

ing in the process by squeezing upon the flanks. If, however, the cyst contents are fluid and the tumor consists mainly of one cyst without adhesions, nothing would seem more simple than an ovariectomy, and the removal of a parovarian cyst is usually a proceeding which takes a shorter time to perform than to describe.

When the cyst has been emptied, it should be drawn gently out through the wound; and if non-adherent, no obstacle will be met with unless it be the presence of some secondary cysts. The trocar having been maintained in its position by means of the spring catches at its sides, its point should be made to enter these cysts, and thus empty them; but very often the contents of these secondary cysts are much thicker than the fluid contained in the major ones, and sometimes they are so numerous and of such small size that they constitute a solid mass at the base of the tumor. In such a case I lay open the major cyst, and, passing my hand within it, I break up into its cavity as much as I can of the secondary cyst mass, in order to save any further enlargement of the abdominal wound. During the whole of these proceedings as much care as possible should be taken to prevent any escape of the cyst contents into the abdominal cavity.

Adhesions are mediate or immediate, the former being generally parietal or omental, existing in the shape of round or flattened bands of peritoneum. They seem to be formed by isolated patches of adhesion, which have dragged off the peritoneum from the abdominal wall, or by pieces of adherent omentum. They are seldom large, and are only of any moment when traversed by an important blood-vessel, which must always be secured by torsion or ligature, or by the cautery. The immediate adhesions require great patience to overcome them; but even when they unite the tumors to the most important organs, they may be separated, or a piece of the cyst may be detached and left. One of the dangers of the removal of an ovarian tumor with extensive pelvic adhesions—and still more of a uterine tumor—is damage to one or both ureters. It will be remembered that they run down obliquely from the kidney over the brim of the pelvis down to the bladder, lying over on each side of the cervix, and close to it. I have often laid them bare, but have never been unfortunate enough to injure them. In the celebrated case published by Simon (*Chirurgie der Nieren.*, 1870), the ureter had been dragged into the wound and clamped, and the patient recovered, with a urinary fistula of the left ureter. Simon heroically removed the left kidney and cured his patient, and I saw her alive some years after the operation, and at the

same time I saw her tumor in one bottle and her left kidney in another.

Nussbaum had a similar accident, and he cured his patient by making an artificial continuation of the ureter between its divided points. When dividing the pedicle of a large tumor of old standing, I have several times seen hugely dilated lymphatic trunks, which looked very much like ureters—a resemblance which more than once made me very uncomfortable for a few days.

Many curious and exceptional forms of adhesion occur, one of the most remarkable of which is occasional adhesion of the tip of the vermiform appendix of the cæcum to the tumor. I have seen this three times, twice in my own practice. The first time I saw it it was unfortunately divided by the scissors of the operating surgeon, with a fatal result; and it was only the discovery of this misfortune at the post-mortem which enabled me to recognize a similar condition, and avoid a like disaster in my own cases. In dealing with pelvic adhesions it must be borne in mind that the large venous trunks in that region lie immediately under the peritoneum, and that they must be carefully avoided. In the first operation I ever saw, one of these trunks was torn across by the rough handling of an inexperienced operator, and I need hardly say that death ensued in a very few hours, because it was quite impossible to secure the bleeding point, or even to find it. Immediate death was only staved off by stuffing the pelvis with a towel. This event made such a strong impression upon me that I thought it hardly possible I ever could take part myself in an operation fraught with such terrible risks. Hemorrhage from adhesions has always a very strong tendency to arrest itself, and most of the bleeding points will stop of their own accord, or can be stopped by simple pressure with a sponge; each point of importance should be seized by a pair of scissor-forceps, or touched with a cautery, or with a piece of solid perchloride of iron. For the arrest of a general oozing from a large surface, the pressure of two or three dried sponges is generally enough, and it is, therefore, my practice always to separate adhesions as rapidly as possible, and to follow their separation by the immediate application of sponges, leaving these *in situ* until I have finished the separation and removal of the tumor.¹

¹ A few days ago I removed a tumor universally adherent, full of pus, and quite rotten. I tore across the pedicle before I had recognized it, and its vessels bled profusely. Like the rest of the tissue, it was quite rotten, and the more I tied the vessels the more they bled. The cautery was equally useless. I therefore secured all the points by means of forceps, and left them *in situ* in the abdomen, closing the

Suppose the tumor separated and withdrawn, the assistant, stationed opposite the operator, should immediately insert one or two sponges to prevent the exit of the intestines, and he should then take possession of the tumor and steady it while the surgeon examines the pedicle, and determines how it may best be dealt with.

