necessary to tie small bleeding vessels with silk or wire. When this is done the ends of the sutures should be cut off short. If obstinate adhesions to the intestines are found the same means must be employed to divide them. It has been found occasionally necessary to leave portions of the cyst adhering. If there be adhesions to the omentum these must be carefully detached as far as possible. The omentum itself must then be spread out on a clean napkin, and examined for bleeding points. Wherever these are found a silk ligature is put round them, the piece of omentum is cut off, and the ligature cut short.

Mr. Hutchinson calls attention to *a special difficulty* caused by adhesions in front. Great difficulty may occur in distinguishing the cyst. The operator may mistake the cellular interspace between the transversalis fascia and the parietal peritoneum for that between the cyst and the latter. If not quickly discovered this error may be the cause of great damage. In endeavoring to avoid it the surgeon may commit another; he may incise the visceral peritoneum of the cyst, and proceed to separate it. In many cases the exterior of the cyst deprived of its peritoneum is smooth, white, and glistening, the adhesions are cellular and easily broken through, so that there is nothing to apprise the operator of his mistake. One plan there is in case of perplexity to avoid all risk of these two errors: it is to enlarge the wound upwards until the peritoneal cavity is opened at a part where no adhesions exist. When once the operator's finger has touched the intestine he knows where he is, and may proceed to detach adhesions without any fear of mistake.

In cases where the detachment of the cyst would be dangerous or impossible, Dr. Atlee has solved the problem by a very ingenious plan. He leaves the peritoneum with its adhesions, by separating it from the fibrous wall of the cyst, so that the adherent portion peeled off is left in contact with the viscus to which it was attached. "Dr. W. L. Atlee has practised this," says Peaslee, "for many years past. In his 215th case adhesions seven or eight inches long were thus left attached to the transverse colon." This is a form of *enucleation of the tumor*, a proceeding by which the whole or the greater part of the tumor is peeled out of its peritoneal investment. Dr. Miner claims the credit of designing this ingenious plan. Dr. Walter Burnham, of Lowell, Mass., reports a successful case. Logan (*Amer. Journ. of Med. Sci.*, 1873) reports a successful case. I believe it was first practised in this country, at my suggestion, by Mr. MacCormac, in 1873, at St. Thomas's Hospital. It is a resource that should be borne in mind as a means of avoiding the great violence and extensive injury which detachment from intimate adhesions to the liver and other organs would entail.

Pelvic adhesions may require special management. T. Holmes says: "Any persistent attempt to dissect or tear away the mass from the pelvis may end in laceration of the ureters or great veins, and may after all be futile. The alternatives are to pull the cyst as far as possible out of the abdomen, and apply a clamp to its neck; or to apply a clamp temporarily, cut away the cyst, tear the cut edges with the cautery, and return the mass into the abdomen; or finally to stitch the edges of the cyst to the wound in the abdomen, and leave the cavity of the cyst exposed." The first is preferable when practicable.

Walter F. Atlee, M.D. (*Amer. Journ. Med. Sci.*, 1877), relates a case, successful, in which he brought out as large a portion of the cyst as possible, clamped, cut it off, and carefully closed the wound behind it, trusting that the ovary would be sealed to the peritoneum of the ovary, and so close the peritoneal cavity.

Wounds of Intestine.—In detaching intimate adhesions the coats of the intestine may give way, or a wound may be made into it by knife or scissors, or the fingers. Wherever intestine is the seat of inflammation or adhesion it becomes extremely lacerable. The opening should be neatly stitched up with a fine needle and silk, cutting the ends of the suture short. This accident does not appear to compromise the success of the operation. I have seen several recoveries after it.

Bleeding from a surface is to be controlled as already directed.

AFTER-TREATMENT.

Rest is the great principle to be observed. To help this an opiate suppository, or an opium pill, should be given two or three times a day, to tranquillize nervous excitement and restrain action of the bowels. If vomiting occur, or indeed to anticipate it, give the patient ice to suck; bismuth or oxalate of cerium may be combined with the opium. The diet should be highly nutritious, not stimulating: beef-tea, milk, eggs, constitute nearly all that can be given with safety. Wine or spirits must be given very sparingly, and rather as means of restoring the system, if it show signs of flagging, than as a recognized part of the diet. The bladder should be emptied by catheter every eight hours.

