

CUMSTON (C.G.)

Septic Infection of Ovarian  
Cystoma

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## SEPTIC INFECTION OF OVARIAN CYSTOMA.<sup>1</sup>

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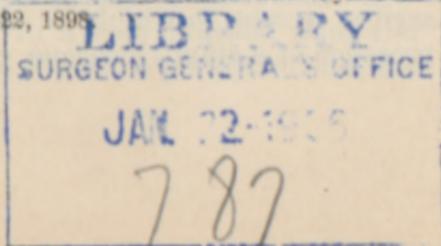
THE question of suppuration arising in either simple or dermoid cysts of the ovary is one that has only been talked of by gynecologists within the last fifteen years, although long before that time a few cases are to be found scattered throughout medical literature, and it appeared to the writer that a general consideration of this rather important question of abdominal surgery and gynecological pathology might not be out of place at this time.

The advance made in abdominal surgery and bacteriology has at the present time put the question of suppuration of ovarian cysts quite well forward, and in the recent and excellent text books on gynecology by Keating, Penrose, Webster, Garrigues, and other writers, all mention this complication, but do not give it the prominence to which we think it is entitled.

Pathologically, ovarian cystoma may be divided into epithelial and dermoid cysts. If these cysts are situated in the ovary they are called ovarian, while if they are included in the parovarium they are termed parovarian cysts, and according to the case they either have or not a pedicle. If their cavity is composed of a single pocket they are termed unilocular, but, on the contrary, when the walls are adherent and the cavity composed of a number of small pockets they are termed multilocular cysts.

The wall of an epithelial cyst is made up of two layers—an external layer which is extremely dense and composed of fibrous tissue which is poor in cellular elements, and is lined by a cubic epithelium which differs from the flat endothelium of the peritoneum. The internal layer of the wall is well provided in cellular elements and blood vessels, and is lined by an epithelial layer comprising a few elastic fibres. Between these two layers a third one is to be found, to which the name of cellulo-vascular layer has been given. The contents of these

<sup>1</sup> Read before the American Association of Obstetricians and Gynecologists, at Pittsburg, Pa., September 20-22, 1898.



cysts are liquid and usually a light yellow or slightly greenish in color, but in certain examples the contents may be a reddish-brown or chocolate color. The consistence of the liquid varies from that of serum to the thickness of gelatin.

The wall of a dermoid cyst is a structure very similar to that of the dermis of the skin, and contains unstriped muscle fibres, blood vessels, nervous elements, papillæ, sebaceous glands, and hair follicles. Their contents are made up of sebum mixed with epidermic products.

Now, if we admit that these cysts, either of the epithelial or dermoid type, undergo an inflammatory process, the result will be a suppuration of the cysts. Pus may exist in a large or small quantity, according to the size of the cyst and according to whether one cavity or only a few of the smaller ones contain this pathological product. Sometimes it is greenish, at others yellow; sometimes it is dirty, with only a slight odor, while in other cases it has been found of a creamy consistence with a very strong odor. When submitted to bacteriological examinations the pus has been found either free from micro-organisms, in which case it was sterile, or, on the other hand, micro-organisms were present.

Sterile pus has been the least frequently met with in cases of suppurating ovarian cysts. In one case reported by Fraisse and Legrain in 1892 an ovariectomy was performed and fifteen litres of pus withdrawn, and neither by staining nor by culture on various media, nor by inoculation of guinea-pigs under the skin or intraperitoneally, could the presence of any bacteria be demonstrated.

Pus containing bacteria is by far the most frequent, the streptococcus and all the staphylococci being found. Bumm reports a case which he observed, in which by culture he demonstrated the presence of streptococcus. Schiperovitsch, Werth, and very recently Keen, of Philadelphia, in his important monograph on the "Surgical Complications and Sequels of Typhoid Fever," have all contributed cases in which Eberth's bacillus was found in the pus. Madlener has reported one case of suppurating cyst of the ovary in which Koch's bacillus was found, while Schauta reports one in which diplococcus of pneumonia was present in the pus.