At present, we may say, there are only three methods in vogue for the treatment of the pedicle, and of these one—that is, the clamp—should be reserved for extremely exceptional instances. Probably not more than two or three cases in a hundred require now to be dealt with by the clamp; certainly, I have not met with more than one for the last three years. The kind of pedicle requiring the clamp is thick and soft, and so short as to contain, perhaps, a small piece of the tumor. With such a pedicle the extra-peritoneal method is admissible, and probably is superior to treatment either by the cautery or the ligature; but I am not quite sure that a combination of a drainage-tube with either of these latter methods may not yet be found superior to the clamp. If to the pedicle of an ovarian tumor, unusually thick and short, or in that of a uterine tumor, it is thought desirable to employ a clamp, then it is evident that what is wanted is a form of circular constriction by some means which will completely arrest the hemorrhage, will not cut the pedicle, and which will allow the wound to be accurately adjusted round the stump.

To meet all these requirements, I have devised a clamp (figured on opposite page) which has served my purpose better than any I have seen.

After a large number of experiments I selected thick copper wire (No. 12, Birmingham gauge), nicked, and completely softened by being made red hot and allowed slowly to cool, as being the best material to work with.

For use I bend it into a loop, as seen in the right-hand figure, ready for the operation. After it has been placed round the pedicle, the collar *B* is run on close up to the pedicle. The handle *A E* is then also run on, the ends of the wires running in the holes *F F*, and the end *A* fitting into a counter-sunk hole, shown by a dotted line at *B*. The pinch-screws *D D* are then closed tightly down on the wires, the screws *C C* being quite loose. The handle at *E* is then turned slowly till the loop of wire firmly constricts the pedicle. The tumor is then removed, and if there be any bleeding, a few more turns of the handle *E*

wound over them. I reopened it in twenty-four hours, removed the forceps, refastened the wound with a drainage-tube at its lower angle, and the patient made an uninterrupted recovery.

will secure it. When this is done, the pinch-screws *C C* are to be securely tightened down on the wire, and those at *D D* loosened. The handle will then come off, leaving the wire clamp with its collar, as seen in the right-hand figure. The ends of the wire are then to be turned slightly up, and the wound closed and dressed as usual.

I have used this clamp in thick pedicles in eleven cases with perfect success, and six of those were uterine myomata.

Of the two intra-peritoneal methods of dealing with the pedicle, which, by common consent, have been adopted as superior to all others, it is as yet extremely difficult to give preference to one over the other. In the hands of Dr. Keith, the cautery, as originally introduced by Mr. Baker Brown, has been brilliantly

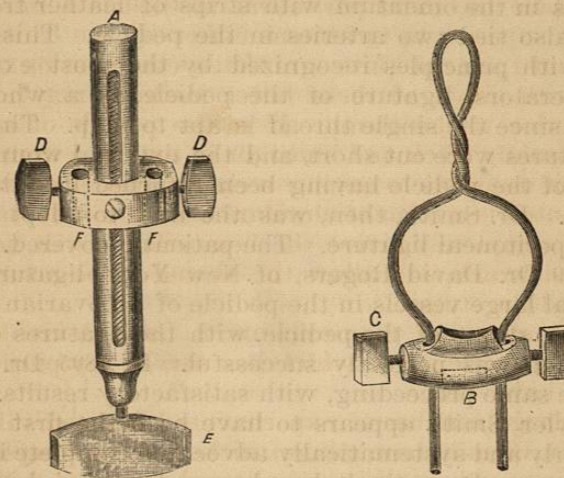


FIG. 33.—Tait's Wire Clamp.

successful; but in my own hands the silk ligature has proved not one bit inferior; and I shall retain it as long as it serves me as it has done up to the present moment; for it could only be by careful comparison of the results of a very extended experience that any determination would be arrived at as to the superiority of the one over the other. As soon as Dr. Keith has removed the tumor, he fastens on the pedicle the well-known cautery clamp of Mr. Baker Brown, screwing it up very tightly; he then divides the pedicle above the clamp by a common cautery iron at a dull red or almost black heat, searing the pedicle very slowly, but very completely. When he removes the clamp, that part of the pedicle which has been embraced by it is shrivelled and translucent, like parchment, and it very rarely gives him any

further trouble by bleeding; if it should do so, he screws it up again and applies the iron more effectually. He then drops the pedicle back into the cavity and proceeds with the further steps of the operation. I have watched him go through the process with great interest, but I was not impressed by anything beyond my previous convictions, that it is the intra-peritoneal method, and not any particular variety of it, which gives the success; and that the ligature as applied in "Tait's knot" occupies less than a tenth part of the time taken by the cautery, and, I think, must be more secure.

