On complete intra-peritoneal ligature of the pedicle in ovariotomy / by Alban Doran.

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ON

COMPLETE INTRA-PERITONEAL LIGATURE

OF THE

PEDICLE IN OVARIOTOMY.

BY

ALBAN DORAN.

In the twelfth volume of these Reports I discussed at some length several questions relating to the impaction of foreign bodies in the tissues. I endeavoured to prove that the archives of modern surgery, British and foreign, offered strong evidence in support of two facts. In the first place, small inorganic foreign bodies have been known in numerous instances to remain embedded in different parts of the body without exciting any pathological changes. Secondly, such fortunate results are not the rule, foreign bodies generally inducing morbid conditions in the structures surrounding them, changes which are most likely to terminate in suppurative inflammation.

It is by the clinical history of accidental wounds that the surgeon is guided when compelled to inflict surgical wounds on patients for the cure of disease or for the relief of suffering. Knowing what kinds of injuries from sharp instruments heal by first intention, and under what circumstances they are enabled to heal in that desirable fashion, he ensures that kind of union, when he requires it, by inflicting similar wounds with keen-edged knives, and by placing the patient under similarly favourable circumstances. Aware that crushes are followed by comparatively little hemorrhage, the surgeon uses the écraseur in cases where the use of the knife might produce a loss of blood obstructive to the operator, if not absolutely beyond his control.

On precisely the same principle the surgeon recognises the mischief likely to arise from foreign bodies remaining in the tissues. From time immemorial he has avoided the permanent introduction of such substances into the body, excepting when he seeks to

produce counter-irritation. When necessity has compelled him to pass threads or pins into the tissues for such purposes as the arrest of hemorrhage, he has ever been eager to remove them at the earliest opportunity consistent with safety. Again, one of the chief advantages claimed by the advocates of compression for the cure of aneurysm, and of torsion for the arrest of hemorrhage, is the avoidance of even a temporary presence of ligatures or acupressure needles in the organism.

On the other hand, the immunity from inflammation observed when certain foreign bodies remain long in the tissues, though an assured fact, rests nevertheless on the evidence of comparatively few cases. Hence surgery has for long refrained from profiting by the knowledge of this fact. At length it has so profited, and, strange to say, not in a minor operation, but in one so beset with dangers that it is of paramount importance to consider how every individual element of risk may be neutralised or eliminated.

When the pedicle of an ovarian tumour is too short to allow the use of the clamp, it is now the practice among the most experienced operators to transfix it with several ligatures, to cut short the ends of those ligatures, to return the pedicle within the abdominal cavity, and to close the wound. This practice may conveniently be termed "complete intra-peritoneal ligature," for the sake of brevity, and in contradistinction to the system, now obsolete, of leaving the extremities of the threads uncut and dependent from the external wound.

"Nothing but the large amount of success which has recently followed the adoption of this most unsurgical method appears to me to justify it. Its disadvantages as regards the probabilities of peritonitis and the risk of hemorrhage from the slipping of the ligature (it being part of the plan to cut the peduncle close to the ligature) are evident."[1] These are the words of a well-known hospital surgeon, written within the last fifteen years, and still retained in a popular text-book. Yet complete intra-peritoneal ligature is now justified, not only by the success of the bold earlier ovariotomists, but also by a precise knowledge of the changes produced in the stump of the ligatured pedicle, changes which are now known to consist, not in gangrene or diffused peritonitis, once considered inevitable, but in processes which are harmless from the first, and ultimately beneficial.

These processes I have myself had the opportunity of observing in a case where death occurred a very few days after operation. But before describing the specimen of ligatured pedicle which I examined in this particular instance, it may be interesting to con-

[1] A System of Surgery, edited by T. Holmes, M.A., art., Surgical Diseases of Women.

sider the history of the complete intra-peritoneal ligature as performed by the earlier operators. These surgeons had not the advantage of the scientific sanction which that practice has gained from the now well-known experiments of Spiegelberg and Waldeyer on the effects of the ligature when applied to the cornua of the uterus in animals.[1] Before those investigations were made public the practice must be considered almost, one may say, empirical. Much valuable information on the subject is scattered among the pages of certain special works, particularly the standard productions of Mr. Spencer Wells[2] and Dr. Peaslee.[3] In order, however, to discuss the matter with precision, it is very advisable to refer to the original records of the early ovariotomists.

Dr. M'Dowell, admitted by Mr. Wells to be "the first rational ovariotomist," did not adopt the complete intra-peritoneal ligature. His practice was to leave the ligatures uncut and hanging from the lower end of the incision in the abdominal walls.

But Dr. Nathan Smith of Connecticut, the second American ovariotomist, 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 recognised by the most experienced modern operators; ligature of the pedicle, as a whole, being hazardous, since the single thread is apt to slip. 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.

Lizars's first *bona fide* ovariotomy was successful, but the ligature encircling the pedicle was "carefully left out" of the external incision. In relating the next case, which ended fatally from peritonitis, he says:[4] "I now gave this enormous mass to my assistant, Mr. Macrae, passed a ligature round the pedicle, and tied it firmly, and then cut close to the tumour, securing three open-mouthed vessels of the pedicle. . . . . I now stitched up the wound, carefully avoiding the intestines and omentum."

