward by its weight, and rest over the lower part of the abdomen. Such accumulations are sometimes quite extensive. They are distinguished, however, by the length of the tumor, the peculiar sensation to the touch, the fact that it retains the imprint of the finger, and that it is entirely removed by free purgation and copious enemata.

Distended Bladder.—An over-distended bladder forms a tumor in the lower part of the abdomen, which fluctuates, is sensitive to pressure, and may be mistaken for a cyst. The precaution should always be taken to empty the bladder as a preliminary step to examination. It will of course thus be eliminated. In cases of pregnancy or fibroid tumor impacted in the pelvis, or even in impacted ovarian cysts, we may have retention resulting, and difficulty in the introduction of a catheter. In such cases it may be necessary to use a soft male catheter.

Cystic tumors, which may be mistaken for those of the ovary, are hydatid cysts of the liver and spleen, and cysts of the omentum, mesentery, pancreas, and kidney. Instead of cysts of the kidney, we may have the entire structure of the organ dilated, giving rise to a hydro- or a pyo-nephrosis. Hepatic cysts or dilatations of the gall-bladder are only mistaken for ovarian cysts when they are very large, filling up the abdominal cavity or by their weight dragging down toward the pelvis. When small they are found situated in the upper part of the abdomen to the right side. The diagnosis is usually determined by the percussion resonance being situated to the opposite side and the lower part of the abdomen, while there is dullness above. On vaginal examination the position of the uterus will be disclosed; possibly also the enlarged ovaries on either side of it may be recognized. In hydatid cyst crepitation elicited by placing the hand over the cyst, and making pressure, will aid in determining its character. This is still further confirmed by finding upon microscopical examination of some of the fluid withdrawn for that purpose, hooklets and spurs of the echinococci. Tumors of the spleen are situated on the left side of the

abdomen, and extend downward toward the pelvis, not infrequently extending across the abdomen. Mesenteric and omental cysts attain a considerable size, and often present great difficulties in diagnosis. Manipulation may, however, disclose the absence of attachment to the pelvic organs, and in this way afford a suspicion of their true character. The mesenteric cysts usually develop behind the peritoneum, and are consequently retro-peritoneal cysts. They may be situated to one side of the abdomen or in the median line, and usually do not dip down into the pelvis. Fluctuation is indistinct, and may be associated with resonance from the overlying intestine. Renal cysts in their origin develop from one side of the abdomen, are usually more or less fixed, and, increasing in size, may be pushed or displaced downward, in some cases occupying the anterior surface of the sacrum. An important aid in the diagnosis of these tumors is their mobility. Retro-peritoneal cysts sometimes develop in the pelvis, filling it up and rising upward into the abdominal cavity. Such tumors will usually be found closely associated with the uterus and difficult to separate from it; the uterus will be lifted up by them, the fundus felt in front of the tumor, above the symphysis; there will be a displacement generally of the rectum more to the left side, or it may run over the anterior surface of the tumor. These tumors are more or less resisting, presenting a sensation of elasticity rather than of fluctuation. They are generally rapid in growth and of a malignant character, more likely to be sarcomatous.

Where our examination satisfies us that we have to deal with an ovarian cyst, it still becomes a question of considerable importance to determine its character, whether single, multilocular, or dermoid. Multilocular cysts are usually of more rapid growth. They present a sensation of greater resistance than the unilocular, with a less distended wave of fluctuation. In the unilocular cyst the wave of fluctuation can be felt distinctly from one side of the abdomen to the other. In the multilocular, as the cyst is divided up into a number of smaller cysts, the wave of fluctuation must necessarily be shorter, and if the cysts are sufficiently small no fluctuation will be distinguished. These cases are sometimes exceedingly difficult to determine from the œdematous fibroid, and it is only by careful manual examination, by which the association of the latter with the uterus is determined, that we are able to

arrive at a diagnosis, and in some cases only an abdominal incision will afford us a correct knowledge.

A case came under observation a year ago in which to the right of the cervix was found a mass, somewhat hard and resisting, which was felt to be continuous with the cervix. Above this was a considerably larger mass, soft and elastic, and between this and what we had supposed to be the entire uterus was tissue into which the fingers could be pressed. This apparently indicated that the tumor had grown from the broad ligament and was closely associated with the uterus. The diagnosis was a probable intra-ligamentary ovarian cyst. Upon opening the abdomen the mass which we had supposed to be an ovarian cyst proved to be an œdematous fibroid. The mass to the right, which was firm, was a second fibroid in a more mature condition, and the soft line between them was the junction of the fibroid with the body of the uterus.

Dermoids are distinguished by their slow growth, greater mobility, sensation of resistance, and absence of fluctuation.