The history of the short ligature is given as follows by Mr. Alban Doran (*St. Bartholomew's Hospital Reports*, 1877):

"But Dr. Nathan Smith, of Connecticut, the second American ovariologist, in his first operation in 1821, not only ligatured two arteries in the omentum with strips of leather from a kid glove, but also tied two arteries in the pedicle. This is in accordance with principles recognized by the most experienced modern operators, ligature of the pedicle, as a whole, being hazardous, since the single thread is apt to snap. The ends of all the ligatures were cut short, and the external wound closed, the stump of the pedicle having been returned into the abdominal cavity. Dr. Smith, then, was the first to adopt the complete intra-peritoneal ligature. The patient recovered.

"In 1829 Dr. David Rogers, of New York, ligatured separately several large vessels in the pedicle of an ovarian cyst, and returned the stump of the pedicle, with the ligatures cut short. The operation was perfectly successful. In 1835 Dr. Billinger adopted the same proceeding, with satisfactory results.

"Dr. Tyler Smith appears to have been the first authority who regularly and systematically advocated complete intra-peritoneal ligature. Recently it has been adopted in hundreds of successful cases where the pedicle has been found too short for the clamp to be safely applied. Ligatures of bleeding vessels in omentum are also cut short. As many as forty ligatures have been left in the abdominal cavity without any evil effects."

My own method of dealing with the pedicle is by a piece of silk thread, varying in thickness according to the mass of the pedicle; for a thin pedicle I use thin silk, and for a thick pedicle correspondingly thick cord, because, of course, in the latter case the ligature must be pulled with much more force than in the former. The method in which I use the ligature is that I have termed the Staffordshire knot, as it is the badge of the county of Stafford; and the idea of its use occurred to me while travelling in a Staffordshire railway carriage, in which it was a conspicuous ornament. Mr. Mazzinghi, the learned custodian of

the William Salt Library at Stafford, tells me that nothing is known definitely as to the origin of the badge, further than that it was granted by the College of Heralds to the county within living memory, and was copied from the arms of the old Stafford family at Maxstoke Castle. Such badges were used to distinguish the adherents of noble families, and their origin is generally altogether unknown. The legend in the present case is that rogues were at one time so numerous in Staffordshire that a knot had to be devised which would hang three at a time. If so, the original knot must have differed from its present representative, for the latter could only hang two. It is, however, its remarkable property in this direction which has led me to introduce its use in surgery.

The woodcut will show how the knot acts, and a very brief description will probably make clear enough how it is used. An ordinary-handled needle, armed with a long piece of the silk required, is passed through the pedicle and then withdrawn so as to leave a loop on the distal side. This loop is then drawn over the ovary or tumor, and one of the free ends drawn through it, so that one end is above, while the other is under, the retracted loop. Both ends being seized in the hand, they are drawn through the pedicle, against which the thumb and forefinger of the left hand are pressed as a fulcrum, till complete constriction is made. A simple hitch is then made, as in the drawing, and tightened; and that is followed by another, as in ordinary ligature-tying. There is another and more complicated way of making the knot, by passing each end of the thread round the corresponding half of the pedicle, and crossing them within the loop in front, which is equally effective, and which may be used in cases of large solid tumors. But the former way is by far the more elegant and rapid method.

The advantages of this knot over all others are that, while it ties the pedicle in two halves, these halves are compressed really into one surface; the two halves are equally well compressed; and, from the mechanical arrangement of the knot, very great constricting force can be employed; and in this respect it greatly excels Dr. Peaslee's chain-ligature. I have used it now about two hundred times and it has never failed me on one single occasion. I cut the pedicle through about a quarter of an inch on the distal side of the ligature and drop it back. It may very reasonably be asked what becomes of a ligature so disposed of, and, fortunately for me, I am wholly unable to

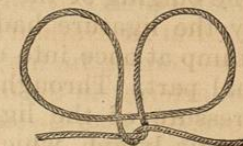


FIG. 34.—Tait's "Staffordshire Knot."