The ligatures of the pedicle, or, more strictly speaking, of the

[1] Virchow's Archiv, 1868.
[2] Diseases of the Ovaries, their Diagnosis and Treatment.
[3] Ovarian Tumours, their Pathology, Diagnosis, and Treatment.
[4] Observations on Extraction of Diseased Ovaria, Edinburgh, 1825.

vessels of the pedicle, were evidently not left uncut and dependent from the wound, for the careful Scotch surgeon would surely have recorded the fact had it been so, as in the preceding case. Thus Lizars's second ovariotomy was the first instance of complete intra-peritoneal ligature ever performed in the British Isles. "The peritoneum investing the parietes which adhered to the tumour, and also those portions of this membrane investing the colon and small intestines which adhered to the tumour, were of a bluish-black appearance, and tore with ease under the fingers, being evidently gangrenous." After expressing his belief that the patient should have been bled the night after operation, Lizars remarks: "This probably would not have saved her, *for such contusion was inflicted* that the stamina of life were apparently not capable to stand such a shock and repair the evil." There is, then, clear evidence that death was due to the bruising of the peritoneum, and the fatal result of this operation throws no discredit on the treatment of the pedicle.

Lizars's third operation was incomplete, and throws no light on the subject of this paper, nor need we refer to Dr. Granville's cases. But Jeaffreson of Framlingham in 1836 ligatured an ovarian pedicle as a whole, and cut short the ends of the thread. This case was perfectly successful. The history of Mr. Phillips's ovariotomy, performed in 1840, is very instructive. The stump of the pedicle was tied as a whole, and returned into the abdomen with the ligatures cut short. The patient died on the fourth day. "Upon examining the Fallopian tube, the ligature was found in its place; but it was evident that, from its hypertrophied condition, it resisted the necessary constriction (although Mr. Samwell had used much force), and the extravasation was a consequence of oozing from the extremity of the tube. *That oozing, however, had long ceased, for nature had blocked up the vessels.*" Thus wrote Mr. Phillips in the "London Medical Gazette," October 1840. A few ounces of undecomposed blood were found in the peritoneum. Dr. Peaslee, in quoting this case,[1] appears to infer that death was caused by the loosening of the ligature, or, as Phillips would express it, by the resistance of the pedicle to necessary constriction. But on reading the case itself as recorded by the operator, it will be found that the patient was suffering from choleraic diarrhœa the day before operation, unknown to her medical attendants. In fact, she died with severe choleraic symptoms; moreover, the above quotation shows that the hemorrhage had been slight, and was checked by natural processes.

Thus complete intra-peritoneal ligature was frequently adopted with success, or, at the worst, without being the cause of fatal

[1] *Op. cit.*

results, in these early cases of ovariotomy, when the surgeon acted at an enormous risk, without anæsthetics, and without taking precautions now known to be essential by the light of greater experience. Moreover, such necessary hygienic measures as washing out the peritoneum with antiseptics was not ventured upon. In short, I think it is clear, from the above records, that the practice in question was justified by clinical experience on the human subject before the experiments of the German physiologists.

These experiments showed the changes that actually take place in intra-peritoneal ligature of the stumps of excised portions of the horns of the uterus in bitches. A communication between the distal and proximal parts of the stump is established by inflammatory plastic effusion, and the ligature is unravelled by granulation-cells insinuating themselves between its fibres.

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 the omentum are also cut short. Mr. Spencer Wells informs me that, on one occasion, he left as many as forty ligatures in the abdominal cavity without any evil effects. In the more perilous operations for the removal of solid growths of the uterus, complete intra-peritoneal ligature may also be practised with impunity; this is proved by Mr. Knowsley Thornton's case, recorded in the "Medical Times and Gazette," April 1877. That gentleman strongly advocates the use of the silk ligature, even in cases where the clamp has hitherto been thought advisable.

An important section of contemporary medical literature furnishes us with a strong proof that complete intra-peritoneal ligature of the ovarian pedicle is firmly established. The student finds it advocated in those educational works on the theory and practice of his profession which he studies when preparing for examination, and retains, or ought to retain, in his library for consultation and reference in after-life.

Mr. Erichsen approves of this mode of ligature, at the same time epitomising its history as follows:[1]—

"Some of the earlier American ovariotomists, especially D. L. Rogers, cut the ligatures short, and returned the stump of the pedicle into the wound. This practice was revived by Tyler Smith in 1861, and has been adopted by him, by T. Bryant, and others, with the happiest results, the ligatures either becoming en-

[1] Science and Art of Surgery, 6th ed., 1872. In the seventh edition Mr. Erichsen expresses a strong preference for the clamp, but retains the remarks above quoted, excepting the last sentence.

capsuled or being discharged after a time through a suppurating track. It appears to me that if the ligature be used, this is the best method to be adopted; and if practised with carbolised ligatures, it would probably be most successful."