Adhesions.—Adhesions may be expected where a tumor has attained a very great size; under the pressure the tumor suffers a loss of the epithelial layer; roughening of its surface follows, with a tendency to a slight peritonitis and the formation of adhesions. These are more likely to take place over the anterior surface of the tumor, and next in frequency between it and the omentum. The history of repeated attacks of peritonitis during the progress of the growth will almost certainly indicate extensive adhesions. They will occur also in inflammatory conditions of the cyst, whether resulting from torsion of its pedicle, from suppuration, or from gangrene. The mobility of the tumor or the ease with which the abdominal walls can be moved over it leads us to hope that adhesions are slight, though we cannot absolutely determine that it is free from them.

Pedicle.—Enlargement of the ovary causes it to prolapse and drag upon its attachment to the broad ligament, and thus become more or less pedunculated. This elongation of its neck becomes increased when the tumor is large enough to rest in part upon the brim of the pelvis. The neck or attachment is known as the pedicle. It is composed in most cases of a part of the broad and ovarian ligaments, and generally contains the Fallopian tube. The thickness and length of the pedicle can only be determined with certainty at the time of removal. Where the tumor is freely movable it is rea-

sonable to suppose that we have to deal with a long pedicle. Elevating the tumor with the external hand while a finger of the other is introduced into the vagina, or better into the rectum, the connection of the growth to the uterus can be determined.

Exploratory Puncture.—In obscure and complicated cases the diagnosis is so difficult that it has been deemed desirable to determine the character of the tumor and its contents before deciding as to what operative procedure to adopt. To accomplish this, the removal and examination—chemical and microscopical—of a portion of the cyst-contents have been recommended.

It should be remembered that the operation of aspiration of a cyst is not unattended with danger, as the intestines and bladder have been frequently punctured. There may be an escape of fluid into the peritoneal cavity or the entrance of air into the tumor, and the latter may be followed by gangrene or suppuration. A large vessel in the tumor-wall may be injured by the introduction of the aspirator, and an extensive hemorrhage result. In view of these dangers tapping is rarely justifiable.

A proliferating cyst usually furnishes fluid of a thick, colloid character, with a specific gravity of 1015–1030, which contains paralbumen and cylindrical epithelial cells. In the papillary cysts there is an absence of paralbumen, while the microscope discloses white blood-corpuscles. The fluid from the Graafian follicles is not distinguishable from that obtained from parovarian cysts. Ascitic fluid is thin, light yellow or greenish-colored, deposits albumen on boiling, does not contain cylindrical epithelium, and has a specific gravity of 1008–1015. In the cysto-fibromata the fluid has a lemon-yellow color, with a specific gravity of 1020, coagulates rapidly without heat, and does not contain cylindrical epithelium. The fluid from echinococcus cysts is distinguished by the hooklets, and has a specific gravity of 1008–1010, without albumen. In hydronephrosis the fluid is thin, with a specific gravity of 1005–1018, varies in color, and contains urea, leucine, tyrosine, and kreatinine. Puncture in an ovarian cyst is always dangerous, and when performed for diagnosis in doubtful cases, as in echinococcus cysts, renal tumors, abscesses, or dermoids, it may be attended with the most serious consequences. The exploratory incision is a far less dangerous procedure. In cases in which it is impossible to arrive at a correct diagnosis, as in ascites from tubercular peritonitis or malignant disease of the ovary, tube, or omentum, or from papillary

cysts, the buttonhole incision, through which one finger can be introduced, is far the preferable procedure, and, while admitting opportunity for the determination of the condition by touch, affords a subsequent opportunity for drainage.

TREATMENT.—As the fluid is contained within a closed sac which has its own secreting surface, the administration of remedies or the use of counter-irritants for the purpose of decreasing the accumulation by increased secretion and elimination is without reason. Electrolysis has been advocated, but when we consider the character of such growths and the danger of infection from many of them, it is too dangerous a plan to be considered. Surgical treatment consists of extirpation. Puncture is at best only a palliative measure, as the removal of the fluid is quickly followed by its re-accumulation, and is attended with great loss of albumen. The first puncture would necessarily be followed by others at shorter intervals, until the patient becomes exhausted by the severe drain. As has already been mentioned, it is attended with danger from the direct loss of blood, as the opening of a vessel, presence of papillary cysts, and rupture of a thin-walled cyst and the spreading of its papillary contents to the peritoneal cavity, as well as from septic infection. The operation may be done in pregnancy in the later stages in preference to ovariotomy as a temporary expedient, where the cyst is situated in the pelvis and would interfere with the delivery of the patient. Under these conditions the puncture should be made through the vagina.

This is an exceedingly dangerous procedure, however, as the vaginal canal is difficult to render thoroughly aseptic. Puncturing the cyst through the rectum is under all circumstances absolutely unjustifiable.

OVARIOTOMY.—The only treatment that is applicable to all cases and is worthy of consideration is the extirpation of the tumor, or ovariotomy. Success in the performance of this operation will depend very much upon the care with which the diagnosis has been made, the knowledge of the operator concerning the condition of the patient, the dexterity with which the operation is performed, or the readiness in meeting complications, and the judicious treatment of patients subsequent to its performance.