answer the question, for I have not yet had an opportunity of seeing one on which I have placed it. I therefore gladly accept the description given by Mr. Alban Doran, in the *St. Bartholomew's Hospital Reports* for 1877 :

"In 1872 Dr. Bantock exhibited before the Obstetrical Society the stump of an ovarian pedicle from a patient who died of cancer one year after double ovariectomy had been performed upon her. The hempen ligature applied, with its ends cut short, to one of the pedicles, was found on dissection to have been completely absorbed, excepting its knot, which remained as a hard body the size of a hemp-seed, covered by peritoneum. The bulging of the tissues over each side of the groove formed by the ligature had brought the strangulated portion of the stump at once into close contact with the unstrangulated proximal part. Through the slight irritation produced at first by the pressure of the ligature, the proximal part had thrown out plastic lymph, which had conveyed nutritive plasma and also capillaries to the distal portion of the stump, and thus saved it from gangrene. In a case like this, the stump ultimately atrophies, for reasons evident to any surgeon with a superficial knowledge of pathology. As for the ligature, it is destroyed in the manner demonstrated by the experiments of Spiegelberg and Waldeyer."

Hegar has described a case where the pedicle sloughed and was passed *en masse* by the rectum, and on it was found the ligature which had been applied. The patient passed successfully through this terrible ordeal, and I hope her accident will remain without imitation.

The next step of the operation is to examine the other ovary, and if this be found diseased, to remove it in a similar way ; and I cannot help thinking that the cases are much more numerous than they used to be in which it is becoming necessary to remove the second ovary on account of cystic growth. Certainly, both in my own practice and in those of others which I have had an opportunity of seeing, the second ovary has been diseased and has required removal more frequently than used to be the case.

An exceptional method of dealing with the pedicle—the one introduced by Dr. Miner and called enucleation—deserves notice, because it must occasionally be resorted to in cases of sessile tumors. It is by no means easy of performance and always gives rise to very troublesome hemorrhage. This method consists in opening the peritoneal capsule at the base of the tumor, and scratching or dissecting out the cyst from the matrix in which its base is placed. Each bleeding point must be carefully

secured as it is divided, and when the tumor is removed the peritoneal stump must be gathered together and the edges fastened by sutures, just as in an amputation. I have three times employed this method with eminently satisfactory results ; but I am bound to say that without a good deal of experience in the separation of adhesions I would have stopped in the middle of the process and left it incomplete, on account of its difficulties.

The next duty of the surgeon is to carefully cleanse the peritoneal cavity from all blood-clots and other *débris* which may be in it. For the introduction of this practice and the extreme care with which it is now done, as well as for the excellent results obtained from it, we are entirely indebted to Dr. Keith, though we find that he was partly anticipated by McDowell, who tells us, in his description of second operation : "Notwithstanding my great care, a quart or more of blood escaped into the abdomen; and, after the hemorrhage ceased, I removed, as cleanly as possible, the blood, in which the bowels were completely enveloped." So highly important do I consider careful attention to this precaution that I make no apology for giving the following somewhat lengthy extract from Dr. Marion Sims' description of Dr. Keith's method :

"When Dr. Keith performed his first operation in 1862, he was surrounded by old men in the profession who had a dread of wounding the peritoneum continually before their eyes. He was obliged to break up extensive adhesions, and, as a consequence, there was free exudation of blood. Before closing the external wound he began to sponge out the peritoneal cavity and suddenly thrust a large sponge down into the pelvis and brought it up saturated with blood. Squeezing it dry, he was about to repeat this process, when they all united in begging him not to do it, as from their stand-point there would be more danger in irritating the delicate peritoneum with the sponge than by leaving the blood there to be absorbed. He yielded against his judgment and closed the wound, leaving a large quantity of blood in the peritoneal cavity. On the third day afterward his patient was profoundly septicæmic, and in imminent danger. He recognized the source of danger and had the courage to open the lower angle of the wound, by removing two or three sutures. There was an immediate discharge of fetid bloody serum in large quantities, and from that moment the patient began to improve and soon got well. This made a profound impression on Dr. Keith's mind, and he determined from that time never again to leave extravasated blood in the peritoneal cavity if he could possibly remove it. It was not long before he had an opportunity of putting this principle to the test of experiment, for his

second case was a very bad one, with extensive adhesion. He had to tie many vessels and bleeding points. There was a large exudation of blood in the pelvic cavity, and he sponged it all out thoroughly, after which he closed up the external wound, and his patient recovered without a single bad symptom. From this time he adopted the principle of never closing an external wound till he had controlled all oozing of blood and made sure that the peritoneal cavity was dry and clean." I have seen Dr. Keith do this, and there can be no doubt that in this, as in other respects, he has greatly added to the success of ovariectomy.