Mr. Holmes states, still more decidedly: "When the clamp cannot be fixed on the pedicle of the tumour, on account of its proximity to the uterus, without injudicious traction on that organ, the best plan is to perforate the pedicle with a needle threaded with stout wire, and tie it in halves, the ends of the ligature having been flattened down so as not to irritate the neighbouring parts, and after cutting away the tumour down to within about half an inch from the ligature, drop the pedicle back into the belly. In a case treated successfully in this way, I searched some time afterwards carefully for the wire by palpation from the abdominal wall and from the vagina, but could elicit no sensation of its presence." [1]

In the second edition of his "Practice of Surgery," Mr. Bryant makes some interesting observations on the history and on the advisability of complete intra-peritoneal ligature. He describes the pathological appearances noted in the pedicle in one case of his own, and in another recorded by Dr. Peaslee in a Transatlantic medical serial. A reference to Mr. Bryant's work will show that the intervals between the operation and the death of the patients in these two cases are similar to those to which I am about to refer. This surgeon concludes his disquisition on the subject by asserting that "with short and broad pedicles, in which the vessels are usually small, the cautery may be employed, or the pedicle ligatured in two or more parts with whip-cord, the ends of the ligatures cut off and dropped in, and the wound afterwards closed."

The precise pathological changes produced in the ovarian pedicle by complete intra-peritoneal ligature have been well displayed in the two following cases, one of which has been under my own observation, and has not hitherto been recorded.

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 ovariotomy 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,

[1] A Treatise on Surgery, its Principles and Practice, 1875.

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.

In the summer of this year I made a post-mortem examination of a patient, aged thirty-seven, who died in the Samaritan Hospital from septicæmia, on the sixth day after the removal of a large multilocular ovarian cyst. The pedicle had been treated by complete intra-peritoneal ligature, and there was no evidence that death was in any way due to this method of treatment.

The stump of the pedicle was an inch broad, and its inner border was about a quarter of an inch from the fundus of the uterus. It was not in a sloughy condition, nor was it even congested. It was separated from the appendages of the uterus by four silk ligatures, none of which had produced ulceration, but all were covered with bands of lymph bridging over the constriction they had produced in the tissues which they encircled. A more interesting feature remains to be noticed. The outer extremity of the distal side of the pedicle was already very firmly united to the broad ligament by well-organised lymph. This plastic effusion must have been exuded some days before death, prior to the onset of septicæmia, and therefore very shortly after the operation. The lymph covering the ligatures was evidently more recent; it also showed signs of breaking down, its plasticity being diminished by the constitutional disorder which had proved fatal to the patient.

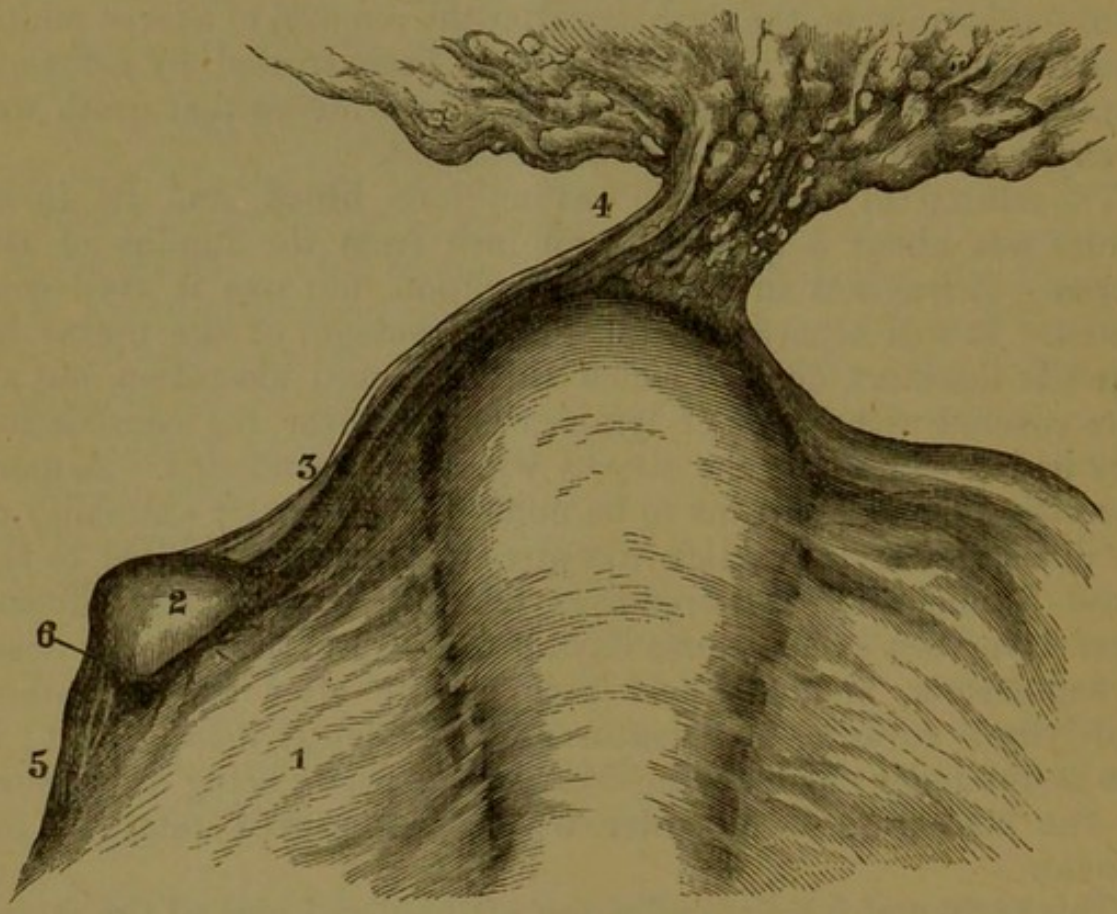
This early and intimate adhesion of the distal part of the stump of the pedicle to the broad ligament is represented in the appended lithograph, for which I am indebted to Mr. C. Berjeau.[1] It might be suggested that the adhesion existed before operation, the ligature being passed under it. Such, however, was not the case, as I carefully observed the pedicle and the process of ligature when Dr. Bantock removed the ovarian tumour. The specimen may be seen in the Museum of the Royal College of Surgeons, Pathological Series, No. 1642 C.