In 1893 Bumm made cultures from the pus taken from an ovarian cyst, and found organisms which were apparently the bacterium coli and staphylococcus; and Mangold in 1895 describes a case in which he also was able to demonstrate the presence of a staphylococcus, bacterium coli, and an organism

which resembled the gonococcus. In most cases the walls of the cyst will be found to have undergone a certain number of changes macroscopically. The walls may be found either thin or thickened; there may be an unequal consistence in different parts; other cysts may be found softened and perforated, while still others may be found covered with small vegetations. In some cases the internal surface of the cyst wall was found covered with a layer of fibrin, while the external surface of the wall showed a partial desquamation of the epithelium, and thus we may explain the possibility of the formation of adhesions taking place by means of friction.

Microscopically various conditions of the walls may be found. In some cases sarcomatous degeneration of the wall has been recorded. In other cases the microscope showed typically a tubercular follicle with nuclear zones grouped around a giant cell. In a case reported by Bumm the connective tissue making up the wall was found infiltrated with small cells. Sections colored with methylene blue showed the presence of bacteria, among which groups of cocci and bacilli were found.

As to the lesions which are present in the neighborhood of the cyst, we may mention, in the first place, ascites, which usually is not very abundant, and also peritonitis, which may either be generalized or localized. In an infected focus such as we have in the suppurating ovarian cysts we can readily explain the continual inflammatory attacks which occur. Localized peritonitis is by far the most frequent, and it is this process that gives rise to the formation of adhesions which bind the growth to the surrounding parts, such as the intestine, the abdominal wall, or the mesentery. These adhesions may be very extensive, thick, and their vascular supply is very abundant.

In a case reported by Page an abscess of the cellular tissue in the retrocecal region was found. In a case reported by Féraud there was a cystocele, rectocele, and an increase in the prolapsus of the uterus which was present. In most cases the uterus will be found high up in the pelvis, and in most cases it is pushed either to one side or the other. A certain number of cases of perforation of the intestine have been mentioned. The diaphragm is often hindered in its respiratory movements, and the iliac vessels and the vena cava are frequently compressed. Pressure of the lumbar plexus and the sacral plexus may be of a sufficient intensity to produce the lesions of peripheral neuritis in the lower limbs, resulting in a very marked muscular atrophy. In one case reported by Féraud a pleuritic collection

on the left was found, and the reporter considers it as due to a hindrance in the lymphatic circulation of the abdomen.

In considering the pathogenesis of septic infection of ovarian cysts, the first question to be considered is whether the liquid contents of the cyst, before infection by foreign elements has taken place, does not contain its micro-organisms, which would almost surely end in a suppurative process. Clinically we may deny this, because if such were the case every ovarian cyst would naturally end in suppuration. And, what is more, if it be admitted that the liquid contents of a cyst, before any contagion has taken place, are already septic, how can we explain these cases of rupture into the peritoneal cavity which will neither result in inflammation nor in symptoms of infection?

Bogdanick has reported the case of a very large ovarian cyst which contained twenty litres of fluid and which ruptured into the peritoneal cavity after traumatism. Abdominal section showed that there were two rents in the cyst wall, measuring several centimetres, one being on the anterior aspect, the other on the posterior aspect of the cyst. Careful examination failed to reveal the slightest traces of peritonitis, and the patient was perfectly well two weeks after the accident.

Lannelongue mentions another similar case. A woman who had an ovarian tumor was twice tapped in order to withdraw the liquid contents, but the cyst soon refilled and the patient entered the hospital. On account of the persistency of the fluid Lannelongue decided to operate, but before doing so he wished to keep this patient under observation for a few days. But his surprise was great when, on the day after the patient's entrance into the hospital, he found that the cyst had collapsed and that symptoms of a peritoneal collection had suddenly taken the place of those given by the cyst; and in fact during the night the latter had burst and had emptied its contents into the peritoneal cavity. There was no reaction, no vomiting, and no pain after this rupture. The liquid became progressively absorbed, and six months later the patient was found in good condition. The abdomen was soft and the vaginal culs-de-sac were perfectly free.

If we now examine the experimental side of the question, we will find still more proofs of the perfect asepsis of the liquid contents of these cysts. This has been demonstrated by Chauffard and Widal, more especially in cases of hydatid cysts, but they have also demonstrated it in ovarian cysts. Knowing, then, that the liquid contents of these cysts is aseptic, we might ask the question whether this liquid itself might

not be a good culture medium for bacteria when they gain entrance within the cyst.

The above-mentioned writers have made comparative inoculations of peptonoid beef tubes and in tubes containing the liquid contents of a cyst. These experiments, which were carried on with the staphylococcus and streptococcus, the bacterium coli and the bacillus of typhoid fever, showed that the tubes containing the fluid from the cyst, as well as those containing the peptonoid broth, gave beautiful cultures of the various organisms inoculated.

