

Fibromata; 2. Myomata; 3. Sarcomata; 4. Carcinomata; 5. Cysts; 6. Adenomata; 7. Dermoids.

The paraöphoron gives rise to papillomatous cysts, and from the parovarium are developed unilocular, thin-walled cysts. Of the above tumors cystomata form about ninety-five per cent., the multilocular cysts being the commonest.

1. *Fibromata*.—These are the rarest of all ovarian tumors, muscular tissue being found along with fibrous in most benign solid ovarian tumors. When pure, these tumors consist of many bands of white fibrous tissue which interlace and include in spaces round cells, and here and there among the fibres a few small spindle cells are seen. No blood-vessels or nerves are found in the substance of the growth. Fairbairn divides them into three groups: (1) Where the whole ovarian stroma is replaced; (2) where part of the stroma only is affected; and (3) where a pedunculated fibroid springs from the surface of the ovary.

Fibroids of the ovary are more likely to develop in women who have passed the menopause than are fibroids of the uterus, and they occur twice as often in married as in single women.

Herbert Spencer found the tumor to originate in the fibrous capsule of the Graafian follicle in three cases. Peter Horrocks asserted that when carcinomatous and sarcomatous tumors are bisected the cut surface remains flat, whereas in fibroids it becomes concave, owing to the elasticity of the fibres. But this diagnostic sign is untrustworthy. The disease is usually unilateral, but Cleeman recently reported before the Philadelphia Obstetrical Society a case in which a pure fibroma of each ovary was found in a patient. Ascites was also present.

*Symptoms* are often absent until the tumor has been present for a long time. The patient may, however, complain of dysuria, dragging pain in the pelvis, dysmenorrhœa, and enlargement of one side of the lower abdomen. Ascites is frequently present, but it does not form a constant sign. Local examination reveals an extremely hard, firm tumor of ovoid shape, situated to one side of the uterus; it is non-sensitive and usually mobile.

The only *treatment* is removal, and this ought to be effected as soon as the tumor is discovered, on account of the difficulty of diagnosis between it and sarcoma.

The *prognosis* is unfavorable if the fibroids are not removed, as, unlike uterine fibroids, they are liable to take on active growth at any period of the patient's life.

2. *Myomata*.—Tumors of the ovary composed wholly of muscular tissue are almost as rare as pure fibromata. They usually develop from near where the ovarian ligament joins the ovary, as this ligament contains an abundance of muscular tissue. In 1896 Gessner found a small fibroid tumor on the ovarian ligament, situated at an equal distance from both the ovary and the uterus, and he inferred from this "that a myoma of the ovarian ligament might invade a healthy ovary and convert it into a myoma of the ovary." Baldy, in "American Gynecology," reports a case which occurred in a married woman, thirty-six years of age. Operation revealed multiple uterine fibroids, and that the right ovary was replaced by a fibroid mass of the shape and size of a lemon. This mass was attached to the posterior layer of the broad ligament and had the Fallopian tube running over its upper surface. The fimbriated extremity of the tube ended on the external surface of the capsule of the tumor. This latter itself was composed of smooth muscular fibres and a little connective tissue. A band composed of connective tissue and large blood spaces separated it from the true ovarian tissue which was apparently normal.

3. *Sarcomata*.—The ovary is not infrequently affected by tumors of a sarcomatous nature. Apart from regular sarcomata, masses of tissue indistinguishable from sarcoma sometimes occur in dermoids, the removal of which in these cases may be followed by malignant disease of the pelvis. When the ovaries are affected by these growths the disease is frequently bilateral, here differing from what takes place in other parts of the body where the affection is usually unilateral.

The ovary may be invaded by either the round- or the spindle-celled variety. The former is usually found when both sides are affected and in young patients. At the Würzburg Frauenklinik, out of 295 cases of ovarian tumors 20 were sarcomatous; the ages of the patients ranged from twelve to sixty-three, 7 being over fifty years old. Out of 4 which occurred in females under twenty, 3 were of the round-celled variety. Seven died after operation, 3 within the first four days and 4 before six months had elapsed.

Cohn states that their occurrence in relation to ovarian cystomata is as 1 to 100, and that they form ten per cent. of all malignant tumors of the ovary. In 400 cases of ovarian tumors of all kinds, including endothelioma, he found 5.88 per cent. to be sarcomata.

The tumors may grow either rapidly or slowly, and often attain a weight of from twenty to thirty pounds. Their consistence varies, some being hard (the spindle-celled variety), and others (the round-celled) soft and brain-like. They are surrounded by an outer wall, which sometimes is very soft and friable. The pedicle is usually short, and it is but seldom that adhesions to neighboring organs are formed, but ascites is usually present.

On section the surface may be yellowish-white or pinkish-gray, this depending upon the number of blood-vessels present as well as on the structure. Small cysts are often seen, and are due either to hemorrhage into the tissue with subsequent softening or else to fatty degeneration of the tumor cells.

Of the two varieties, the small round-celled is the most malignant; the greater the amount of fibrous tissue present, the less danger is there of any secondary trouble. This secondary infection attacks structures in the following order: viz., peritoneum, omentum, stomach, pleura, lungs, uterus, liver, diaphragm, and kidneys. The tumor may undergo degeneration, the commonest being fatty and myxomatous.