This process has been called by the German surgeons the "toilet" of the peritoneum, and no care can be too great in its performance. I generally clean out the cavity of the pelvis and the hollow of each loin by two or three sponges, and then fill the whole abdomen full of tepid water by means of a tube running from a ewer or a suspended cistern, closing the wound as well as I can with one hand while the other is inside. I move my fingers rapidly about among the intestines and give them a good wash in the water. I then empty the cavity and refill it two or three times until the water comes out quite clear. In this way I very rapidly determine if there is any bleeding, because even a small point will perceptibly tinge the water I have poured in; and if the water continues colored I immediately hunt about until I have found and secured the bleeding point. After the cleansing has been satisfactorily accomplished I put a number of dry sponges down in the pelvis and over each kidney and then proceed to insert the sutures in the wound. By the time this is accomplished the dry sponges have soaked up all the water, and the peritoneum is generally found quite clean and dry. But if it should not be satisfactorily so, I repeat the process until I am quite certain nothing has been left behind, and in this way I believe I have added largely to the success of my practice.

Dr. Keith places great reliance on the use of drainage-tubes as originally introduced by Koeberle in 1867, and improved by himself; and this is a practice I have employed frequently of late and I think with very great advantage. Dr. Keith used to think the Listerian method obviated the necessity for drainage, and that by its employment any fluid left in the abdomen was prevented from decomposing; but my own experience satisfies me that neither of them need be used if the abdomen can be properly cleansed and dried. Dr. Keith has now given up Listerism and his results are quite as good without it as with it, perhaps better, for he has had two deaths from carbolic acid poisoning. I think the peritoneum itself will do a great deal of work in removing the *débris*; but the surgeon's object should be to give it as little un-

necessary employment as possible, and therefore I adhere most closely to Dr. Keith's practice in this respect, and to it I may largely attribute my increased success. Finally, I take the utmost care with the sutures to see that they are ranged evenly, that they include all the structures of the abdominal wall, that the stitch-holes do not bleed, and that the wound is most accurately closed. I am never satisfied to leave an eighth of an inch of gaping wound, and I take the utmost care that the edges of the skin are in correct adaptation. I always use silk sutures, and introduce them generally by means of a large crochet needle. In fastening the sutures, as well as in tying all ligatures which are not transfixed, I always use the knot here figured, having two turns in its first hitch, so that when this is pulled tight it does not slip before the second hitch is made and drawn up. For ligatures that are transfixed I use the Staffordshire knot.

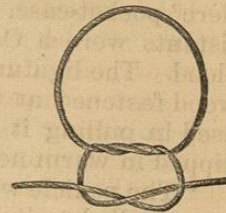


FIG. 35.—Double-hitch Knot.

For the first dressing of the wound I use nothing but the absorbent cotton-wool introduced by Mr. Sampson Gamgee, and I know of no greater addition to our means of treating wounds than this simple material. It is made up into pads of different sizes and shapes, averaging about five inches square, and from one and a half to two inches thick. Two or three of these are placed over the wound and are secured in their places by two or three narrow straps of sticking-plaster, the whole dressing being covered by a cotton binder round the patient's waist, and this is fastened with safety-pins. This dressing is rarely touched before the fourth day, when fresh padding is adjusted. On the sixth or seventh day I remove every alternate stitch and the rest are removed on the day following, and it is quite an unusual thing to find the wound otherwise than completely and permanently united.

In the *Medical Times* of March, 1874, Dr. S. G. Stephens, of Rio Bueno, Valdivia, Chili, gives an account of an "Ovariectomy under Difficulties," which is such a splendid instance of surgical pluck, crowned, fortunately, with success, that I wish to do what

¹ A great deal of fuss has recently been made concerning some experiments performed by Mr. Spencer Wells on rabbits and other animals, relative to the inclusion of the peritoneum in the stitches, and it is claimed by Mr. Wells that by these experiments hundreds of women's lives have been saved. As it is a surgical rule to secure the coaptation of all divided structures, as it never was doubted that the peritoneum was an exception to this rule, Mr. Spencer Wells' experiments were altogether needless, and contributed nothing whatever to the advance of abdominal surgery. In many instances I have been obliged to leave the peritoneum out of the stitches, and I never saw that this exclusion made the least difference to the patient's recovery.