From the above-mentioned facts it may be said that if the liquid contents of an ovarian cyst are not contaminated by bacteria they will remain aseptic and will undergo no change; but if, on the contrary, microbes attack a cyst and enter it, its contents will serve as an excellent culture medium and symptoms of infection will soon appear. But the human organism will take on the offensive and will react against the bacteria which have infected the cyst; leucocytes come through the walls of the vessels and attack the invading microbes, and thus we have the transformation into pus of the liquid contents.

It is well known at the present time that suppuration is not to be considered as a special reaction of the organism, produced by certain infective germs; and also it is known that it is not confined alone to certain types of bacteria, and that it is a simple pathological process. The most varied kinds of bacteria may produce it, be they pathogenic or saprophytic. Thus, for a suppuration caused by pyogenic organisms other than the staphylococcus and streptococcus, we know that suppurating meningitis is produced by pneumococcus, that the gonococcus will produce a suppurating arthritis, that empyema can be produced by the bacillus of tuberculosis, and that the bacillus of typhoid fever can produce osteomyelitis. In the case of saprophytic infection, in order that the liquid contents of an ovarian cyst be preserved from purulent changes, it is necessary that it remain free from both pathogenic and saprophytic organisms, and if they find entrance they are the cause of suppuration.

From what we have said we may conclude that we have two kinds of septic infection of ovarian cysts—viz., the pathogenic infection and the saprophytic infection.

Pathogenic and saprophytic organisms enter ovarian cysts in various ways. Puncture, incision, and drainage are often the means of their direct invasion from the exterior; and we should always bear in mind that the deep layers of the epidermis contain bacteria in large quantities, more particularly the

staphylococcus albus, the latter presenting a very great resistance to all manner of disinfection, and which by the above-mentioned operative interference may be pushed directly into the interior of the cysts. But in a great number of instances, as puncture is discarded by the majority of the profession, the patient contains the agent of the septic process under consideration. The germs did not come from without, but from the interior of the organism, and it may be called a true auto-infection, which can take place in one of three ways: Firstly, by means of the blood, in which case the infection is either direct, produced by phlebitis which extends up to the cyst, or it may be indirect, in which case the infectious elements are carried in the general circulation into the tumor by means of its pedicle. Secondly, infection may take place by the lymphatics, in which case the lymphatic channels act as the contaminating canals and allow a direct introduction of the germs into the interior of the cyst up its hilum. Thirdly, we have infection through adhesions, which are plentifully supplied in new-formed vessels which are intimately connected with those in the walls of the cysts and thus allow an easy transportation of the bacteria.

Thus let us suppose that a woman with an ovarian cyst becomes stricken with an intercurrent infectious disease; by the indirect way of the blood, by the aid of a branch of the abdominal aorta, the utero-ovarian artery, the septic matter may be brought to the cyst and infection result. Thus we have on record cases in which influenza, typhoid fever, gonorrhoea, tuberculosis, and pneumonia have been the cause of septic infection of ovarian cysts. In other cases puerperal infection, septic remains of an abortion, have probably produced suppuration in the cyst by means of an infecting phlebitis—streptococcus phlebitis of the uterine veins extending as far as the pampiniform plexus, and from there reaching to one or several veins in the wall of the cyst by the lymphatics. The lymphatics of the uterus form an anastomosis with those of the ovary, and thus we have a direct route free for the invasion of the cyst by the pyogenic germs. In other cases the adhesions may probably furnish the means of transport for the organisms, and in one case infection took place from a cystitis. Adhesions with the intestine or appendix may permit of the arrival of saprophytic germs into the cyst, these saprophytes always existing in large numbers in the intestinal cavity.

Sutton, Giles, Pozzi, and others believe that infection is possible by adhesions with the tubes in cases of pyosalpinx.

Keating and Coe have put on record a case in which infection took place by means of adhesions binding an inflamed appendix to the ovarian cyst. These three routes of infection being admitted, it is quite logical to ask if there are not other circumstances which may favor infection.

Locally traumatism, the injection of corrosive substances such as iodine, torsion of the pedicle—which, on account of the vascular and nervous phenomena which it brings about, weakens the cell elements—alter vitally the tissues and thus render them less apt to resist microbe invasion. In one case sarcomatous degeneration of the walls of the cyst, producing a *locus minoris resistentiæ*, was the cause.