Thus the surgeon need no longer dread any evil effects when he thinks it desirable to leave ligatures enclosed in the abdominal cavity after a serious and complicated operation. Hence small foreign bodies do not necessarily produce disastrous consequences, even when impacted in a wounded structure in the neighbourhood

[1] In the engraving, an asterisk points to the adhesion.

of delicate organs irritated by disease, and by unavoidable surgical manipulations.

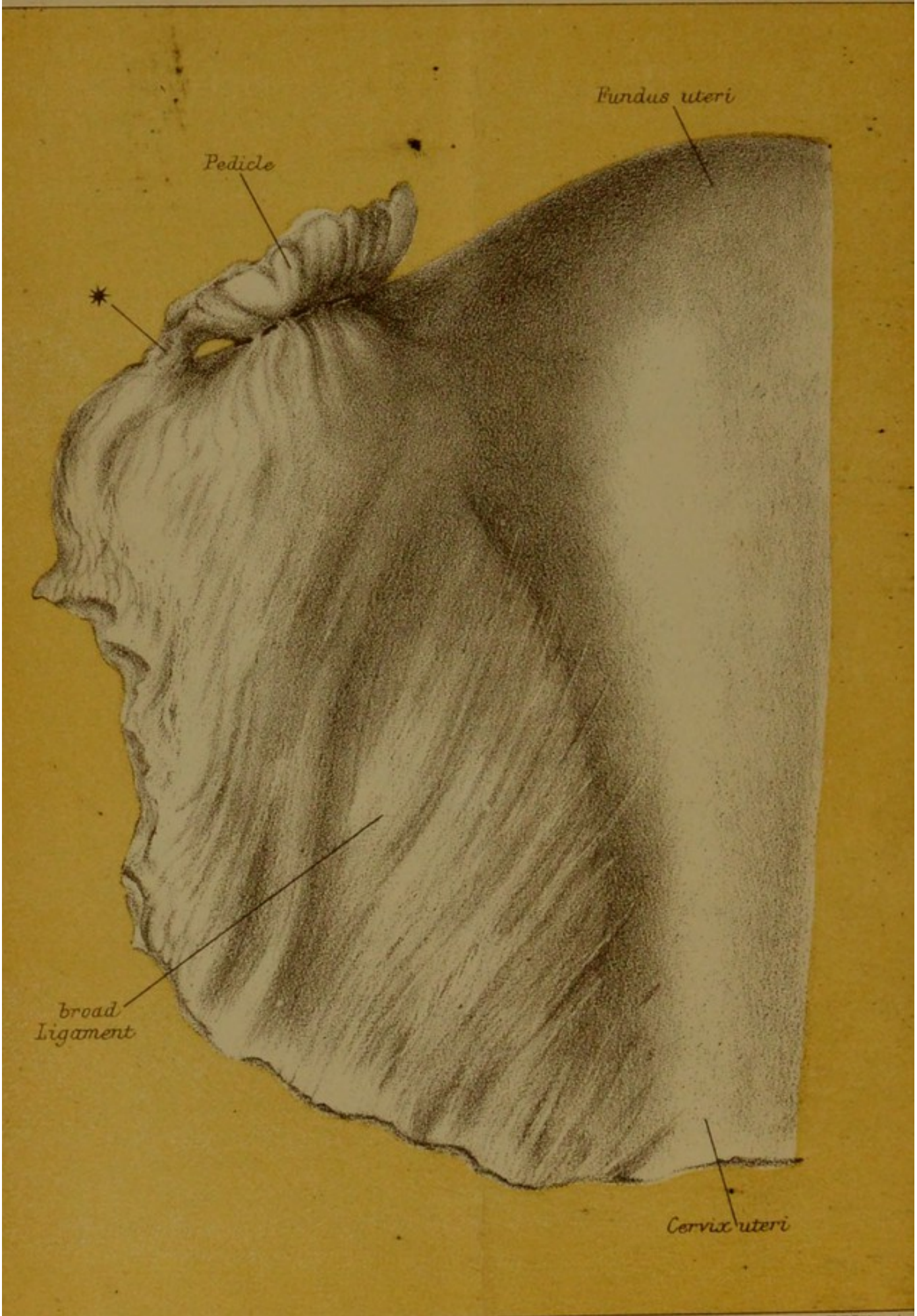
From the success of the complete intra-peritoneal method of ligature in ovariotomy we may deduce the important corollary, that necessity may justify the setting aside of surgical principles previously considered as laws never to be violated with impunity. Such deviation from precedent may yet be applied with advantage to other operations.



1. Broad ligament. 2. Stump of pedicle. 3. Adhesion between pedicle and 4. Portion of omentum adherent to fundus uteri. 5. Adhesion to broad ligament. 6. Line of ligature.

Note.—Since sending the above to the press, Dr. Bantock has drawn my attention to another specimen, showing the effects of complete intra-peritoneal ligature on an ovarian pedicle. Hempen thread had been employed, on the theory that that material shrinks when moistened, and thus tightens its hold on any structure around which it may be tied.