The *symptoms* are few at first, but ascites may develop early, and this forms one means of differentiating sarcomata from fibromata or myomata of the ovary. Pain and disturbance of menstruation are also more frequent than in benign solid ovarian tumors. Physical examination yields similar results in both fibroma and sarcoma ovarii. Metastases are indicated by ascites, œdema, enlarged abdomen, and rapid decline in the patient's health.

The only *treatment* is prompt and thorough removal of the affected organ, and it is also wise to remove the ovary of the opposite side, as it may be affected without showing it macroscopically.

Post-operative *prognosis* as regards recurrence is not good, but is better than when the ovary is the seat of cancer. When both ovaries are diseased or when the round-celled variety is found, the prognosis is decidedly more grave than when one side only is affected or when the growth is composed of spindle cells.

*Endotheliomata*.—These are malignant tumors which begin by a proliferation of the endothelial lining of the blood or lymph vessels of the ovary. They may be said to occupy a place midway between carcinoma and sarcoma, differing from them in structure but possessing similar clinical features. Billroth regarded them as being as malignant as carcinomata.

Endotheliomata were thus named on account of their origin, by Marchand, who first described them in 1879. They are usually solid, but may contain spaces. The surface is smooth, but may present tuberosities, composed of tissue which is of a brain-like or spongy consistence. They occur mostly at middle age, although Leopold has seen one in a girl of eight, and Olshausen one in a girl aged seventeen. In size they vary from that of a closed fist to that of a fetal head. Usually they are unilateral and rounded, but may be bilateral and lobulated. The pedicle is short and the tumor prone to form adhesions.

On section, the cut surface may be either gray, or yellow, or white, the tissue being soft and friable and easily torn by the fingers.

Pick differentiates endotheliomata into three types, of

which the first is of a rosary-like form, consisting of chains of cells in rows lying in narrow clefts of fibrous tissue. The borders of the rows are parallel and frequently anastomose. In the second form the structure resembles glands and it is difficult to distinguish it microscopically from adeno-carcinoma, the spaces being encroached upon by several layers of polymorphous cells. In the third variety the cells are grouped as in alveolar sarcoma. All three forms may occur in the same tumor.

Endotheliomata may occur in connection with other tumors, Pfannenstiel reporting a case in which an endothelioma and epithelial cyst-adenoma were present in the same patient. These tumors may degenerate, the usual form of degeneration being either hyaline or myxomatous, but colloid and fatty have been seen to take place.

*Carcinoma*.—Cancer of the ovary may be either primary or secondary. The latter usually accompanies malignant disease of the uterus, but it may complicate an affection of the stomach or mammary glands. It may originate in either the Graafian follicle or the germinal epithelium. It is convenient to divide cancer of the ovary into medullary carcinoma and adeno-carcinoma.

I. *Medullary Carcinomata*. These are solid tumors which are usually oval or rounded, but are also often nodular. They vary in size, but are rarely larger than the head of a full-term fetus. There is usually a pedicle which is short and thick, but at times they are intraligamentous. Both ovaries are but seldom affected.

Medullary cancers have a dense, well-defined, fibrous capsule, and on section the cut surface is seen to be more or less homogeneous, of a yellowish or grayish-white color. At times extravasations of blood into the substance of the tumor produce a mottled appearance. Degenerations, especially caseous or fatty, are common, resulting in the formation of cyst-like cavities with irregular walls and turbid or yellowish contents.

Histologically the growth consists of carcinomatous cells infiltrating a fibrous stroma, which may predominate and form alveoli filled with cancer cells, but usually the cellular elements predominate.

II. *Adeno-carcinomata*. Adeno-carcinomata are tumors which closely resemble ordinary serous cysts of the ovary. They are oval or rounded, and rarely exceed an adult head in size. They usually have a short pedicle, but may develop between the layers of the broad ligament and often form adhesions to neighboring structures. Although they may appear to be unilocular, they are usually multilocular. The disease is generally bilateral.

In about half of the cases examined, Pfannenstiel has seen papillæ on the surface. The cyst wall is composed of connective tissue which is quite friable. This wall may be thickened in spots, owing to the development of carcinomatous nodules. Papillary and cauliflower growths may spring from the internal surface of the cyst wall and may nearly fill the cavity. The cyst contents may be clear, turbid from cellular elements, or blood-stained from hemorrhages into the cyst.

Cystic carcinoma of the ovary is usually papillary, the papillæ usually resembling ordinary papillomata, but on section the microscope reveals the presence of cancer cells, and the carcinomatous structure may at times even be observed by the naked eye. Any individual tumor may contain masses which vary greatly in structure from one another. One form consists of a diffuse infiltration of a medullary character. More often the masses are composed of papillæ and glandular structures with their lumen still apparent. An atypical proliferation of epithelial cells is everywhere seen and the papillary growths are covered with several layers of cells asymmetrically arranged. A similar arrangement of the epithelium is seen in the glandular forms of the disease, this giving rise to their alveolar appearance. Lime salts become deposited in the tumors, especially those of a papillary nature, and give rise to psammomata.