Thrombosis of the vessels of the cyst wall is not in all probability a factor in the production of simple rupture of ovarian cysts, but hemorrhage due to a papillomatous change is important, because a slight disturbance in the circulation or a hemorrhage is alone quite enough to set up inflammatory phenomena in a cyst, or even gangrene. Cases are on record in which both suppuration and gangrene have resulted after hemorrhage into the cyst had occurred.

In other cases pregnancy or labor has played a large part on account of the abdominal congestion produced, as well as by the contusions that the cyst received during gestation or labor.

Labor and the puerperium certainly offer great opportunities for septic infection or gangrene of ovarian cysts. This is especially true of pressure or laceration of the tumor during labor itself. The application of the forceps or manual extraction of the placenta, with the added possibility of infection from the lochia, an endo-, peri-, or parametric inflammatory process, are factors enough, each one of which is in itself sufficient to cause septic infection of an ovarian cyst.

The danger is still more increased when the tumor is a dermoid, or if during labor perforation of the cyst takes place; and, previous to a labor or miscarriage, gestation alone plays quite a large part as a predisposing factor to inflammation generally.

Mangold states that bacteria may enter a cyst by direct transportation through the venous circulation in cases of septic puerperal uterus, while, on the other hand, Bouilly believes that the bacteria are transported through the lymphatics of the ovarian ligament from the infected endometrium. For the same reason hyperemia of the pelvic organs and menstruation may facilitate infection. During the menses it may happen

that the reflux of the blood may introduce germs, which normally are present in the vagina, into a previously aseptic uterine cavity.

The germs usually found in the vagina are certain diplococci, several varieties of staphylococci, and occasionally streptococci, and when once these organisms have entered the uterine cavity we can easily see how they may attain a cyst.

This theory has been put forward by Schauta, and he says that the process which takes place in cases of gonorrhoeal-peritonitis may also be applied to the infection of ovarian cysts. In the former case the gonococcus is deposited in the vagina, and he can only extend his territory by means of segmentation. The internal orifice of the cervix forms a hindrance to the entrance within the uterine cavity of the secretions of the cervix, but during menstruation the transportation of the gonococci may take place by means of menstrual reflux. If to menstruation we add coitus practised during this time, we certainly increase the chances of infection. In the first place, the congestion within the abdomen is increased, and during the venereal spasm the contractions may possibly produce a certain degree of aspiration from the vagina toward the uterus.

Mangold is also of the opinion that coitus during menstruation or the puerperium is an etiological factor in septic infection of ovarian cysts, while, on the other hand, Bouilly affirms that he has never seen a case to which the above theory might apply.

The general condition of the patient may also have its influence. Debility, intoxication of the organism, or bad hygienic surroundings will certainly place the organism in a more marked state of receptivity, and both pathogenic and saprophytic organisms make greater havoc in such people. It is also very probable that certain infectious diseases in which the specific microbe has been demonstrated in the pus act in the same way, the suppuration in the cyst being, so to speak, a secondary infection arising in a weakened organism.

The pathogenesis of aseptic pus of ovarian cysts only means that it is a different stage of the same process, because in the beginning of the lesion, in all probability, the pus contained bacteria. The same ways of infection, the same determining causes which predominate, are also present in cases in which the pus is aseptic, and if bacteriological examination demonstrates that the pus is free from organisms, it simply means that they have disappeared or that they have already died off and can no longer be grown on artificial media nor can be seen microscopically in stained specimens.

We have nothing new in the above fact, and the same phenomena take place in abscess of the liver as well as in certain purulent foci produced by the tubercle bacillus. Why the bacteria die is as yet an open question, but nevertheless it is certain that this is the case.

Regarding the symptomatology of ovarian cysts, we may say that they give rise to local and general phenomena. Local phenomena are not identical when the cyst is in a latent and when it has arrived at what may be termed the pelvic or abdominal state. In the beginning there are no marked signs, and disturbances of the menstruation and indefinite pains in the lower abdomen have only a very slight value. Later on, by palpation, we can distinguish a growth which is seated laterally and extending more or less beyond the median line. The area over the tumor gives dulness on percussion, while sonority will be found all around it.