This specimen is from a girl eighteen years of age. On 5th April 1876, Dr. Bantock removed a large multilocular tumour, weighing seven pounds, from her left ovary. The patient made a good recovery, but in the following October the right ovary became the seat of a sarcoma. She was readmitted into the Samaritan Hospital, where she had undergone the first operation, and the abdomi-



C. Berjèau, lith.

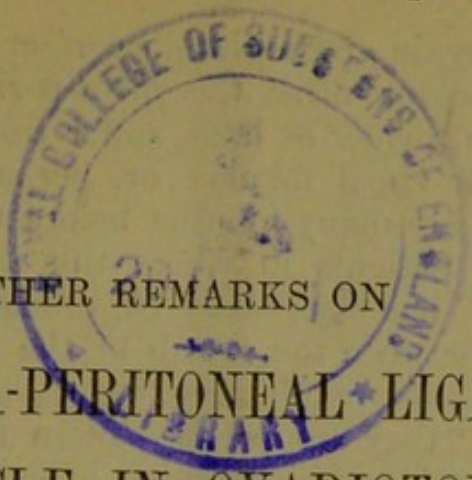
E. Weller, im

Complete Intra-peritoneal Ligature.

Stump of Pedicle of Ovarian Tumour,
Sixth day after operation.

nal cavity was opened, but on account of the character of the tumour it was not deemed advisable to remove it. The patient died on November 3, 1876. The annexed woodcut shows the appearance of the stump of the pedicle of the left ovary seven months after ligature. Towards the middle line it is connected by a long, thin, and very vascular adhesion to a portion of omentum, which has become adherent to the fundus uteri. Externally another vascular band has formed between its outer border and the broad ligament. This outer band is homologous to that in the specimen figured in the lithograph. The free upper edge of the stump has curled in and formed an adhesion to its anterior surface, so that the whole has made itself, so to speak, into a cyst. A deep groove marks the position of the hempen ligature, not a trace of which remains.

[Reprinted from St. Bartholomew's Hospital Reports, Vol. XIV.]



FURTHER REMARKS ON

COMPLETE INTRA-PERITONEAL LIGATURE OF THE PEDICLE IN OVARIOTOMY.

ILLUSTRATED BY AN ANALYSIS OF TEN POST-MORTEM EXAMINATIONS.

BY

ALBAN DORAN.

The long-standing dispute between the advocates of the clamp and those surgeons who prefer ligature of the pedicle in ovariotomy has hardly abated during the past twelve months. In the lectures delivered by Mr. Spencer Wells at the Royal College of Surgeons in the month of June 1878,[1] a decided preference for the clamp is expressed throughout. The great success following its use, according to the lecturer's experience, is held up as the first argument in its favour. The after results are alleged to be more satisfactory than in cases where the pedicle has been secured by ligature. Although the clamp permanently fixes the uterus in a most unnatural position, one angle of that organ being drawn up against the abdominal wall, still functional disturbances of the displaced womb are rare. This is certainly remarkable, and, considering the great inconvenience caused by flexions, it would seem to show that the distress is produced in these common disorders by other influences than mechanical displacement.

On the other hand, bad consequences have been seen to follow complete intra-peritoneal ligature long after patients have survived the immediate danger of the operation. "Patients who recover after the extra-peritoneal treatment of the pedicle, as

[1] On the Diagnosis and Surgical Treatment of Abdominal Tumours.

a rule, soon regain and maintain perfect health. So do many of those who recover after the intra-peritoneal treatment. But some of them, sooner or later, suffer from chronic suppuration, hæmatocele, or fæcal fistula; or, perhaps without any definite local ailment, are many months before they become strong and well."[1] The patients in whom this absence of any "definite local ailment" has been observed, probably owe their discomfort to adhesions between the stump of the pedicle and a portion of intestine. Of obscure inflammatory adhesions Hunter has already inferred that "they are perhaps often the cause of many indescribable sensations which cannot be called pain."[2]

When the advocates of the ligature refer to Waldeyer and Spiegelberg's experiments on animals,[3] they are reminded that human beings do not resemble animals constitutionally. Operations on the healthy uterine appendages of the lower mammalia may lead to conclusions which do not apply to women brought to the operating-table already in ill health, and suffering from a grave local disease of the part subjected to surgical interference.

Lastly, one great advantage of the clamp lies in the facility of its application when the pedicle is long enough, an important recommendation to the beginner. It must also be remembered that the operation is more rapidly completed when the clamp is used than when the pedicle is transfixed and carefully ligatured.

On the other hand, experienced authorities who systematically adopt complete intra-peritoneal ligature are also ready to bring forward brilliant results in support of that system. They have noted how the advocates of the clamp only resort to the ligature when the pedicle is too short for extra-peritoneal treatment. But these cases are generally the worst, and unfairly throw discredit on the ligature. They attribute the failure of their system, in the earlier practice of ovariotomy, to ignorance of certain pathological conditions and neglect of certain precautions which they have shown to be necessary. The ligature, unlike the clamp, allows the uterus to lie almost in its natural position. Some operators assert that they have observed, after the use of the clamp, results as bad as those recorded by their opponents in cases where the pedicle has been secured by threads. Complete intra-peritoneal ligature is especially suitable in cases of ovariotomy performed with all the rigid antiseptic precautions

[1] Wells, "Diseases of the Ovaries," p. 401.