Operation.—In considering the conduct of the operation we prefer to divide it into different steps or stages and describe the method of procedure in each. By so doing we feel that we can impress

upon the would-be operator a graphic outline of the various accidents which may occur and the subterfuges to which he may be obliged to resort as he proceeds. We do not feel that he can deviate from a safe course in completing the entire journey if an accurate chart of each portion is presented. The different steps are:

1. Incision of the abdominal wall;
2. Puncture, emptying, and removal of the cyst;
3. Management of adhesions;
4. Management of the pedicle;
5. Toilet of the peritoneum;
6. Drainage.

A description of the abdominal incision will be found in the chapter on Technique.

Incision of the peritoneum should be made between two dissecting forceps, which hold it away from the abdominal contents and avoid danger of injuring the cyst or coils of intestine. The peritoneum incised, the pearly, glistening surface of the cyst is exposed; when there are adhesions the finger should be introduced as a guide to guard against injury to the cyst or to intestine. At the lower part of the wound it will recognize the bladder and prevent it being wounded. The peritoneum may be overlooked and cut through, and the omentum mistaken for preperitoneal fat; in the latter the vessels are transverse, in the former vertical. Where the peritoneum is firmly fastened to the parietes of the cyst it may be difficult to determine when it is reached. The cyst-wall should be incised, the cyst emptied, and an attempt made to withdraw the posterior wall; or the abdominal incision may be continued to the umbilicus, where the layers of the wall are fused together, when the cyst-wall will be more easily recognized. As a prelininary step to further procedure after the peritoneum is incised, it may be fastened to the integument by one suture about the middle of either side of the wound. This procedure prevents its being pushed off from the abdominal walls during the further manipulation.

Emptying the Cyst.—The cyst projects into the wound, presenting a pearly, glistening appearance. The trocar, with a rubber tube attached long enough to dip into a receptacle placed beneath the table, is plunged into the cyst, choosing a point for its introduction which will empty the large or main cyst and is free from large vessels. This puncture should not be made at the lower angle of the wound, for the reason that as the cyst empties it retracts and leaves the

opening situated below the wound, increasing the difficulty of preventing the fluid from flowing into the abdomen. As the trocar is plunged into the cyst the abdominal walls are held close about it, and sponges should be packed around the orifice to prevent any fluid running back into the peritoneal cavity. As the sac becomes relaxed it is grasped with hemostats, and later with cyst-forceps, and drawn out, keeping the opening in the cyst outside the abdominal wound. The assistant will place his hands upon either side of the abdomen or upon its upper part, making pressure which forces out the fluid and keeps the wound stretched over the projecting surface of the cyst. If there are a number of cysts, the trocar may be passed from one into the other. In this procedure, however, it is important that the hand should be passed into the abdomen around the cyst to prevent the trocar from perforating its main wall, injuring the viscera or abdominal tissues, or permitting the escape of fluid. Where a trocar of suitable character is not at hand, the parts may be drawn tense around the cyst, puncture made into it with a knife, the edges grasped with forceps, drawn out, and the orifice thus kept outside the abdominal cavity. Other cysts may be opened through the first cyst, and their cavities broken down by the hand passed through the opening. This, in some cases, may be necessary, owing to the consistency of the fluid being such that it will not readily flow through the trocar. In small cysts it is preferable to introduce the hand and break up the cysts rather than to attempt to pass the trocar in different directions to empty them. As the cyst is emptied it is also drawn out, so that in a single cyst, or in a multilocular cyst which is not adherent, the emptying is followed or partially preceded by the withdrawal of the sac. Where the cyst has thick, viscid contents, it may be necessary to draw it well up into the wound before opening it, or possibly, after turning the patient upon her side, to press back the abdominal wall from the under side, open the cyst, and, dragging the opening still farther out, break up the contents. In this way a cyst of considerable size may be brought through a small opening. Where there is considerable solid material in the cyst, however, requiring some difficulty to bring it through the opening, the latter should be enlarged, rather than to subject the patient to much manipulation in order to avoid a large opening. In dermoid cysts or those in which suppuration has occurred it is better that a larger opening should be made and the cysts be removed entire. When the contents of dermoid cysts

flow into the abdominal cavity it is exceedingly difficult to remove them and to neutralize their irritating effect. The material is oily in character, and does not wash out readily by irrigation; for such reasons it is preferable that the cyst should be removed intact.