If the cyst is very large and unilocular, fluctuation may sometimes be easily made out. If the cyst is a multilocular one we will find by palpation an irregular tumor covered with bosses, while attentive examination will show in many cases that in certain parts of the cyst fluctuation is present while in others it may be wanting. As long as the tumor remains in the pelvis an elastic and resistant mass, which is independent of the uterus, may be easily found by manual palpation; or when the cyst has become large and has extended up into the abdomen, we may no longer be able to reach it by the vaginal finger, and it will reveal the fact that the cervix uteri is high up and reached with difficulty. The abdomen increases in size, while the lateral projection becomes more pronounced in the middle line and may extend up as high as the false ribs, pushing back the diaphragm; the bladder, rectum, stomach, uterus, iliac vessels and the vena cava, and the sacral and lumbar plexus show signs of compression. The general health of the patient begins to deteriorate. The general symptoms produced by ovarian cysts is difficulty in breathing, producing dyspnea; dysuria, incontinence of urine, vomiting, constipation or diarrhea, symptoms of chronic uremia, edema, and more or less violent pains are present; pronounced loss of flesh, with a peculiar expression described under the name of "ovarian facies," is also to be noted.

If we consider the symptoms presented by an infected cyst, we should immediately ask if there are any phenomena, either local or general, which may facilitate a diagnosis that suppuration has taken place. Generally speaking, this cannot be

done, and it may be said that there is no symptom which in itself can indicate to the surgeon that an ovarian cyst has become infected. But there are certain symptoms which may possibly help us in making a diagnosis when septic infection of a cyst has occurred, besides the symptoms of cysts generally speaking. As local phenomena we will have rapid increase in size of the abdomen, and accompanying this there will usually be a development of the subcutaneous veins. The patient will complain of very sharp, nearly continual pains in the abdomen, which may be either spontaneous or produced by the slightest provocation. Ascites may be present, but more usually there is peritonitis. The tumor will be found only slightly movable, and fluctuation is not often so marked as in ordinary cysts, on account of the greater density of the fluid contents.

As Penrose has pointed out, a suppurating ovarian cyst may sometimes contain gas, either from communication with the intestine or from decomposition of the contents, and in such cases the usual tumor dulness will be replaced by a tympanitic note. But when infection has occurred the general phenomena are by far the most important: the health is rapidly undermined and the patient loses flesh, the mucous membranes are pale, and the skin has a cachectic color; edema, great thirst, and profuse perspiration during sleep are complained of; in most cases fever is continuous, the mercury marking in the neighborhood of  $38.5^{\circ}$  C., with an evening rise and morning remission. In other words, we have the classical picture of septicemia. Anorexia and vomiting has been noted in a number of cases. In some it occurred and later on the cyst perforated, its contents being emptied into the general peritoneal cavity. But in many cases no rupture had taken place and the vomiting must be wholly attributed to septic infection of the neoplasm. Vomiting was present in some instances at the onset or some time before the septic process was diagnosed, while in others this symptom first appeared during the course of complication and when there were a number of symptoms indicating the presence of suppurative phenomena.

When vomiting is present it is usually persistent and severe, or even incoercible. The vomitus may be greenish in color, or the coffee-ground type may be present in some cases. Nausea often precedes vomiting, either with or without rupture of the cyst having taken place; and in one reported case, where nausea without vomiting appeared some time before the symptoms of septic infection of the cyst, necropsy revealed the presence of an old gastric ulcer.

Diarrhea has been noted in many cases, with or without rupture of the cyst; it may occur at the onset or during the course of the septic disturbances. It may also give place to constipation. In one case constipation appeared at the onset, and then a severe diarrhea was substituted which lasted several weeks. Constipation, which is often quite obstinate, may be present instead of diarrhea, and may occur at the onset of the septic process.

Insomnia, or even delirium, and later on, if the case goes badly, there will be a profound prostration and semi-coma. Albumin may be present in the urine, and indol will nearly always be found if looked for.

Dyspnea is quite frequently present, and may precede the septic phenomena or appear at the onset and continue throughout the progress of the septic complication. Broncho-pneumonia and pleuritis (metastatic?) have been reported, and in these cases it was due to a compression of the lung, one of which presented adhesions and an inflammation of the diaphragm. The dyspnea may be accounted for in some cases on account of the acute purulent peritonitis following rupture of the infected cyst.