little I can to commemorate the hero, and therefore I give his account here in full:

"We had to send to Valdivia for chloroform—four days' journey. In the meantime I occupied myself in preparing the patient, in considering with what instruments I was to perform the operation, and selecting and instructing my assistants. The instruments were a trocar made from a piece of colhuihue¹ about ten inches long, hollowed out, and sharpened to a point at one end, and at the other connected with a piece of india-rubber tubing from an enema syringe; the instruments from a 'Charrière' pocket-case, and a pair of craniotomy forceps. The assistants were a Catholic missionary, two Indians, and a half-blood. The ligature was made of raw-hide, with two pieces of wood fastened at the ends, in order that more power could be used in pulling it tight, and at the time of using it was to be dipped in warm neatsfoot oil.

"The pedicle was rather long, but flat; the raw-hide ligature was applied to it, and tightened by means of the two pieces of wood pulled by the two assistants on each side of the body until it was almost buried in the parts, and then made fast with two lasso-knots,² the ends cut off, and the whole dropped into the cavity. The cavity was mopped out with cotton-wool, and the wound closed with fine iron-wire sutures, pushed through from within outward and twisted, and a superficial continuous suture of silk. Water-dressing was next applied, and a warmed bayeta flannel roller passed twice round the body. Consciousness returned before I could get her off the table, owing to the priest not attending to the chloroform, being too occupied and astonished at my movements; in fact, throughout the whole proceedings I had constantly to attend to the pulse. Great exhaustion followed; and I had first to administer warm wine-and-water, and afterward warm whiskey-and-water, apply friction to the extremities, until, finally, at five o'clock in the afternoon, she had improved very much, with a pulse at 115, and the surface warm and moist. My thermometer was broken, so I could not note the temperature. I remained in the neighborhood twelve days to attend to her, during which time she went on well, with the exception of a little vomiting the day after the operation, owing to the husband giving her warm lamb's blood without my knowledge. The first pair of sutures were removed on January 28th, and so on, day by day, one or

¹ A species of bamboo.

² One on each side—*i. e.*, one tied first, and then the ends carried round to the opposite side; a slit made in one end, and the other cut in the form of a knob, which passes through it, thus preventing slackening through swelling.

more was removed, until the ninth, or middle one, was taken out.

"Never having seen the operation, nor read any special work on the subject, I had nothing to direct me but the short account given in the last edition of Dr. Tanner's 'Practice of Medicine.'"

Occasionally we are called upon to deal with an ovarian tumor in a woman who is pregnant—a complication which may or may not be discovered before the operation. Some years ago the question of the propriety of removing an ovarian tumor in a pregnant woman was discussed before one of the medical societies, and various opinions were given. By some obstetric physicians the opinion was expressed that it would be better to induce premature labor, and that after the patient had recovered from this, we should perform ovariectomy. Mr. Spencer Wells and myself, on the other hand, contended that it would be much better to perform ovariectomy, and leave the pregnancy alone, and this plan has now become the accepted practice. At that time Mr. Wells had operated upon ten pregnant women, and nine of these cases were successful. I do not know what his experience may have been since, and I have not found any record of the experience of any one else upon this subject; but since the discussion I have operated upon ten pregnant women with uniform success. Before that time I had only operated in one such case. The result was fatal, and was undoubtedly due to the use of the clamp, for the cause of death was gangrene of the pedicle. I do not now think pregnancy offers any bar to the operation. In all of my cases I have been able to recognize the pregnancy before I opened the abdomen; but I can easily imagine that it might occur to the most experienced surgeon to operate on a woman in whom he had not previously recognized the existence of the complication. Indeed, Mr. Wells tells us of a case in which he punctured a pregnant uterus with a trocar, having mistaken it for a cyst. He opened the uterus, emptied it of its contents, and the patient recovered.¹ This is one of the complications, therefore, to be especially borne in mind. The usual color and appearance of an ovarian cyst is as a rule sufficiently characteristic to make it easily recognizable from a pregnant uterus; yet I can easily imagine circumstances such as Mr. Wells encountered, that would lead to such a mistake; and should this misfortune happen, the bold proceeding he followed would certainly be the best practice.

We not unfrequently find tumors of the uterus associated

¹ A similar accident happened to Dr. Byford, of Chicago, and he successfully followed out the same practice as did Mr. Wells. (American Journal of Obstetrics, January, 1879.)