It is almost impossible to tell when an adenomatous tumor of the ovary is benign and when malignant, as the gradation from an ordinary cyst-adenoma to primary carcinoma is so gradual. Ziegler holds that no clear line of

demarcation between the two can be drawn, and Pfannenstiel estimates that one-half of ovarian papillomata are carcinomatous. He, however, is rather an extremist, claiming that tumors which become carcinomatous should be classified as primary carcinomata, whereas most writers would consider these to be merely cases of carcinomatous degeneration of benign growths. Metastases frequently occur, affecting, in the following order, the peritoneum, omentum, liver, stomach, intestine, the ovary of the opposite side, and, but rarely, the pleura.

*Differential Diagnosis of Solid Ovarian Tumors*.—During the following brief consideration of this subject, it must be remembered that it will often be quite impossible to differentiate between a solid ovarian tumor and a solid subserous tumor of the uterus with a long pedicle, as, even where this is felt on palpation, the pedicle may be mistaken for the Fallopian tube, unless it be thicker than is commonly seen in the case of a long pedicle. A kidney may be prolapsed into the pelvis and give rise to some difficulty in the diagnosis, but it can usually be replaced.

First, these solid ovarian growths have to be distinguished from tumors of other organs; and secondly, from one another. The tumor is one of the ovary because (1st) it is situated in one side of the pelvis or lower abdomen; (2d) it is unconnected with any other abdominal organ, as ascertained by palpation and percussion; and (3d) uterine movements are not influenced by those of the tumor.

A *fibroid* is the hardest, slowest-growing, and least liable to produce other than pressure symptoms of any tumor of the ovary. It is more liable to appear after the menopause than a fibroid of the uterus.

*Sarcomata* are firm, and may be quite hard, but they grow rapidly, occur at an early age, and produce ascites, emaciation, secondary deposits, etc. They usually also have longer pedicles than the next variety.

The *malignant solid ovarian tumors* are more apt to be nodular than the above and produce the other signs of malignancy (ascites, emaciation, etc.) more quickly.

*OVARIAN CYSTS*.—Cystomata of the ovaries may arise from infolding and downward prolongations of the germinal epithelium, or else by enlargement of follicles which have failed to rupture, this failure frequently being due to inflammatory thickening of the outer coat of the ovary. Herman says that this latter "is such a simple and natural way of explaining the development of ovarian tumors that one would think that any other must only apply to exceptional cases," and there is much wisdom in this statement. Why these follicles develop into large cysts in some cases and not in others is not really known, although various theories have been advanced. They may occur at all ages and in every condition, but are more often seen in women who have borne few children than in those who have large families.

*Hydrops folliculi* is a condition in which one or more follicles become distended by fluid to the size perhaps of a cherry, retaining their globular form. One variety of this affection has been called Rokitansky's tumor, which consists of many distended follicles which have become pedunculated in some cases or compressed laterally in others. They contain a thin serous fluid and sometimes ova. This variety of tumor is both bilateral and rare.

*Neoplastic Cysts*.—Most ovarian cysts are of the proliferating variety, which Waldeyer divided into the proliferating glandular and the proliferating papillary cysts; but this is merely a clinical division. A more scientific classification is that of Pfannenstiel. He found that the contents of the two varieties differed from each other. In one there is a clear, thin, serous fluid, while in the other class the fluid is dark and turbid and contains a substance called pseudo-mucin. Using this fact as a basis, he named the two groups pseudo-mucinous and serous.

The *pseudo-mucinous* are the most numerous of all ovarian cysts. They are usually unilateral and the size may vary from that of a hen's egg to a tumor weighing two hundred and forty pounds; but one rarely now sees an

ovarian cyst weighing over thirty or forty pounds, as they are usually removed as soon as discovered. No age beyond puberty is exempt from these growths, but they are more liable to attack women between the ages of thirty and forty-five, especially if they are sterile or unmarried. The shape is usually ovoid and the surface may be either even or lobulated, the latter being most often seen in the case of the smaller tumors due to the presence of daughter cysts. The color is usually bluish or purplish-white and glistening, with here and there blood-vessels running over the surface. At times bands of unstriped muscle are also seen upon the surface, on which portions of ovarian tissue may become flattened out.

When opened up, the tumor may consist of one large sac with its contents, but if the interior is carefully examined bands of tissue, the remains of the walls of previously existing loculi, will usually be seen. More frequently many smaller cysts with their walls agglutinated together are discovered making up the large tumor. The contents of these numerous loculi may vary from a thin serous fluid to that of a jelly-like consistency. The inner surface of the cyst wall is usually smooth, especially if the tumor is of large size, this pressure causing atrophy of the epithelium; but in the small cysts, small papillæ and other excrescences are often seen. This lining is composed of a single layer of cylindrical mucous-like cells, which stain very readily with eosin and hæmatoxylin. These cells are implanted upon a layer of connective tissue and at times ovarian or unstriped muscular tissues. Outside this again is a layer composed of germinal epithelium.