To relieve vomiting and tympanites I have found O'Byrne's tube passed a foot or more up the rectum very useful. And the injection into the rectum of half a drachm of chloral, with a drachm of bismuth, a little tragacanth, and four ounces of milk, is of marked service in allaying irritability.

Unless local distress arise, the wound need not be disturbed for three days. On the fourth day the stump may be examined. It will commonly be found shrivelling up, sometimes even dry. The clamp may now be removed. If there be any discharge, wash lightly with weak carbolic acid, and dress with lint steeped in carbolic oil.

The abdominal wound is often firmly united in four or five days; but the sutures, if of wire, may usefully remain until the seventh or eighth before being removed. It is desirable to keep a flannel belt or binder on for some days after this.

To obviate hernia and to promote the return of the flaccid abdominal walls to due relation with the lessened bulk of contents, a well-adjusted belt should be worn for a year.

Accidents that may interrupt recovery after ovariotomy.

When bad symptoms follows ovariotomy, as pain, vomiting, fever with abdominal distension, it is probable that some fluid, blood, serum, or pus is collecting in the peritoneal cavity. It may collect in such quantity as to give rise to sensible fluctuation from one side of the abdomen to the other, or it may gravitate to the bottom of Douglas's space, and form a tense swelling behind the uterus.

Whenever fluid can be detected by vaginal examination in the neighborhood of the uterus, it is usually in such quantity that it may be removed. This may be done by a long rather fine trocar and aspirator. The seat of puncture should be where there is free fluctuation behind the uterus, so as to strike a dependent part of Douglas's pouch. A drainage tube may be inserted. But a better plan is to remove a stitch in the lower part of the wound, and insert a glass tube, which will serve to remove offending matter by aspiration, and to cleanse by injecting.

Untoward symptoms must be encountered according to their indications. A survey of the *causes of death* under ovariotomy will supply the best guidance. The first and most immediate cause is commonly *shock and collapse*. A considerable proportion of all the deaths, I am convinced, occurs from *shock*. Recovery from this is greatly a question of individual power of endurance. We can hardly foretell what this power is in any particular case. Women recover from the severest operations attended by all the complications considered the most formidable; others sink after the easiest and simplest operations. Women comparatively robust succumb, whilst the apparently fragile recover. In many cases the unexpected result is not due, at least appreciably, to difference in skill. It can only be referred to difference in innate power of resistance. This is an unknown quantity, and is the chief cause of the uncertainty which surrounds the operation. No doubt the shock can be lessened by care and skill during operation, and the patient can be to some extent supported through it. Shock bears some relation to the length of the operation. Koeberlé found the mortality increased with the time spent in the operation. The patient should be carefully watched and supported during the stage of depression which follows the operation. A free supply of wholesome, fresh, warm air, without draughts, should be secured. If the surface is cold, warm-water bottles must be applied to the feet and legs; light stimulants, as a little brandy and water, or champagne, or ether, or sal volatile, may be administered.

Hemorrhage.—Internal hemorrhage may proceed from two sources—the vessels torn across in separating adhesions, and the stump. The modes of avoiding or diminishing this risk have been described. If hemorrhage to an extent to produce serious symptoms occur, it is better, desperate as the expedient may seem, to open the wound, search for the source, and stop it by styptics, cautery, or ligatures.

Peritonitis is a frequent cause of death. It may be purely traumatic, the result of the violence necessarily done during the operation. It may be due to the injury inflicted in separating adhesions. But it has often been remarked that those subjects in whom a large extent of peritoneum has been altered in character by previous attacks of inflammation, leaving adhesions to the cyst, are not so prone to peritonitis as are many subjects in whom there were no adhesions, the peritoneum retaining all its natural liability to injurious impressions. A more serious form of peritonitis is one that seems analogous to the puerperal form. Here there is commonly septicæmia, or inflammation is propagated from the seat of the pedicle, in which some unhealthy action is going on. It will, of course, be especially likely to occur in the incomplete operations, where a portion of cyst has been left behind. It is also seriously promoted by the escape

of the fluid of the cyst into the abdomen, and its imperfect removal. The fluid has been shown in certain cases to possess a peculiarly noxious, even poisonous property.