Indicanuria may, according to Kielman, have considerable diagnostic value, and he says that it occurs regularly in all cases in which there are purulent collections in the body, and may consequently be considered as a very valuable sign, proof that there is a latent suppuration present. Personally, in two cases of infected ovarian cysts we have found indol present in the urine. As rare complications of septic infection of ovarian cysts we may mention edema of the external genitals, of the lower extremities, phlebitis with or without rupture of the cyst; metastases in various joints, and ileus, have also been reported.

The diagnosis of septic infection of ovarian cysts is not easily made, and we should always have present in our minds the various diseases which may simulate this condition. We should consider two classes of conditions—viz., those in which the infected cyst presents only the symptoms of an ordinary cyst, and, secondly, those in which the suppurating process manifests its presence by local and general symptoms which are more or less marked. In the first case it is impossible to make differential diagnosis with a simple cyst of the ovary, because examination and symptomatology are identical in both instances; and for this reason a septic infection of a cyst may be mistaken for various other affections which are similar in their symptoms to ordinary ovarian cysts.

In ascites the shape of the abdomen is not the same, because the flanks have a perfectly symmetrical projection. By percussion we find dulness, which is replaced by a tympanitic note when the patient changes her position. Hydrosalpinx usually gives rise to an exquisite pain, which is sudden and localized in the region of the diseased organ; and thus we are always able to elicit more former trouble of the genital apparatus in the patient. A fibrocystic tumor of the uterus will show by palpation that the tumor is firmer than an ordinary cyst; it is directly connected with the uterus and participates in all the movements given to that organ. A unilateral hydronephrosis would naturally give rise to serious troubles in the urinary apparatus. And, lastly, in cases of cysts of the mesentery or of the liver, the surgeon should remember that in such cases the tumor develops from above down and is independent of the genital organs, whereas in the class of cases that we have now to examine septic infection of the cyst is accompanied by special symptoms. Nevertheless the diagnosis may be very uncertain. When the cyst, during its latent period, gives rise to no local symptoms, but has already produced toxic symptoms in the body, the question of a typhoid fever, an acute miliary tuberculosis, or some infectious disease may be considered, and such cases have been reported by Féraud and Goodell; and it is only by the local manifestations of the growth that all doubts may be removed as to the real cause of the trouble.

When we are dealing with an infected cyst which is situated high up in the pelvis or high up in the abdomen, it may be mistaken for a large number of conditions, and, in the first place, we should consider the question of a malignant transformation of an ordinary cyst of the ovary or a neoplasm of this organ. In these cases we find locally by palpation that they are harder, more consistent, and firmer tumors than in cases of an infected ovarian cyst, while the general symptoms in most instances are less acute and less rapid. If the malignant process has extended we will certainly find enlarged lymphatic glands. Cases of torsion of the pedicle have, like suppurating ovarian cysts, a rapid increase in size of the abdomen and a sudden and very sharp pain, but there are two important signs, which have been described by Reboul, which will allow of making an exact diagnosis before operating, and these are: first, by auscultation a systolic souffle will be heard, situated over the painful point (that is to say, over the pedicle of the cyst); and, secondly, by palpation we will have a movement

*en masse* of the tumor, which gives the sensation of heaving, which coincides with the arterial pulse.

In cases of suppurating ovaries or pyosalpinx we will be able to elicit former disturbances in the adnexa, while suppurating hydatid cysts of the ovary, which are only mentioned here more as a curiosity than anything else, will give rise to the characteristic trembling which is found on palpation in these cases. Intestinal occlusion begins very suddenly, and soon the abdomen increases in size. A tympanitic note will be found everywhere, and the distended intestinal coils may be outlined through the abdominal wall in these patients. Fecal vomiting and absence of feces and gas per rectum, with cold skin and lowered temperature, are sufficient signs for the diagnosis.

In the generalized peritonitis the pain extends over the entire abdomen and produces severe pain, vomiting will occur, and abdominal palpation is impossible, and if vaginal examination be made no sign of any tumor will be present. Fever is high, temperature reaching at about 40° C. without any morning remission, and if, in a case of infected ovarian cyst, it remains continually up, in peritonitis we must have at a given time a decrease by lysis.

The differential diagnosis with encysted peritonitis is most difficult, especially when the collection is considerable in amount. The means for differentiating are not very numerous, and Spencer Wells says that he knew none. However, a certain amount of information may be drawn from the irregular shape of the abdomen, with a more marked projection in a given direction while the rest of the abdomen remains depressed, and also the history of a slowly progressing disease with former attacks of peritonitis and the peculiar sensation given by the intestine on palpation.