The *serous cysts* are much less common than the above, nor are they so large, rarely exceeding the size of a pregnant uterus at term and usually being much smaller. Externally they resemble the pseudo-mucinous, but have a greater tendency to adhere to the surrounding organs by means of bands. They are usually multilocular, but contain fewer divisions than do the pseudo-mucinous cysts. They contain a clear, thin, yellowish or greenish fluid, in which albumin is present to a large extent. This fluid is produced partly from the blood-vessels and partly by secretion by the glands in the lining membrane. The composition of the cyst wall is the same as that of the pseudo-mucinous; the cells of the epithelium are columnar and ciliated.

*Symptoms of Ovarian Cysts.*—The patient may merely have a vague sense of fullness of the abdomen or of weight in the pelvis, or else she may experience no sensations whatever until she accidentally discovers a lump in the lower abdomen. There may be no interference with menstruation, so that when it ceases suddenly one should always be on guard lest pregnancy has occurred. At times the flow is increased, in which case an endometritis may be found to exist.

The physical signs will vary according to the size of the tumor. Where this is small and confined to the pelvis, a bimanual examination will reveal an ovoid, tense cystic swelling to one side of the uterus. Rarely it may occupy the middle line, as occurred in a case of the writer's, the tumor lying in front of the uterus, where it was held by an adhesion on one side and the Fallopian tube on the other. A tumor of this size would cause a downward bulging of the vaginal fornix and could be easily felt by the finger in the vagina, as would also be the case when the contents of a large tumor were very fluid or the cyst was unilocular. When, however, the tumor has risen out of the pelvis it rests upon the brim, and the only sign of its presence to be made out by the examining finger is the depression of the uterus. On inspecting the abdomen, an enlargement is to be seen of the lower part and usually to one side, this enlargement being either regular or uneven. Upon palpation the mass will usually be felt to be tense, but fluctuating, though when the contents are gelatinous the sensation may be similar to that caused by a soft myoma. When the tumor is unilocular, or one loculus is especially large with very fluid contents, a thrill may be obtained by flicking the mass with the finger on one side, while the

other hand is placed on the opposite side. This may be intensified by requiring an assistant to exert pressure on the mass by means of the outer edge of his hand placed mesially on the abdomen. Percussion will show that the intestines are pushed into the upper part of the abdomen and to the sides, and turning the patient on one side produces no change in the areas of dullness, an ovarian cyst differing in these two points from free abdominal ascites in which the percussion note is clear in whatever part of the abdomen happens to be uppermost at the time.

*Diagnosis* of small ovarian tumors (*i.e.*, while they lie wholly in the pelvis) is not as a rule difficult. The peculiar tense, semifluctuating sensation imparted to the examining finger by an ovarian cyst is felt in practically no other conditions than hydro- and hæmato-salpinx and encysted peritonitis. In the two former conditions the mass is elongated or sausage-shaped instead of ovoid as in the case of a cyst. Encysted peritonitis is fixed and has not the clearly defined margin of the ovarian tumor. When the cyst is adherent the diagnosis is more difficult, but space forbids further consideration of the subject. Of course, a parovarian cyst may be mistaken for an ovarian growth, but the treatment is the same and a definite diagnosis can be made only by opening the abdomen.

When the tumor has risen out of the pelvis it may be mistaken for ascites, a distended bladder, a tumor of the uterus (fibroma, myoma, or fibro-cyst), cyst of the mesentery, ovarian dermoid, renal cysts, hydronephrosis, phantom tumors, cyst of the parovarium, and pregnancy with hydramnios.

In *ascites*, unless encysted, the flanks bulge and the enlargement does not stand up prominently, as in the case of an ovarian cyst. Percussion will give a clear note over the highest point in the abdomen. That is to say, with the patient on her back a tympanitic note will be heard in the region of the umbilicus, while the note in the flanks will be dull; whereas if she is turned on her side, the flank which is uppermost will yield a clear note. Exceptions to this rule, however, occur now and then, as was well illustrated in a case which came under the writer's observation some years ago. An immigrant woman was brought into hospital and found to have a swelling of the abdomen which progressed rapidly. The fluid impact wave was readily obtained and percussion gave a dull note all over the abdomen, except just below the sternum. Posture made no change in this note. The uterus and vaginal fornices were depressed. The heart, liver, and kidneys were healthy, and a diagnosis of a rapidly growing parovarian cyst was made. On opening the abdomen for its removal a large quantity of fluid was removed from the general peritoneal cavity and the pelvic organs were found to be healthy. Shortness of the mesentery preventing the intestines from floating to the surface and the excessive quantity of fluid present accounted for the absence of the clear percussion note from its usual situation.

A *distended bladder* occupies the median line of the lower abdomen and appears as a tense pyramidal mass above the pubes. There is generally dribbling of urine, and careful catheterization of the bladder will clear up the diagnosis. For this little operation a male metallic instrument is the best, as something may be pressed against the bladder diagonally, thus cutting off the part into which the ureter of one side opens. A rubber catheter will coil up in the free part of the bladder, and this also will be the only part of the organ which can be emptied by the ordinary short glass catheter, while the long metallic instrument can be cautiously guided past the obstruction into the dilated portion.