[2] Catalogue of the Pathological Specimens contained in the Mus. Royal Coll. Surg., vol. i. p. 98.

[3] Virchow's Archiv., vol. xliv. Hegar points out (in the work quoted farther on) that both these observers, as well as Maslowsky, detected suppuration after some of their experiments.

of the Listerian school of surgery. As to the experiments on animals, experience has shown that the effects of ligature of the pedicle in sick women are very similar to the results of ligature of the horns of the uterus in healthy animals. The most remarkable feature, absorption of the fibres of the threads, first detected by Waldeyer and Spiegelberg, has been shown by Dr. Bantock to occur in the human subject, as illustrated by two cases recorded in my contribution to last year's Reports.[1]

Still there remains a lack of pathological observations on the appearance of ligatured pedicles. This is, to a certain extent, favourable to the cause of complete intra-peritoneal ligature, for it indicates frequency of recovery. At the Samaritan Hospital the results of this manner of treating the pedicle have, during the past two years, proved highly satisfactory. But owing to the very large number of patients operated upon at that institution, sometimes three in one week, and on account of the desperate nature of many advanced cases of ovarian disease under surgical treatment in the wards, opportunities for making post-mortem researches do occasionally present themselves.

Since it has been my duty for over a twelvemonth to make post-mortem examinations on patients dying at the Samaritan Hospital, I have endeavoured to avail myself of these opportunities by closely observing the condition of the ligatured pedicle at each autopsy. I will describe at length the appearances noted in each case, so that more competent persons may perchance find in these records certain pathological details whence they may draw valuable inferences hitherto overlooked.

Before considering these cases, I must refer to a remarkable monograph by Hegar[2] on complete intra-peritoneal ligature. That surgeon describes fifteen cases of ovariotomy, all performed by himself and all ultimately successful. In nine cases complete intra-peritoneal ligature was exclusively employed, and when the clamp was used, many vessels in the omentum and other structures were secured by silk. Although all these nine cases recovered, they were much complicated by after results, especially by the formation of abscesses in the abdominal cavity, or in the walls of the abdomen around the edges of the external incision. The patients at the Samaritan Hospital have recently been quite free from this complication. The discharge of ligatures (previously applied to bleeding vessels) through abscesses or *per anum* was frequent in Hegar's series, but is very unusual in the experience of British operators.

[1] On Complete Intra-Peritoneal Ligature of the Pedicle in Ovariotomy.

[2] Zur Ovariotomie, Die intraperitoneale Versorgung des Stiels der Ovarientumoren, Volkmann's Klinischer Vorträge, No. 109, 1877.

But a pathological record of complete intra-peritoneal ligature would be imperfect were an extraordinary case to be omitted, an instance among Hegar's series of sloughing and discharge *per anum*, not of a small ligatured vessel, but of a whole stump of an ovarian pedicle.

The case must be related as nearly as possible in the German surgeon's own words:—

H——, 35 years old, a nullipara, suffered from a cystoma of the ovary as large as a new-born infant's head. The patient, already in indigent circumstances, could not work owing to very severe hypogastric pains. On commencing the operation, no adhesions were found, but there was no pedicle. The tumour, which had a very wide base, was seated on the posterior layer of the left broad ligament. An attempt was made at first to shell the growth out of its peritoneal investment, but this was abandoned as hæmorrhage was set up to an extent not to be neglected. Dr. Hegar then dragged forcibly on the tumour, lifting it up so as to raise a fold of the posterior layer of broad ligament; in fact, an artificial pedicle, through which a double ligature was passed and tied on both sides. As hæmorrhage began directly the growth was cut away, another double ligature was applied to the false pedicle, deeper than the first, which was removed.

On the first two days the patient complained of nausea, and very severe vomiting took place at the end of the second day. On the next day the patient was jaundiced; on the fifth the sutures were removed from the abdominal wound. An abscess the size of a walnut, and originating in the track of a suture, emptied itself on the twelfth day. The icterus continued for eight days, with furred tongue and foul taste in the mouth. Pressure in the epigastrium produced a persistent feeling of nausea. The hypogastrium was rather sensitive to pressure on the left side, but felt soft and was in no wise distended. The patient's bowels were acted upon by aperients. On the fourteenth day she vomited mucus containing an ascaris. Small doses of calomel were administered, producing soft motions. On the sixteenth day a soft mucous stool was passed with a large piece of tissue surrounded at one end by a double ligature. This fragment was undoubtedly the ligatured pseudo-pedicle, and is figured in an engraving appended to Hegar's monograph. The portion of broad ligament below the knot was about four inches long.

After the escape of the sloughing pedicle there was a decided improvement in the condition of the patient, but symptoms of catarrh of the intestine persisted for some time. On examining

the uterus in the recumbent posture, a flattened thickening could be felt to its left side posteriorly, about the width of a segment of spinal marrow. It was movable, and rather tender on pressure.

When we consider the serious conditions implied by the sloughing and escape into the rectum of the ligatured tissues, the absence of any very grave symptoms and the successful issue of this case is most remarkable. This accident could hardly have happened to a true pedicle well supplied with vessels, for its smaller arteries, escaping complete compression, would maintain its vitality after ligature. In dragging up the posterior layer of the broad ligament to make an artificial pedicle, the vascular supply of that portion of peritoneum must of necessity have been much interfered with. Moreover, the ligature might have been drawn too tightly; but on this subject more will be said farther on.