Periuterine hemocele which has undergone an inflammatory process will reveal to the examining finger within the vagina a swelling which fills Douglas' pouch.

When we are dealing with an abscess of the broad ligament we have one pathognomonic sign, which is the "abdominal plaque," and is felt as a hard and resisting mass situated deep in below the abdominal wall and projects immediately above the crural arch.

Abscess of the iliac fossæ is apt to be adhering to the integuments, and is felt superficially independent of the deep organs.

Generally speaking, the prognosis of the septic infection of ovarian cysts is serious. If the ordinary cysts are themselves serious, if they produce serious symptoms, if, on account of

their epithelial nature, they are, so to speak, balancing between virulence and perfect innocuity, it must be remembered that in cases of infected cysts the chances of a fatal termination are very much greater. Patients who are subjects of infected cysts of the ovary run great dangers, and before surgical interference became a current practice in this class of cases death was the most frequent outcome.

Such a large quantity of pus as is found in suppurating cysts is with difficulty supported by the human organism, and the disorders that it produces are too considerable for a body to resist, and, as already stated, cachexia and prostration are prominent in a large number of cases. And what is more, the progress of the symptoms is in most cases extremely rapid, usually not extending over a few months.

We must nevertheless bear in mind that things do not go quite so rapidly in every instance, and instead of this quick progress a more latent form of symptoms of subacute or chronic septicemia may be present. Some patients have even remained sick for some time without presenting any serious disorders, and in one case reported by Féraud the suppuration had existed eighteen months and still the patient was in a fair condition. One thing which is certain is that these purulent collections, when once formed, will never disappear spontaneously, and sooner or later they will either end in death by acute septicemia, which, according to Herman, is the most frequent, or by generalized peritonitis, which may take place in one of the two following manners—viz., by an extension of the inflammation to the surrounding structures, or from rupture of the walls of the cyst if no peritoneal adhesions are present, in which case the pus will be spread throughout the general peritoneal cavity. The same phenomena take place when we are dealing with sterile pus; its consistence, density, and considerable quantity prevent it from being absorbed, and when suddenly emptied into the peritoneal cavity it will disturb the circulation and thus produce a shock which is most favorable for the development of inflammation.

If rupture of the cyst should take place when peritoneal adhesions are already present, the eruption of pus will take place in the neighboring hollow viscera, more particularly in the digestive tract. Serious disturbances, either direct or reflex, may result and death may occur within a few days. But in the majority of cases a prolonged suppuration is set up, which little by little brings the patient into a hectic condition. If the ruptured cyst is a dermoid the hair and solid

matter, more particularly the teeth which have been emptied out along with the liquid contents, may become the cause of a particular series of accidents. For example, in certain cases, if foreign bodies from the cyst which have entered the bladder become the nucleus of a vesical calculus, or else if they become engaged in the ureter, they cannot pass down it and consequently become an obstacle to the flow of the urine. The cystitis produced by a communication between a dermoid cyst and the bladder is always very severe, and the inflammatory process, extending upward to the kidney, will result in very serious renal lesions.

If rupture of the cyst takes place into the vagina or through the abdominal wall, the patient is liable to chronic septicemia. Nevertheless in these cases, as well as in those in which rupture has taken place into the hollow viscera of the neighborhood, a happy outcome may be brought about and the condition may finally be cured after a certain length of time, because the walls of the cyst collapse, become atrophied, and the secretions dry up; but in such a case we have an exception, and, if the surgeon does not wish to see his patient die, interference is the only proper thing.

At the present time the removal of cysts of the ovary, whether they have become infected or not, is the proper course to pursue. As soon as suppuration has been recognized, or even suspected, immediate interference is to be recommended. To wait is to place one's self voluntarily in bad condition and takes away much chance of success. If we operate early the patient is in better general condition to undergo surgical interference, and if adhesions are present they are naturally softer, easier to break down; and consequently an operation under these circumstances is less difficult and of shorter duration, which, as we all know, are some of the chief elements of success.