*Myomata* and *fibromata* of the uterus are hard, and palpation fails to elicit any fluctuation. They move with the uterus, the cavity of which is enlarged. If they are interstitial or submucous, menstruation is increased.

A *fibro-cyst* of the uterus gives fluctuation, but moves with and is evidently attached to the uterus. It is a very rare form of neoplasm, and if it is punctured and if the fluid is allowed to stand spontaneous coagulation quickly supervenes.

*Cysts of the mesentery* have a clear percussion note all around them, if they are not large enough to fill the whole abdomen, in which case a history of the growth having proceeded from above downward and not vice versa, as is the case of ovarian affections, can usually be obtained.

A *dermoid of the ovary* is of slow growth and may occur in a very young girl.

*Renal* cystic tumors and hydronephrosis give a history of progressive enlargement from above downward and can usually be separated from the pelvic organs. In the case of a hydronephrosis ureteral catheterization will usually clear up the diagnosis.

*Phantom tumors* disappear when the patient is anesthetized.

*Pregnancy with hydramnios* may be diagnosed by observing the rhythmical uterine contractions, by auscultation, and by the softening of the cervix and the changes in the breast coexistent with pregnancy. There will also be the history of amenorrhœa, and when all else fails time will clear up the diagnosis.

A *cyst of the parovarium* grows quickly, is never nodular, and, owing to its being unilocular and containing very limpid fluid, gives the wave impact very distinctly.

*Complications of Ovarian Cysts.*—Any organ or structure in the body may become diseased contemporaneously with tumor formation in the ovary, but the most common complications are albuminuria, ascites, adhesions, pregnancy, rupture of the tumor, and torsion of the pedicle.

The coexistence of *pregnancy* and ovarian cyst is grave and requires care before, during, and after labor. If the cyst is large an abortion is very apt to result. The tumor is very liable to rotate, causing torsion of its pedicle after labor, owing to the change in the intra-abdominal pressure. Infection and consequent suppuration of the cyst are also apt to occur. When pregnancy goes to full term the fetal and maternal mortality is high. In 271 cases of ovarian tumor complicating labor, there was a maternal mortality of 25 per cent. and a fetal of 75 per cent., while Zitter and Litzmann place the maternal death rate at 30 and 43 per cent. respectively.

*Torsion of the pedicle* is a not infrequent complication of ovarian cysts; dermoids, probably on account of the difference in consistence and weight of various sections of the growth, being the variety most often affected. Its onset may be either acute or gradual, the former being naturally the more grave.

The *symptoms* of a twisted pedicle are a sudden, acute pain, followed by rapid enlargement of the tumor. The abdomen becomes tender and the patient may show evidences of most profound shock, the respirations becoming rapid, the pulse small, thready, and rapid, with later on a rise of temperature.

When the onset is more gradual there may be few or no special symptoms. There may be an increase of the previous pain and some enlargement of the tumor. The rapid increase in size of the tumor is due to congestion, which may be so great as to cause hæmorrhage into the tumor substance or even into the peritoneal cavity.

The only *treatment* is to operate without delay.

*Ascites* may accompany an ovarian tumor, especially if it be malignant. Its chief importance lies in the probability of there being disease of the heart, kidneys, or liver, and in its rendering the diagnosis difficult.

*Albuminuria* should be looked for and cured if possible before any operative interference is carried out. It may be caused by pressure of the tumor on the ureters, in which case it will disappear after removal of the growth and no casts will be found in the urine.

*Adhesion* of the tumor to neighboring organs forms a serious complication when an operation is called for. These adhesions may be so intimate as to offer sufficient nourishment to the tumor even after it has been freed from its usual attachment, as sometimes occurs in torsion of the pedicle. They also complicate the diagnosis, as, for instance, when the tumor becomes adherent to and moves with the uterus.

*Rupture of the cyst* may occur and may be followed by permanent disappearance of the growth, or this may refill. When the contents are either irritating, as in the case of a dermoid, or malignant, a general peritonitis or secondary infection of the peritoneal cavity will follow. In some cases a blood-vessel will be torn through and a more or less severe hæmorrhage into the peritoneal cavity may take place.

*Prognosis.*—If left alone ovarian cysts are apt to increase in size until they prove fatal through interference with the alimentary, cardiac, digestive, and respiratory systems.

*Treatment.*—Removal of the cyst by either the abdominal or the vaginal route is the only treatment indicated. Formerly frequent tapping of the tumor and withdrawal of the contents were practised, but ovariectomy is now so safe a measure as to have no rival in the treatment of this condition. Tapping is not only useless, but is distinctly dangerous, as it sets up adhesions and may allow leakage into the peritoneal cavity, is liable to cause sepsis, and puncture of bowel or blood-vessels may occur, and the fluid tends to accumulate more rapidly afterward. Even when the tumor has ruptured spontaneously operation may be indicated by peritonitis or by hæmorrhage. In a case of the writer's, rupture took place half an hour before the time appointed for operation, and on opening the abdomen the cavity was found to contain a large quantity of fluid blood which had escaped from a vessel that had been torn across.