The earliest signs of peritonitis are pricking and shooting pain in the abdomen; or according to Hutchinson, a peculiar pallor of the cheeks and an anxious expression of countenance, with frontal headache. The pulse becomes quicker and smaller, the skin hot, the temperature rises to 101°, 102°, 103°, or even 104°, the tongue becomes a little dry, and there is almost always more or less sickness. At a later stage the face may become flushed, the skin painfully hot, whilst at the same time the pulse is rapid and very small. Distension of the abdomen with flatus is a common and distressing symptom; and at a later stage the intestines become involved, and the abdomen is full and tympanitic. The peritonitis may be local or general. If limited to the parts adjacent to the pedicle and to the pelvis, it is protective rather than otherwise, since it tends to exclude irritating matters from the general cavity. In cases, however, in which the peritonitis is encysted, very profuse discharge may take place, and the patient may sink ultimately from exhaustion. If from the first the whole peritoneum be invaded, recovery is rare. The *treatment*. Locally, leeches in the earliest stage are useful. The abdomen should be covered with a hot linseed-meal poultice. The relief thus given is not less marked than it often is in puerperal peritonitis. But ice has been used with apparent advantage. My own opinion agrees with Hutchinson's as to the value of mercury and opium, at least in the initiative stages. But salines are also serviceable, the best being the acetate of ammonia. Where the peritonitis is of a low or erysipelatous type, twenty-drop doses of solution of perchloride of iron should be tried. Where internal hemorrhage is feared, or when the temperature rises with abdominal pain, the *ice-cap* is often of signal service.

Septicæmia may occur, although not commonly, without much peritonitis. The symptoms then are very similar to those of septicæmic puerperal fever, and should be treated in a similar manner. It is in these cases especially that drainage and washing out the pelvic cavity are indicated. The septicæmic fever requires careful watching. Having fulfilled the first indication, namely, to provide for the removal of the presumed source of the blood poisoning, the foul matter in the peritoneal cavity, we have to carry out the second indication, that of reducing the fever. The principle of lowering the temperature of the blood by the external application of cold has been successfully applied. The plan advocated by Mr. Knowsley Thornton (*Med. Chir. Trans.*, 1877), of adapting an ice-cap to the head made of coiled India-rubber, through which a stream of ice-cold water is carried, deserves further trial. Mr. Thornton applies it whenever the temperature rises to 102° F.

Embolism and Thrombosis.—Some deaths have occurred from these conditions.

Phlegmasia dolens occurs occasionally. When it occurs it will be on the side of the stump. Hence it may be assumed to be determined by the clotting of the blood in the vessels strangulated by the clamp or ligatures. But I believe that the invasion of the blood *in loco* by septic matter is a nearly constant factor in thrombosis. This invasion would

also naturally be most likely to occur in the neighborhood of the stump, so that the two factors, stagnation and empoisonment, would be acting together. It is not a necessarily fatal complication. In one case that seemed desperate at the time of operation, in which it was necessary to secure the pedicle by whipcord, and to drop it into the abdomen, recovery took place after phlegmasia dolens.

Obstinate vomiting or hiccough may attend peritonitis. But sometimes they can only be referred to irritation of the ganglionic system, the irritating cause being pain starting from the structures included in the clamp or ligature, or other injury. The vomiting started by the inhalation of chloroform may persist, or it may be due to *strangulation of intestine* by entanglement by omentum.

In two cases *tetanus* proved fatal. In some cases *obstructed intestine* was the immediate cause of death. In one case Keith (*Brit. Med. Journ.*, 1873) succeeded in saving the patient by puncturing the distended colon with a fine needle. Inhalation of nitrite of amyl should be tried in such cases.

Two or three further questions in connection with ovariotomy call for discussion:—

1. *How to deal with a case in which the cyst has ruptured, or has given rise to effusion of blood, to peritonitis, or to septicæmia.*

This literally vital question has already been partly answered by anticipation. The argument may be stated as follows: The case is, that the patient is in the most immediate danger from the shock, irritation, and loss of blood attending the injury. The shock may be regarded as a blow struck at the vital powers. We cannot lessen the shock given by this blow; but we may, in some cases where there is some rally, do good by removing that which is the cause of protracted shock. This cause consists in the irritation arising from the contents of the cyst, or the blood effused in the peritoneum, which irritation is quickly followed by inflammation. Of course the patient may sink rapidly under the primary shock, and thus defeat all idea of giving relief by operation.