Adhesions.—The ease with which adhesions may be managed depends much upon their character. In recent cases, where the cyst has undergone inflammatory action, resulting in adhesive peritonitis, the adhesions may readily be overcome by the use of the sponge. It is sometimes recommended to introduce the hand into the abdominal cavity before the cyst is punctured and separate or break up the adhesions. This can readily be done over the anterior parietes, where the adhesions are soft, but dense, firm adhesions should preferably be separated at the wound under the guidance of the eye. Consequently, after the cyst has been wholly or partially emptied, it is drawn out, and where adhesions of a soft and friable character exist, these are separated by pressing the viscera off from the sac by a sponge. Adhesions will depend in gravity upon their situation and duration. The older the adhesions, the more thoroughly organized they become and the more difficult they are to separate, requiring, in some cases, the use of the scissors or knife. Parietal adhesions, where they cannot be sponged off, may be separated by the finger, tearing the surfaces from the cyst-wall, or, where this cannot be accomplished, by using the scissors. Not infrequently considerable bleeding will take place. Omental adhesions are frequently long and quite vascular, so that they are preferably tied with a double ligature and cut between, using for this purpose fine silk. Adhesions that are difficult to manage are those between the intestine and other abdominal viscera and the cyst-wall. Such adhesions may involve coils of the intestine, the stomach, the spleen, the liver, and the gall-bladder. Adhesions to some of these organs are exceedingly firm and only separated with considerable difficulty. Where the adhesions are long they may be separated by means of the scissors or by grasping the adhesions with a clamp and burning through the tissues with the cautery. When the adhesions to the intestine, for instance, are sessile, the removal of the neoplasm may be attended with considerable difficulty. In some cases adhesions are very close, and their removal would involve the structure of the bowel, impairing its vitality. It is then preferable that the cyst-wall should be cut through, leaving a portion of it attached to the intestine, taking the precaution

to remove the epithelial lining membrane, thus taking away the entire secreting surface of the cyst. Pelvic adhesions of long duration are the most difficult to manage and the most dangerous in character. A tumor which has been situated low down in the pelvis, filling it, may be adherent to the large arterial or venous vessels. The author never had a more trying or sadder experience than in a woman of sixty-three years of age, the mother of a physician, who had a thin-walled cyst, which was completely emptied, and was only adherent in the pelvis. On making gentle traction upon the cyst, endeavoring to push off the pelvic tissues, there was at once a sudden filling up of the entire pelvis with venous blood, showing that a large vein had been injured. The hemorrhage was controlled by packing the pelvis with sponges, removing the blood, but the patient was already profoundly shocked. After the removal of the sponges the pelvis was packed with iodoform gauze, which was brought out at the lower angle of the wound. She lived but a few hours after the completion of the operation.

In some cases the adhesions will be found extending into Douglas's cul-de-sac, requiring an universal enucleation. In parovarian or broad-ligament cysts we may find the broad ligament spread out and covering the cyst-wall. In such cases it is important to examine carefully the tissues as we progress, for the tumor may be found to have begun its development deep in the broad ligament, and may have pushed above it the ureter, as was found by the author in one case of broad-ligament cyst: after opening the cyst and commencing to enucleate, the ureter was found to pass directly over it. Attempted enucleation would have been attended with so much injury to the ureter as to have imperilled its vitality. For this reason the tumor was completely emptied, irrigated and with a view of securing drainage, stitched to the abdominal wound and its cavity packed with iodoform gauze, in order to set up inflammatory changes within it to destroy its secreting surface and lead to adhesion of its walls. In this, however, we regret to say, the operation was not a success, as the patient appeared a few months later having a cyst fully as large as the one for which we had operated.

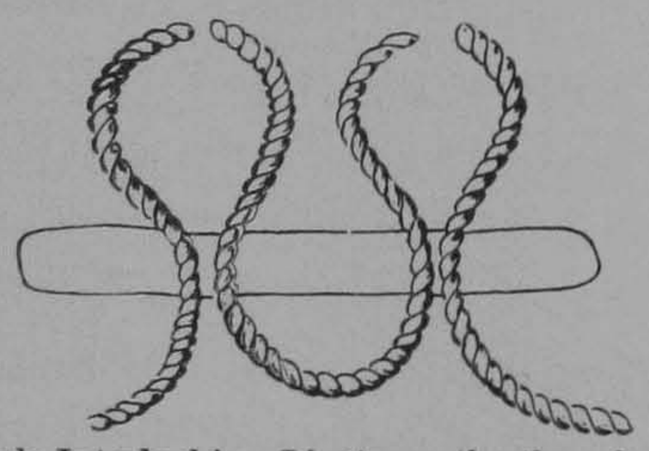
Papillary cysts may develop beneath the broad ligament, and infiltrate the tissues to such a degree as would render their removal almost impossible, or, if removal were performed, would leave a large, ragged, raw surface which necessarily increases the danger to the patient. In bleeding following the separation of extensive adhe-

sions, not arrested by irrigation with hot water, it may be necessary to use the Paquelin cautery. Where the adhesions have been to the anterior parietes in very large cysts, large raw surfaces are exposed; that is, the peritoneum is torn through. The bleeding may be controlled and unfortunate intestinal adhesions avoided by introducing sutures through the abdominal wall in such a way as to approximate the large raw surfaces and thus shut them out of the abdominal cavity and promote their union.