Operation for the removal of ovarian cysts which are the seat of a septic infection may be divided into four stages, as follows: 1. Incision of the abdomen. 2. The breaking-up of the adhesions and ligation of blood vessels which they may contain, and then the pus may be removed by the trocar, and not with the knife, because if the cyst is incised pus will immediately flow out and the wound will very likely become infected by the septic material. The third step in the operation is the extraction of the cyst through the wound, and in doing this the surgeon should be careful to avoid infecting the abdominal incision at the time he is drawing the pocket through; but this

complication may be easily avoided if aseptic gauze sponges are tightly packed around and inside the line of incision. Next comes the ligature of the pedicle and its section, after which it is dropped into the abdomen; and here again we must remember that the ligature may become infected, and stout catgut is, according to our way of thinking, the proper material to use.

The fourth step of the operation consists, firstly, in the cleansing of the peritoneum, which should be done with great care, especially when the operative field has run any chance of infection. If this has occurred it appears to us that a free irrigation of the peritoneum is proper, but it should be done with care and the liquid employed should be a warm normal salt solution. We should be careful to limit the irrigation to the subumbilical portion of the peritoneal cavity, and a back flow of the liquid toward the diaphragm should be prevented by having the operating table perfectly flat and the thorax slightly raised. The temperature of the fluid should be  $37^{\circ}$  C. After the cavity has been carefully cleansed the abdominal incision is to be sutured, but we think it more prudent to always drain these cases by placing the tube at the most dependent part of the wound.

The question that arises is, have we any contraindications for operating on ovarian cysts which are the seat of septic infection? If the patient is pregnant we believe that this condition is a decided indication for operating, because both the mother and child are greatly imperilled by the presence of this pathological condition. In the first place, miscarriage may take place, and in a case reported by Féraud the mother and fetus both died.

Labor may also be greatly hindered by the presence of a cyst, or may even be rendered impossible; and even if this takes place without trouble, when the uterus becomes emptied it may produce a change in the relationship of the cyst to the surrounding organs and produce a torsion of the pedicle, or the cyst at the time of delivery may prevent involution from taking place and thus give rise to very serious hemorrhage. We are also of the opinion that pregnancy may cause infection to take place in ovarian cysts as well as cause them to rupture. Consequently, if we wish to prevent the patient from the possible occurrence of these serious accidents, ovariectomy should be performed regardless of pregnancy, and the life of the mother is thus insured, while in many cases pregnancy will go on to term and a healthy child will be delivered.

Davis says: "In cases of pregnancy complicated by ovarian tumor but one treatment is advisable, and that is the removal of the tumor. The best time for such operation is about the fourth month of pregnancy. No period of pregnancy, however, positively forbids ovariectomy, and in all cases removal of the tumor is indicated."

Penrose, Dsirne, Flaischlen, Anderson, Terrillon, McMurtry, Acconci, and Mangiagalli are all in favor of the removal of ovarian cysts during pregnancy, and, lastly, we should cite from the excellent text book on obstetrics by Ribemont-Desaignes and Lepage the following, viz.: "That during pregnancy certain complications, such as peritonitis, torsion of the pedicle, or rupture of a cyst, demand immediate interference," and the writer would add that septic infection of an ovarian cyst complicating pregnancy imperatively demands immediate operation. As to whether ovariectomy should be performed on a woman who presents puerperal septicemia, we think that the puerperium should not be considered as an absolute contra-indication for surgical interference, and this proposition is borne out by the case reported by Leroy des Barres, who saved his patient by operation. It is certain that a patient presenting a puerperal septicemia is most excellent soil for the development of bacteria, and consequently if operation can with good reason be delayed it is better to do so; but we are absolutely in favor of operating where the septic symptoms are urgent.

There is one absolute contraindication for the complete removal of cysts, and this is when we find ourselves in the presence of old and tough adhesions binding the tumor to the surrounding parts, and in these cases there is much danger if rupture of these fibrous bands is undertaken. Under these circumstances, both on account of the difficulties in an operation and the necessity of long and laborious work, it has been advised to perform an incomplete extirpation. Keith in one case found the peritoneum hard and cartilaginous and fully one-third of an inch in thickness, and it was so incorporated with the cyst wall that an attempt to separate it was not made. The pus was washed out and the cavity drained. The patient recovered.

We think it advisable in these cases to suture the borders of the incised cyst and then drain the latter, just as we would in cases of abscess. But we also think that in addition to the drainage through the abdomen it is more prudent to incise the vaginal cul-de-sac and obtain the drainage by this route as well. Naturally ovariectomy with complete extirpation of the cyst is

the ideal treatment when it is possible, but in other cases in which danger is incurred from the presence of tough adhesions, the above treatment, we think, is indicated.

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