But, in not a few cases, the primary shock does not kill. The patient, however, will hardly pull through the secondary dangers of hemorrhage, peritonitis, and blood-poisoning, unless these be arrested in their course. There is the opportunity of trying to give relief to obviate these dangers. Here then is a case for the decided application of the great law in medicine: Remove the offending cause. If extirpation of a diseased ovary, which is slowly sapping the vital powers, be recognized as a justifiable operation, *à fortiori* must the operation be conceded as necessary when the diseased ovary is the source of instant danger to life. It would be difficult to answer *à priori* reasoning like this, except by urging that, howsoever plausible in theory, it would be useless in practice. But even this answer, which until recently was still urged, is now deprived of force by the results of experience. When the irritating cause has been removed, the patient has recovered.

The *signs of perforation* are local and general. The local signs are: pain setting in more or less suddenly in the abdomen; if a considerable quantity of the contents of the cyst have escaped, sensible diminution in the size of the tumor, marked by diminished tension of it; alteration in the shape of the tumor, it loses sphericity, and any solid portions come into more distinct prominence; the signs of ascites may be added to those of the cystic tumor; fluids of ovarian origin may escape by bowel or bladder. If this last event concur with diminished bulk and altered shape of the tumor the conclusion is clear. There may, however, be increased activity of the kidneys discharging the fluid thrown into the peritoneum by absorption and secretion. The general signs are not constant. There may or may not be rise in pulse and temperature, and rigors; and occasionally there is no appreciable shock. All that may be noticed is a sense of distress, local and general, a minor degree of depression.

Mr. Wells says,[1] "In several of my cases the operation has been performed after the cyst has burst, and its contents had escaped into the peritoneum. The peritoneum has been found intensely red, thick, soft, or villous, and occasionally covered by loosely adherent flakes of lymph. Yet the result has been surprisingly satisfactory. Twenty-four times has this complication presented itself out of the last 300 of my operations. Five of the patients have died, so that the ordinary rate of mortality does not seem to have been much augmented. At any rate the bursting of the cyst, or the filling of the peritoneum by oozing from the puncture made by tapping the cyst, is no bar to the operation, but rather a reason for doing it without delay." Nor is this experience singular. My own and that of many others is to the same effect.

In addition to the cases in which ovariotomy is resorted to deliberately as the best means of rescuing the patient from a more or less lingering death, it is justified under certain accidental circumstances of extreme urgency. Some of these are rupture or strangulation of a cyst, attended with internal hemorrhage and shock.

2. The occurrence of *strangulation of the tumor as from twisting of the pedicle; of hemorrhage into;* or *suppuration in the cyst.* In all these cases there will arise signs of local injury and constitutional distress, not easily distinguishable from those attending perforation or bursting of the cyst. But the indication to remove the offending body is the same. It is not necessary to determine precisely the mode in which it offends. Dr. Malins relates (*Lancet*, 1877) a case in which rotation of the tumor on its pedicle occurred as a consequence of tapping. He removed the tumor successfully.

3. *How to deal with ovarian cystic tumors complicated with pregnancy.*

Ovariotomy during pregnancy has been performed several times, the operator not suspecting the pregnancy before the operation. What should be done when a pregnant uterus is discovered during some stage of ovariotomy? Wells says, "Let it alone," that is the uterus. Dr. Atlee performed ovariotomy in the second month of pregnancy. It was followed by such great irritability of stomach, in consequence of the state of pregnancy, that the woman could not be nourished, and she died, thirty days after, of starvation. In a case related by Mr. Burd, of Shrewsbury, in 1847, of ovariotomy performed by him in the third or fourth month of pregnancy, abortion took place two days after operation, and was followed by alarming symptoms, lasting several days. Dr. Marion Sims performed

[1] Diseases of the Ovaries, 1872.

ovariotomy in the third month, not detecting the pregnancy until the ovarian tumor had been removed. The patient recovered well, and was delivered of a fine child at term.

Mr. Wells says, "If inadvertently the uterus be penetrated, if any conclusion can be drawn from the case in which I made this mistake and emptied the uterus, and two other cases in which the same mistake was made by other surgeons, who did not empty the uterus, but closed the puncture in its wall by wire sutures, both patients having died after aborting, while mine recovered, it would appear to be the safer practice to empty the uterus."