Pedicle. — After emptying and drawing out the cyst, the empty sac is found to be attached to the abdominal cavity by a more or less narrow band of tissue which is known as the pedicle. It consists in the majority of cases of the ovarian ligament, a part of the broad ligament, with not infrequently the tube extending over the cyst. There has been much discussion in the past upon the proper treatment of the pedicle—whether it should be treated intra- or extra-peritoneally; in other words, whether it should be ligated or the vessels otherwise secured and dropped back, or should be brought out and fastened in the lower angle of the wound. In the latter method of treatment it has been the custom to use the clamp. This clamp method for many years was practised by Atlee, Wells, and contemporary operators. Its advantage was the security against hemorrhage and the fact that the pedicle was constantly under observation. It had the disadvantage of requiring a longer time for convalescence; the pedicle sloughed off, increasing the danger of septic infection, leaving a surface to heal by granulation, and in some cases has resulted in subsequent menstruation from the stump. The intra-peritoneal method is that which is now universally practised. The pedicle may be ligated, or cauterized as has been recommended by Keith. Cauterization is performed by grasping the tissue of the pedicle in a clamp, one side of which is covered with ivory plates to prevent the heat being conveyed to the tissues beneath, and searing the included tissues by cautery-iron heated to redness. The method is not to be used under any circumstances where it is possible to place a ligature. Operators universally prefer the use of the ligature. The pedicle, when of ordinary size, is transfixed and tied in two portions. The ligament should be transfixed with a double ligature, cut, and each half tied separately and then both the ends together, or one ligature may be carried around, tying it over both parts. Where we have a large tumor made up of solid

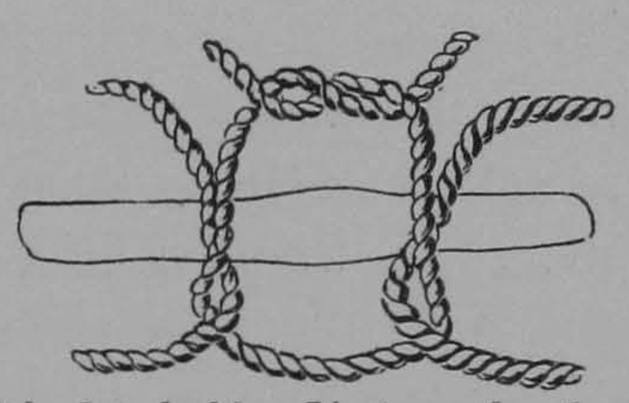
material, which it would require considerable effort to hold and prevent traction upon the pedicle, the latter may be seized with pedicle forceps immediately beneath the cyst, to secure the patient from loss of blood, and the tumor cut away, after which the pedicle may be tied in the manner we have already described. In removing the tumor it is important to leave a sufficiently long stump above the ligature to prevent the possibility of a portion of the tissue being retracted, permitting hemorrhage to take place from either the ovarian or uterine arteries. For ligation of the pedicle either silk or catgut may be used. The catgut is preferred by some operators for the reason that it, being an animal ligature, is absorbable and will not remain to give rise to irritation subsequently. Its disadvantages are that the ligature may slip, affording an opportunity for hemorrhage to occur after the wound has been closed, and the catgut being septic may cause infection of the peritoneal cavity.

FIG. 321.



Triple Interlocking Ligature; the threads inserted.

FIG. 322.



Triple Interlocking Ligature; the threads interlocked ready for tying.

Where the pedicle is a broad one and a short stump is left above the ligature, it is preferable to introduce a second one about that portion of the pedicle through which the ovarian artery passes,

FIG. 323.

Triple Interlocking Ligature tied.

so that in case the ligature should slip this large vessel would still be controlled. An illustration of this procedure is given in Fig. 279. A broad, fleshy pedicle should preferably be tied in a number of sections, the ligatures being introduced and tied as seen in the accompanying figures. Or, better still, an en masse ligature may be placed about the uterine end of the ovarian artery, a second one

about the opposite end of the same artery placed close to the pelvic wall and introduced deep enough to include the round ligament and its accompanying artery. The pedicle is cut away. Any space in the broad ligament intervening between the two ligatures is then whipped together by a continuous catgut sature. After the removal of a cyst and ligation of the pedicle the operator should examine the condition of the other ovary, and should it show signs of cyst-growth, it is also to be removed. In some tumors, particularly the broad-ligament and parovarian cysts, no pedicle will be found. These tumors dip into the broad ligament alongside of the uterus. In such cases it will be necessary to peel out the cyst, and ligate any vessels that may be found to bleed, or, if the bleeding be from a large surface rather than from distended vessels, it may be controlled by gauze packing. This may be accomplished at times without removing the ovary or tube.