**OVARIAN DERMIDS.**—In women dermoid tumors have never been found growing from any other organ in the abdominal cavity than the ovaries. They are comparatively rare, only between three and four per cent. of all ovarian tumors being of this nature. They may occur at any age, but are more liable to occur before puberty than any other form of ovarian tumor. Usually only one ovary is affected, but now and then the disease attacks both.

Until recently it was maintained that they were due to inclusion, in the developing ovary, of cells from the other layers, but Wilms has lately suggested the probability of their being caused by some eccentric development of ova, and he supports this theory by the facts of their being found occasionally in the fetus, and of the tumor containing traces sometimes of nearly every organ in the body, which is not the case with dermoids situated elsewhere.

Ovarian dermoids are not large tumors, rarely being seen larger than a man's head. They contain a cheesy material, in which may be found almost any organ of the body, sometimes in a very rudimentary state. One of the commonest structures found is hair, which may measure five feet in length but which is usually short. In addition to these substances, teeth are often found embedded in the cyst wall, where also rudimentary mammae may be seen. A heart with a mitral valve and chordæ tendinæ has once been described as having been found in a dermoid of the ovary. The more fluid contents are extremely irritating to the peritoneum, and if they escape into the peritoneal cavity they are almost sure to set up a most intense inflammation of its lining.

An ovarian dermoid gives rise to the symptoms of an ordinary ovarian cyst, from which it may be diagnosed by its slow growth and the peculiar want of elasticity which it imparts to the examining hand. An ovarian tumor seen in a girl before puberty is much more likely to be a dermoid than one of any other variety.

The proper *treatment* is to remove the tumor. **PAPILLOMATOUS TUMORS OF THE OVARY.**—This variety of ovarian cyst is of sufficient importance to warrant some special consideration, and is divided into two groups, according as to whether the papillomata occur inside the cyst or on the outside of its wall.

1. *Papillomatous cystoma of the ovary* may be shortly described as a cystic tumor of the ovary containing masses of papillæ; from the tendency to form secondary growths, it may be looked upon as malignant.

Olshausen, in 1877, noted the difference between sim-

ple cysts and those containing papillary projections. Inspection of the tumor with the naked eye reveals numerous papillæ on the inner surface of the cyst wall. These may be few in number or else so numerous as completely to fill the cavity of the cyst and even at times cause its rupture. The papillæ are pedunculated and vary from a simple projection to a most complicated branching structure. Not only does this shape vary, but the color may range from almost white to a pinkish hue, this depending on the supply of blood going to the papillæ and also on their consistence. They are usually soft, but may contain sand-like bodies which cause the growths to feel gritty. After perforation of the cyst wall the peritoneum and other organs may become infected.

These cysts usually contain a clear, thin, watery fluid of a yellow color and alkaline reaction. It has a specific gravity of from 1.005 to 1.040, and does not coagulate on standing. It responds to the tests for albumin. On examining the fluid with the microscope, it may be seen to contain epithelial elements, compound granular bodies, and sometimes cholesterolin and hæmatoidin crystals. Instead of the fluid being clear, however, it may be dark and turbid or even grumous, the character varying at times even in different parts of the same tumor.

**Microscopical Appearances.**—In a pedunculated cyst the wall has an outer layer which is thin and dense. It is composed of laminated tissue, a few cells, and occasionally non-striated muscular tissue may be seen. The next layer is thicker and more cellular. Both contain blood-vessels. Internal to this second is a third layer, composed of epithelium which sometimes rests upon a thin homogeneous basement membrane. The epithelial cells may be cuboidal, cylindrical, or, in fact, almost any shape. Cilia may or may not be present, and even in the same tumor some cells may bear cilia while their neighbors do not, their absence or presence being purely accidental and having no bearing upon the case (J. W. Williams). These cells may be in one layer or in several, and in small cysts they are not usually so high as where they simply cover papillæ, the low merging gradually into the high. In the smaller cysts also, part of the outer wall may be replaced by true ovarian tissue. The stroma of the cyst wall, which may be dense and well formed, or else somewhat myxomatous, continues up through the pedicle into the papillæ, and is usually well supplied with blood-vessels, which are thus enabled to pour out a portion of their serum and so contribute their quota toward the fluid contents of the cyst.

The sand-like bodies, above referred to, are called psammomata, and consist of particles of carbonate and phosphate of calcium arranged in concentric rings.

Papillomata may extend from their primary site by three methods. They may do so by direct extension to contiguous structures, by the attachment of small broken-off fragments of the growth to the peritoneum, and lastly by true metastatic formation.

In the early stage no diagnosis of the exact nature of the pathological process is possible. This is clear only when the ascites can be made out, when the psammomata can be felt per vaginam, or when papillomatous masses burst into the bladder or rectum. Freund considers that the simultaneous appearance of ascites and hydrothorax favors the diagnosis of papilloma ovarii.

These cysts are apt to burrow between the layers of the broad ligament, both toward its base and laterally toward the uterus. They occur most frequently between the ages of twenty-five and fifty.