Wells relates four cases, in one of which ovariotomy was performed at the fourth month of pregnancy, after rupture of the cyst and peritonitis; in the second, third, and fourth operation was a matter of election to avoid other dangers. The result was successful. All three subjects gave birth to living children at term.

When pregnancy supervenes on ovarian dropsy, there are three, perhaps four, courses out of which to select.

a. We may *leave things alone*, simply watching, prepared to act, if urgency from rupture of the cyst, axial twisting, or hemorrhage or excessive pressure arise. In a considerable proportion of cases pregnancy goes on to term, and the labor is completed happily. Is it wise then to stand by and trust to the chance of this issue? If we determine to anticipate danger, we may

b. Tap the cyst. This will, of course, at once lessen the inconvenience of pressure, and the danger of bursting.

c. Or we *act upon the uterus.* We may lessen the distension and risk of rupture by drawing off the liquor amnii; that is, by inducing labor, postponing the question of dealing with the tumor, until the case is reduced to its simplest expression, by eliminating the pregnancy. I have discussed this question in my work on *Obstetric Operations*, and have there given the reasons which appear to me to weigh in favor of this course.

d. The opposite view, that of *acting on the ovarian tumor by tapping or extirpation*, is well argued by Mr. Goddard (*Obstr. Trans.*, 1871). No doubt in certain cases, either proceeding may be preferable to the other. But, as a general rule, I believe experience will show that it is better to act first upon the pregnant uterus.

Mr. Wells refers to five patients whom he has tapped during pregnancy, one of them three times, one twice, and three once. In all these women great relief was afforded by the tapping, no ill effect of any kind was observed to follow it, and in all the children were born alive, after labors of moderate duration.

There is a peculiar state of nervous and vascular tension produced by pregnancy which should be taken into account. Pregnancy induces great irritability of the nervous centres, spinal and cerebral. This irritability accounts for the greater risk of abortion, of vomiting, if interference be resorted to. It also is a source of danger if accident or complication arise, as rupture of the cyst, or inflammation. And as this complication may be more serious than the operation, the operation may become justifiable as the lesser danger.

Believing, as I do, that a woman in whom pregnancy is complicated with an ovarian cyst, is in a position of imminent peril; that her life is threatened at any moment by some catastrophe which may strike so suddenly and so violently as to leave no time for action, my opinion is decidedly in favor of eliminating the pregnancy. I have acted on this principle on several occasions with a successful result, not counterbalanced by a single unsuccessful one.

If the cyst actually burst, or give rise to hemorrhage or peritonitis, there should be no hesitation in attempting removal of the tumor, which is the cause of immediate danger.

Ovaritomy by the Vagina.—In suitable cases where the tumor is small, and presumably free from adhesions, Thomas recommends removal through the roof of the vagina. The occasional extrusion of tumors by bursting through this route under the straining of labor lends support to his expedient. Thomas proposes to open Douglas's pouch by the vagina, to puncture the cyst, then to draw it out, to tie the pedicle and cut off the tumor, returning the stump into the abdomen. Some dermoid cysts might admit of removal in this way; but the frequent complication with adhesions would prove a formidable obstacle.

Normal Ovariotomy.—The subject of ovariotomy cannot well be dismissed without reference to the operation of removing the healthy working ovaries, proposed by Dr. R. Battey, of Georgia, U.S.A. The question, of course, does not apply here. This form of "spaying" will be referred to more particularly when discussing the treatment of fibroid tumors of the uterus.

CHAPTER XVII.

SPECIAL PATHOLOGY OF THE UTERUS; DEVELOPMENTAL FAULTS; UNILATERAL DEVELOPMENT; UTERUS BICORNIS; UTERUS BIPARTITUS, BILOCULARIS; HYPERTROPHY; ATROPHY.

BEFORE entering upon uterine pathology proper, it will be useful to take a rapid review of the congenital or developmental abnormities of the uterus. This review is necessary, because these abnormal conditions are often attended by disorder of function, and give rise to symptoms, the interpretation of which would be extremely puzzling, if not sometimes impossible, unless this association were present to the mind. Some of these conditions have been referred to in the history of Retained Menstruation, and of Ectopic Gestation. The following summary is chiefly drawn from Rokitansky and Kussmaul, and from study of specimens in the London museums. The principal varieties of atresia, congenital and ac-