Dr. Hegar does not seem to dread the occurrence of suppuration, which he generally found to be circumscribed in his cases. Objectionable as the complication appears, *finis coronat opus*, for his patients all recovered. As cases similarly treated do well in England without suppuration or discharge of ligatures and sloughs, the verdict remains favourable to complete intra-peritoneal ligature.

In the same monograph Dr. Hegar makes the following remarks, which are much to the point for the subject now under discussion :—

"There are many paths yet to be explored in order to ensure further progress in ovariotomy and allied operations. The chief means of improvement appears to be, in my opinion, *the knowledge of every condition which can produce an unfavourable metamorphosis of discharges, foreign bodies, and fragments of loose tissue left behind in the abdominal cavity.*"

Such knowledge cannot be attained without laborious pathological research. I trust that the following practical observations may prove to be of some value in detecting every source of danger after complete intra-peritoneal ligature, and in distinguishing those bad results to which it may directly give rise, from coincident complications arising elsewhere than from the ligatured pedicle. I believe that I shall be able to show that, as a rule, this method of securing the pedicle is not the cause of the fatal result when death follows after operations where it has been employed. To attain the desired object, a critical consideration of each individual case will be necessary, even at the cost of frequent repetition of certain facts. By such means alone can any general conclusions be justified.

Case I.

A. F., 61. Removal of the left ovary for cystic disease; death on the fourth day.

Pedicle of the left ovary very tightly ligatured by transfixion;[1] congested and sloughy in parts, but adherent to the broad ligament by recent lymph deposited along its outer and posterior border. Ulceration at several points from pressure of the ligature. An adhesion between the tumour and the sigmoid flexure had been separated during the operation. This adhesion was old and well organised, and left on the bowel a raw surface the area of a halfpenny, where the muscular coat was exposed. At this spot the calibre of the intestine was diminished to a diameter of under a quarter of an inch. The walls of the bowel at the seat of obstruction were inflamed and thickened. There was no other morbid appearance in the body.

Was the cause of death to be traced to the treatment of the pedicle or to the intestinal lesion? Both probably took a share in the fatal result. It is always possible that the operator may pull the ligature so tightly as to cause sloughing before certain well-known salutary changes can save the stump of the pedicle. The absence of a covering of organised coagulum, so often observed on the cut surface of the stump, is significant; in considering Case X. more will be said on this subject. The surgeon cannot invariably calculate the exact amount of force necessary, in any given case, to ensure against hæmorrhage without the induction of gangrene. On the other hand, the pedicle, not cut so long as to be free at its margin from vascular influence, had become adherent posteriorly to the broad ligament. This favourable pathological change suggests that the less favourable congestion and the actual sloughing of parts of the stump had been secondary. Now the condition of the sigmoid flexure of the colon represented morbid influences quite sufficient to destroy an old patient exhausted by suffering followed by a capital operation. These influences possibly induced the sloughing of isolated spots on the pedicle after the establishment of the favourable adhesive changes. Hence this case does not severely reflect on intra-peritoneal ligature, which might have had a very small share, if indeed it took any part at all, in the fatal result.

Case II.

Mrs. P., 36. Death twenty-six hours after the removal of a large cystic tumour of the right ovary.

[1] In all the cases here described silk was used for that purpose.

Pedicle secured by transfixion, some very recent lymph covering the ligatures and connecting the bulging tissues on the distal and proximal sides. Free surface covered by a dark red clot of rather firm consistence.

A great quantity of blood-stained serum was thrown out into the peritoneal cavity. The parietal layer of peritoneum near the incision in the abdominal integuments was thickened from chronic inflammation, and ecchymosed from forcible separation of the adherent cyst. The blood in the chambers of the heart was dark and fluid, with a few very soft dark clots in the left ventricle. The clinical symptoms pointed to septicæmia, not to hæmorrhage.

The septicæmic changes might have been induced by hæmorrhage from the stump of the pedicle, from the great bruising of the parietal peritoneum, or from some effused blood which had not been taken up by the sponges during the latter stage of the operation. The second condition seems the most probable. It is not likely that after hæmorrhage sufficient ultimately to cause death, a firm clot should form on the free surface of the stump. It is more reasonable to suppose that if death arose from the pedicle, the clot formed first and its surface became the seat of septic changes, the hæmorrhage into the peritoneal cavity proceeding from its parietal layer.

Case III.

G. R., 38. Removal of cystic right ovary under the strictest antiseptic precautions. Death in twenty-eight hours.[1]

Free surface of stump of pedicle capped by a dark, firm clot. The edge of the stump adhering posteriorly to the broad ligament by recent inflammatory effusion. Several coagula in the substance of the stump on the distal side of the ligature, and a small recent coagulum in the Fallopian tube.

There was no trace of peritonitis in any part of the abdominal cavity, nor had there been any symptoms of septicæmia before death. Both pleuræ were acutely inflamed. The effusion was not fluid but dry, and remarkably tenacious, like very firm size. The relation of this peculiarity to the antiseptic precautions, or the presence of carbolic acid in the blood or air passages, may be suggested here, but cannot be discussed under the circumstances.