Peritoneal Toilet.—Where a simple uncomplicated cyst has been removed the necessary toilet of the peritoneum is slight. It consists in sponging out the pelvic cavity or in introducing a sponge to ascertain that there is no sign of bleeding, when the cavity may be closed. Where adhesions have been extensive, it is important to examine carefully to see whether or not bleeding still continues, and, if so, to take measures to control the hemorrhage. If the omentum has been torn from the cyst and shows signs of bleeding, it should be placed upon a towel wrung out of hot water, carefully examined, and bleeding points ligated with catgut. All bands of adhesion or openings in the omentum should be tied and cut away, as they only afford an opportunity for a knuckle of intestine to slip through and thus endanger the patient from obstruction of the bowel in the subsequent convalescence. Where there has been much bleeding and the abdominal cavity has been soiled with discharges from multilocular or papillary cysts, it should be thoroughly irrigated. The preferable fluid for this purpose is a 0.6 per cent. solution of common salt, of which, if necessary, several gallons may be used. The solution is made by adding forty-eight grains of salt to the pint of water, and should always be rendered sterile by boiling prior to use. After irrigation the superfluous fluid may be removed by sponging, or if the drainage-tube is used it may be left. A flat sponge is placed beneath the wound, over the intestines, in such a way as to cover them and keep them back while the sutures are introduced.

Drainage.—Before closing the wound we must consider the sub-

ject of drainage. When shall drainage be used? If used, what shall be its character? What shall be the method by which it will be accomplished? The question of drainage is one which has been much discussed of late years, some operators advocating that every case should be drained, others none. Larger experience has demonstrated that drainage may be most frequently omitted. Even in those cases in which the peritoneal cavity has been soiled by discharge from suppurating cysts, the sponging away, and in case any be left the dilution of the poison, usually renders it inert or gives the peritoneum ample opportunity to destroy and absorb it. Irrigation with large quantities of salt solution and closing the cavity with a large quantity remaining is a proper method of procedure. Cases in which injuries of the intestine have occurred of such a character as to render leakage possible should be drained.

As to the form of drainage: a glass tube, as illustrated in the consideration of Technique, is by many preferred. The perforations at the bottom of the tube should be perfectly smooth, depressed rather than elevated, and small, to prevent the entrance of the intestinal walls by intra-abdominal pressure, rendering the removal of the tube difficult and painful, and increasing the danger of lighting up inflammation. The objection to the glass tube is that it requires frequent emptying, and is an open avenue for the entrance of pathogenic germs into the peritoneal cavity. Another method of drainage is the gauze drain, which is also described under Technique. Its advantages are that the possibility of entrance of septic infection is lessened. When the drain is removed, which may be at the end of twenty-four to seventy-two hours, it may be replaced by a sterilized rubber tube. The abdominal wound is closed as described in the chapter on Technique.

The method of managing patients after ovariotomy will be found described in the chapter on After-treatment.

ACCIDENTS DURING THE OPERATION.—*Stripping off the Parietal Peritoneum.*—This accident is not likely to occur where care is observed. The operator may overlook the .peritoneum, and, supposing that it has been opened, push it off from the abdominal walls. This is especially so in chronic accumulations of free fluids in the peritoneal cavity accompanied by thickening of the parietal peritoneum as in tubercular peritonitis. More frequently, however, it is likely to be opened without being recognized, and the omentum be-

neath regarded as the preperitoneal fat. As has already been observed, this may be avoided by noticing that the vessels in the transversalis fascia run transversely, while those in the omentum are vertical. When the omentum is fastened over the tumor, it is better to find its point of attachment and tear it up, rather than to open through the omentum itself, on account of the probability of bleeding. The peritoneum may be stripped off during manipulation, as in the introduction of sponges to keep the surfaces dry during the introduction of the sutures.

Rupture of the Cyst.—In delivering the cyst, particularly where the walls are fragile, it may be torn through, permitting the contents to escape into the abdominal cavity. This is not an accident of serious importance unless the contents of the cyst are putrid in character, as in suppurating cysts, or, again, in the dermoid varieties, where the oleaginous material is exceedingly difficult to remove from the cavity. Tearing of the wall of the cyst during its removal necessitates a thorough irrigation of the abdominal cavity to neutralize or remove the contents.

Fatal Hemorrhage.—Fatal hemorrhage during operation was formerly an event of greater frequency than it has been of late. The site of the hemorrhage will have much to do with its character: in large cysts with extensive adhesions we may have hemorrhage taking place from the cyst itself or from vessels that may be torn within its walls, giving rise to a serious condition. In such cases the course of treatment should be to separate adhesions rapidly, lift out the cyst, secure its pedicle, and so cut off the supply of blood. In separating adhesions the larger and more vascular should be cut between two ligatures or between a ligature and a pair of hemostats. If the hemorrhage is of a serious character, the assistant may place his hand within the abdomen and compress the abdominal aorta, maintaining the pressure until after the operation is completed. Such a procedure prevents further supply of blood being sent to the tumor, and so arrests the bleeding. We may find hemorrhage take place from a very extensive surface, particularly after the removal of malignant disease, or extensive papillary growths behind the uterus, involving its entire posterior surface and the pelvic viscera. In a recent case the diseased tissues were hurriedly removed, and the cavity and bleeding surfaces above were compressed by a number of antiseptic towels packed into the abdominal cavity. This thoroughly controlled the flow, but the patient