2. *Superficial papillomata of the ovary* are more rare than intracystic growths, and like them are nearly always bilateral. They are formed of branched, usually pedunculated masses, springing from the surface of the ovary. Their histological structure resembles that of the intracystic form of the disease, the epithelium being continuous with the germinal epithelium, as is also the case in some intracystic growths, although the etiology of the latter is uncertain.

The treatment of papillomatous disease of the ovary is

prompt and thorough removal of the diseased structures, and this is usually followed by permanent relief.

F. A. J. Lockhart.

**OVARIOTOMY.**—Ovariectomy (from the Latin ovarium, ovary, and Greek *τομή*, cutting) is to be classed among the unsatisfactory terms which unfortunately are too common in medical nomenclature. Leaving out of consideration its hybrid formation, the word by no means expresses the removal of the ovary. In this sense oöphorectomy (*ὄοφορον*, ovary, *ἐκτομή*, excision) is far more appropriate; and if the Fallopian tube be also removed, *salpingo-oöphorectomy* should be employed.

Under the heading "ovariotomy" most text-books consider the operation for tumor formations alone of the ovary, ignoring the inflammatory and other conditions for which identically the same procedure is more frequently undertaken. In accordance with custom, however, the first class of cases will be dealt with here.

**HISTORY.**—The history of this procedure is of considerable interest. The kings of ancient Lydia are said to have had it performed upon women either for the purpose of preserving their youthful characteristics, or in order that they might be employed in the place of eunuchs. The actual nature of the operation, however, is somewhat doubtful, as in some instances in all probability only the clitoris was removed, although from the scanty details procurable it may be inferred that at least some genuine ovariectomies were performed. During the seventeenth century a Hungarian sow-gelder is said to have removed the ovaries from his daughter as a punishment for her frequent lapses from virtue. In the eighteenth century, although suggested much earlier by continental surgeons, the possibility of the operation was seriously discussed, more particularly by John Hunter in England and John Bell of Edinburgh, although, owing to the high mortality of all intra-abdominal operations, these men lacked the courage of their convictions and were unwilling themselves to undertake a hitherto untried procedure. Their teachings, however, bore fruit, and the first prearranged and successful ovariectomy was accomplished in 1809 by Ephraim McDowell, of Kentucky, who had been one of Bell's students in Edinburgh. It must of course be conceded that the ovaries had been removed by operation previous to this time, but in the majority of such cases, if not in all, the real nature of the procedure had not been recognized until later. Moreover, in several other instances ovarian cysts had been tapped through an abdominal incision, and portions of the sac walls had been resected. Nevertheless, it is important to recognize the fact that all such operations had lacked the careful pre-arrangement or the successful issue of McDowell's case.

In the United States the operation was repeated by the originator twice before 1817. Nathan Smith, of Connecticut, unaware of McDowell's cases, performed it in 1821; Rogers, of New York, in 1829; Billinger in 1835; and in 1843 Dunlap, of Ohio, and the Atlee brothers, of Pennsylvania, obtained favorable results. From this time on, the operation gained in favor in America, and the excellent work of W. L. Atlee and of Peaslee did much to popularize it.

In Great Britain Lizars, of Edinburgh, performed the operation four times in 1825, but no other attempts were made in Scotland until 1845. In 1833 Jeaffreson, of Framlingham, obtained the first successful result in England, although Granville had had two failures in 1826 and 1827. Interest in the procedure was revived in 1842 by Clay, of Manchester, who soon became noted for his work. Spencer Wells from 1858 to 1871 performed the operation 440 times, and his total number of ovariectomies reached nearly 2,000. His successors, Keith and Tait, also obtained splendid results. The first successful operation in Europe was performed by the German surgeon Chrysmar in 1820, a similar case in the previous year having terminated fatally. In Germany, until 1850, only 23 ovariectomies with 7 successes had been done, and until

1870 there had been only 180 with a mortality of 105, or over 58 per cent.

It was not until 1844 that Woyerkowsky scored the first success in France, but here as in Germany the profession were so opposed to the operation that it made but little headway, and was not recognized until long after it had been established in America and England.

Following the introduction of the principles of antiseptic and asepis the mortality was reduced to a remarkable degree until, instead of being regarded, as it was by many leading surgeons of fifty years ago, as almost the equivalent of murder, the procedure is now looked upon in uncomplicated cases and in the hands of a skillful operator, employing a rigid aseptic technique, as one of the simplest of abdominal operations. The gradual development of ovariectomy is very fully presented by Peaslee ("Ovarian Tumors," 1872).

**Indications.**—Internal medication and local treatment are futile in cases of ovarian tumor, and the days of simply tapping cysts are now past. So soon as the diagnosis is made, operative measures should be instituted. Some operators prefer the vaginal route, wherever possible, and in suitable cases this answers the purpose admirably. The relative merits of the two methods cannot be discussed here, but to-day, as a rule, the abdominal incision is chosen; since by its employment the tumors can be rendered plainly visible and accessible to close examination, and the question of complete or partial removal of one or both ovaries is consequently more easily decided.