was so enfeebled prior to the operation, and still further exhausted by the loss of blood, that she died shortly afterward. Fatal syncope and death may take place in very large tumors from the decreased abdominal pressure. Vessels relieved from pressure become distended by the blood, forming reservoirs, until so much is withdrawn from the circulation that the resulting cerebral anemia is sufficient to cause the death of the patient. In such cases the patient may be said to have bled into her own vessels. Such an occurrence is only likely to take place in very large tumors, and may be obviated by emptying the cyst slowly. When syncope occurs the head should be lowered, the limbs wrapped in warm blankets or bandaged, and an assistant may compress the aorta directly with the hand in the abdominal cavity, while the treatment of the pedicle and the toilet proceeds. It may at times become necessary to remove the uterus on account of the free bleeding from its torn and denuded surface. Such a procedure will not infrequently spare the patient the dangers incident to drainage.

Visceral Injuries.—Injuries to the viscera, particularly the intestines, are likely to occur during complicated operations. It is important before opening the peritoneum to lift it up with forceps, and make a small incision into which the finger can be introduced. The importance of doing this under the eye can be appreciated when we remember that a coil of intestine may be situated between the tumor or cyst and the abdominal parietes, adherent to the latter, when an incision blindly made might result in cutting into or through the intestine. Where adhesions are dense the intestine may be torn into or even across during the progress of the operation. Where such lesions occur the parts should carefully be repaired at once, and measures exercised to prevent soiling of the peritoneal cavity with the contents of the bowel. The intestine should be carefully sutured, and, when torn through to such a degree as to render the vitality of the parts uncertain, its resection and an end-to-end or lateral anastomosis should be practised. Where the operator is prepared with the Murphy button an end-to-end anastomosis is very quickly accomplished. In the absence of these buttons, an end-to-end anastomosis may be done by simple suturing of the surfaces, beginning with sutures between the muscular surfaces, and then a second row around the peritoneum, so that considerable peritoneal surface is opposed. The most difficult cases to suture are those in which the rectum has been torn during

the operation. Portions of the bowel may be so devitalized that they subsequently slough, giving rise to fecal fistula. In tumors situated low in the pelvis, those that have developed in the broad ligament, and particularly in the papillary forms of ovarian growth, it is quite important to keep in mind the position and relation of the ureter, as this organ may be pulled up or torn off in the enucleation of such masses. Where the situation of the ureter is such as to render its injury possible, it is better to dissect it out to make sure it is uninjured; where it has been cut or torn, the preferable procedure is to establish an anastomosis with the bladder. Where the ureter is short and likely to be too much drawn upon, the bladder should be anchored to the side of the pelvis in the most favorable position to relieve the tension on the ureter. If the bladder and ureter cannot be safely approximated, an end-to-end anastomosis of the severed ureter should be made. (See chapter on Diseases of Bladder, Urethra, and Ureters.) A case has been referred to which came under the observation of the writer in which the ureter passed directly over the upper surface of a large cyst, and came very near being cut or torn in two during the effort at its enucleation. The bladder may be situated in such a position that it may be injured during the abdominal incision or during the progress of the operation. Thus, where the bladder is drawn up by contact with the cyst and spread out over its anterior surface, it may be overlooked before its true character is suspected. The entire fundus of the bladder has been cut away in the removal of cysts. It has been the misfortune of the operator to open into the bladder before he realized its true character. The peculiar interlaced muscular structure of its wall should cause it to be recognized. Wherever the bladder is opened or injured it should be sutured. In a case in which the entire summit of the bladder was cut away the walls were sutured, opposing a good extent of the peritoneal surfaces and the patient recovered. In such injuries it is important also to prevent the bladder becoming unduly distended during the convalescence, especially for the first few days. It should be emptied frequently, in order that the accumulation may not lead to separation of the weak union and consequent leakage of urine.

Incomplete Operations.—We are unable by our most accurate rules of examination always to arrive at a correct and definite diagnosis of either the disease or the structures involved.

An incision of the abdomen may reveal that a tumor is so situ-

ated or so extensively adherent to surrounding structures as to render its removal impossible. Incomplete operations were formerly much more frequent than at present. Indeed, there are few cases in which an operation for the removal of a tumor should be discontinued after it has been once begun. In those cases, however, in which an exploratory incision discloses that the disease is malignant, and has already infiltrated tissues which cannot be safely removed, or secondary nodules are found in tissues remote from its origin, the acquisition of such knowledge should be considered a bar to further procedure. If upon opening the abdomen it is found that the entire peritoneal cavity is studded with papillary growths resulting from infection of the peritoneum through the rupture of a papillary cyst, it would be unwise to subject such a patient to the danger incident upon the removal of the original source of the disease.

The cases in which complications too grave to permit of the completion of the operation exist may be subjected to mere closure of the wound where the parts have not been much disturbed; in others it may be necessary to drain: this may be done by a glass or rubber tube or by the gauze drain. Where a cyst has been opened, or in any case in which it has been injured, but is found connected with other tissues by adhesions so firm as to render removal impracticable or unwise, the cyst may be opened, emptied of its contents, brought up and stitched into the abdominal wound. The superfluous portion should be cut away. The cavity may be packed with iodoform gauze, which promotes drainage, and by its presence in the sac may lead to an inflammation which will cause its obliteration.

SEQUELÆ.—The subsequent progress of a patient who has been subjected to ovariotomy will depend much upon the manner in which the operation has been conducted. In spite of every precaution that may be taken, there will be some cases of delayed convalescence, possibly due to some latent or pre-existing pathological tendency; but when an operation is carelessly performed and its details are imperfectly carried out, the probability of serious trouble can be appreciated. The operator and his assistants should have so trained themselves that the slightest deviation from a proper course cannot go unnoticed. Of what avail is it to spend much time in securing cleanliness of person, room, and instruments, and then drag the ligature with which the pedicle is to be secured over blankets or dirty tables before its introduction; to dust the wound

with iodoform from a box that has been standing open and used in all sorts of cases about a ward; to rub the nose, scratch the head, or touch other non-sterilized objects, and place the hand in the cavity without any precautionary cleansing? Such indiscretions will often explain stitch-abscesses and other septic processes. Pus-collections and cellular inflammations will occur in the pelvis about and posterior to the uterus, due possibly to some infection of serous collections in Douglas's pouch. Elevation of temperature, rapid pulse, and pain continued after the fourth or fifth day should lead to a careful examination for its origin. A mass of exudation in the pelvis should be considered an indication for the administration of salines in free doses until purgation, and the use of rectal and vaginal enemata of hot water at least twice daily. The exudation should be carefully watched, and the appearance of softening, felt either through vagina or rectum, should be considered as requiring prompt evacuation. The latter is accomplished by an opening through the vault of the vagina behind the uterus. The vagina should have been carefully disinfected, and the pus-cavity should be irrigated with normal salt solution or sterilized water and packed with iodoform gauze.

Intestinal Complications.—After operations for conditions complicated by inflammatory troubles intestinal sequelæ are not infrequent. It is difficult to make sure the intestines are free from twists when replaced, but danger is aggravated when we have bands of inflammatory adhesions, or openings in the omentum or mesentery, beneath or through which a knuckle of intestine may slip and become strangulated. Laceration of the coats of the intestine will affect its peristaltic action, and may lead to paralysis of a section, with ensuing symptoms of obstruction. A twist or volvulus may become so fixed that nothing can pass through it. If the walls are already weakened, a fecal fistula may ensue, as has occurred in our experience during the past year. A woman, much prostrated by puerperal sepsis, was subjected to abdominal section, the pus evacuated, forming as it did reservoirs in front and behind the uterus, and the abdomen was irrigated and drained. She did well for a few days, when a discharge of feces occurred, and upon her death some weeks later a volvulus was found. In a case operated upon at the Philadelphia Hospital by a colleague obstruction occurred five weeks after operation. The patient was seized with stercoraceous vomiting. A resection was performed, and five feet of intestine torn up, finding at its base a

distinct volvulus, which was untwisted. The patient recovered after a prolonged convalescence. The importance of early reopening the abdomen in such cases cannot be over-estimated, as the obstruction may be due to strangulation of a knuckle of intestine beneath inflammatory bands or to its enclosure between the sutures in the wound.

Adhesions.—It is quite probable that no case subjected to abdominal section is subsequently free from adhesions, though their frequency and extent will depend somewhat upon the presence of sepsis. The more aseptic the operation and the less the peritoneum is injured, the slighter and more fragile will be the adhesions.

They are more likely to take place between the abdominal incision and the underlying viscera, and between the stump of the pedicle and adjoining coils of intestines. The former may be rendered less annoying by drawing down the omentum to protect the wound, and the stumps may be turned forward and stitched to the anterior fold of the broad ligament. Dusting a film of aristol over the intestines to prevent adhesions has been recommended, but the procedure is of little practical use. Where adhesions have formed pain may be caused by traction upon them during the peristaltic action of the intestines. Pain thus caused has been so great that patients have submitted themselves to subsequent operation for relief. It is questionable how much is gained by such attempts, as whenever adhesions are broken up new injuries are produced, which increase the danger of inflammation and additional adhesions.

In all secondary operations the possibility of adhesion to the cicatrix should be kept in mind, and the incision should be prolonged upward to obviate the danger of injuring the intestine.