It is true that in many instances an ovarian tumor may exist throughout a patient's lifetime, without detriment to her health, or without producing any symptoms whatever, so that its discovery is often more or less accidental. But despite this well-recognized fact we must always take into consideration the comparative frequency of malignancy in these tumors, and the liability to the occurrence of secondary implantations and metastases, even at a period when the main growth is causing no unpleasant manifestations. Moreover, the possibility of certain accidents, as torsion of the pedicle, or rupture of a cyst with perhaps a resulting hemorrhage or peritonitis, is worthy of consideration. Infection of the cyst contents from an adherent bowel may also occur and greatly increase the danger. Adhesions are likely to form, rendering operation at a later date more difficult, and secondary changes in other organs may begin insidiously and make considerable and rapid progress.

Age as a rule seems to make but little difference. Generally speaking, elderly women bear the operation very well. In children we must always bear in mind the relative frequency of sarcomatous tumors.

The coexistence of pregnancy does not modify to any extent the indications for operation, inasmuch as statistics show that fatalities to the mother and fetus are much more likely to occur when the ovarian tumor is allowed to remain undisturbed than when it is removed even during the pregnancy. In the case of a malignant tumor the dangers incident to expectant treatment are even greater than in the non-pregnant state, since the physiological congestion tends to promote rapid growth. The liability to torsion of the pedicle is naturally increased as the enlarging uterus crowds the tumor, often rotating it, in its attempts to occupy the narrowing space to the best advantage. Thus in one series of one hundred and nine cases of ovarian tumor with pregnancy torsion occurred ten times. Large tumors in the presence of the additional bulk of the uterus may lead to pressure symptoms, sufficiently severe to endanger the life of the mother, and growths of relatively small size have been known to cause the death of the fetus. Smaller tumors, especially if solid, may become impacted in the pelvis below the growing uterus, the accident either leading to abortion or giving rise to an impassable obstacle to delivery at term, thus necessitating a Cæsarean section or other radical measures. The pregnant uterus may also be crowded backward under the promontory of the sacrum, so that its development is

hindered, and abortion is very likely to occur. Adhesions of the ovarian tumor to the uterus may prevent the symmetrical enlargement of the latter, leading to abortion or sometimes to a malposition of the fetus. The adhesions may be torn apart by the traction exerted by the uterus, sometimes in conjunction with a sudden trauma. In such cases alarming or even fatal hemorrhage has been known to take place. Rupture of an ovarian cyst is also liable to occur from pressure or trauma, in the latter case because there is less room for the movement of the tumor, so that even a slight blow might suffice to cause such an accident.

The question of the advisability of operation during pregnancy is very apt to present itself, since a tumor that has existed unknown to the patient may attract her attention as soon as it is displaced upward, into the abdomen, by the growing uterus. The physician may also discover it during an examination in a case of apparently normal pregnancy.

If the tumor be discovered only in the later months, especially if it be small and cause no trouble, and if after it has been carefully watched for some time it shows no signs of enlarging, operation may be deferred until after delivery has taken place. All the various factors, however, in the individual case must receive careful consideration. If a cyst causes disturbances only during the last four weeks of pregnancy, or after the onset of labor, tapping may become necessary, and the short respite thus obtained may tide the patient over until a more favorable time for a radical operation. There is also the possibility that the cyst may not refill. In the earlier months, inasmuch as pregnancy is less liable to be interrupted by operation, interference is clearly indicated. The operation should be done as rapidly as is consistent with proper precautions, and during all the various manipulations the pregnant uterus should be protected from trauma, and the pedicle carefully ligated. In view of the stretching that may be exercised by the enlarging uterus, the tissues should not be too tightly bunched; it is far preferable to employ several ligatures, each including a small portion of the pedicle. The case should be treated afterward as if abortion were imminent, and opiates should be administered if necessary.

The only absolute contraindication to the operation may be the enfeebled physical condition of the patient. Thus in torsion of a pedicle with resulting collapse it will sometimes be very difficult to decide whether a postponement is not justifiable in the hope that the patient can be tided over the acute attack, and not submitted to operation until some days later when her condition is improved. Many unfavorable symptoms apparently contraindicating operation may be due entirely to the tumor, and disappear after its removal. Among the most important of these are ascites, circulatory and even respiratory changes induced by pressure, albuminuria, and in some cases glycosuria. In several instances sugar, which had been present in the urine of patients suffering from ovarian cysts, disappeared entirely after removal of the tumor.

Even in apparently hopeless cases unexpected results are sometimes obtained, and records are found of cases of widespread papillary adenocystomata and endotheliomata with peritoneal metastases, in which these latter caused no further trouble after the main tumor had been removed. Moreover, in densely adherent cases which at first seem to defy even an expert operator, by patience and careful work the tumor may probably be freed and then removed. At times in almost moribund patients radical measures may be indicated, and unless the condition be due to cachexia brought about by a malignant tumor, after prompt and active stimulation and infusion or intravenous transfusion of decinormal salt solution, operation will sometimes save. More particularly is this true in cases of torsion or rupture of a cyst or when the symptoms are due to pressure.

In brief, then, the indications for treatment in cases of ovarian tumors may be summed up as follows: Operate as soon as you are satisfied of the presence of such a tu-