Not the slightest doubt can be entertained that death was in

[1] See "Unsuccessful Ovariotomy," by J. Knowsley Thornton, M.B., C.M., "Medical Times and Gazette," vol. ii. 1878, p. 46. This article includes a clinical history of the case.

this case due to acute pleurisy; the treatment of the pedicle, or at least its presence in the pelvic cavity with its ligatures cut short, was not followed by any serious local change. As far as the pedicle is concerned, antiseptic precautions can only diminish the risk of complete intra-peritoneal ligature. The clamp, being quicker of application than the ligature, might partly obviate the danger, if there be any, of a prolonged action of the spray; the disadvantages, on the other hand, of the clamp in antiseptic ovariotomy are not few, but I prefer not to dwell on matters rather clinical than pathological.

The rapid adhesion of the free edge of the stump to the broad ligament occurred within twenty-eight hours after the operation, in a space of time, too, when fatal changes were going on in another part of the body. This speaks well for complete intra-peritoneal ligature, and, so far, reflects credit on antiseptic ovariotomy.[1]

Case IV.

Mrs. R., 39. Removal of a cystic sarcoma of the right ovary. Death in thirty-two hours.

Pedicle secured by transfixion and capped by a soft, dark clot. Contiguous parts of the stump above and below the ligature slightly adherent.

Nodules of new growth were disseminated over the parietal peritoneum, the greater and lesser omentum, and the capsules of the liver and spleen. The lumbar glands were enlarged. The pelvis contained half a pint of deeply stained serum and a few clots. The operation had been very tedious, for the tumour adhered to every part adjacent to it, and some of its substance had to be left behind.

The hæmorrhage was chiefly traceable to vessels in broken-down adhesions in the peritoneum, omentum, &c. Many of these ran through sarcomatous tissue, and hence were very hard to secure. There decidedly had been a certain amount of hæmorrhage from the stump of the pedicle, but if there had been no bleeding elsewhere, death would not have arisen from loss of blood. Had I found every part of the body in a normal condition excepting the pedicle, I should have attributed the loss of the patient to septicæmic changes in the clot which covered it.

Case V.

Miss D., 40. Colloid disease of the ovary. Death in four days after pyæmic symptoms.

[1] All the remaining cases had undergone operation with antiseptic precautions.

Pedicle infiltrated with colloid, its free border suppurating; no sloughing nor sign of hæmorrhage.

There was universal peritonitis of the too well-known low type, and the pelvic viscera were swimming in pus.

The injuries necessarily inflicted on the abdominal viscera in separating the malignant tumour were more than sufficient to cause death in this most untoward case. But I deem it unscientific to defend a practice through thick and thin, after the manner of counsel defending a client. The suppuration of the stump of the pedicle was also sufficient to destroy the patient, and was very possibly the origin of the peritonitis. The purulent changes in its substance unaccompanied by any vestige of gangrene are significant as to the effects of ligature even in a bad case. Had things been less serious, there would have been, not suppurative, but simple inflammation, inducing the changes which act so remarkably on the pedicle.

Case VI.

M. S., 50. Removal of a large cyst of the left ovary, which included some very small secondary cysts. Death on the seventh day.

Pedicle secured by three silk ligatures; no trace of gangrene. The free border of the stump was not capped with a clot, as is generally the rule, but its edges had united after inflammatory changes on the raw surface between them. There was no adhesion of this free border to the broad ligament, either posteriorly as in Case III., or externally as in the two examples figured in my contribution on this subject to the last volume of the Reports. Much lymph was thrown out over the ligatures.

Both lungs were extremely congested, there was no inflammatory effusion in the peritoneal cavity, but the serous coat of the small intestines was sticky, and some coils were glued together. A drachm of fluid blood lay in the right iliac fossa; it had exuded from a small artery in the parietal peritoneum.

The pulmonary complication had come on very early, with continuous high temperature and a very dry state of the skin. The operation was prolonged on account of numerous adhesions. The patient was kept alive by great care for nearly a week, but sank, as old subjects do sink, with subacute bronchitis.

There is no reason to believe that septicæmia complicated this case, and there was a very palpable cause of death observed clinically and confirmed by the autopsy. The method of securing the pedicle could hardly have induced any fatal complication;

certainly no large vein was transfixed. One interesting feature in the state of the stump was the slowness of the pathological changes in the distal part, although nearly a week had elapsed since the operation. Comparing the pedicle in this instance with those in the cases just referred to, the absence of any extensive adhesions is significant, and explained by the inferior reparative powers in an old subject. For Case III. was not forty years old, and Dr. Bantock's patient, where a firm adhesion of the pedicle to the broad ligament was found on the sixth day after operation,[1] was a year younger.

The pedicle was light and narrow in this case, and stood almost upright in the pelvis. It is the heavy broad stumps that fall backwards, so that their posterior edges come into close contact with the broad ligament and rapidly form adhesions. This tends to neutralise a danger, for otherwise the broader pedicles necessarily involve greater risk, but an early communication with a neighbouring part materially lessens the chance of sloughing.

Case VII.

This case demonstrates one of the dangers of complete intra-peritoneal ligature.

Mrs. J., 41. Large dermoid cyst of the left ovary. The pedicle was secured by complete intra-peritoneal ligature, and its outer extremity was drawn up against the abdominal wall through transfixion by one of the threads of silkworm gut which closed the external wound. Death on the fifth day.

Pedicle secured by eight stout silk ligatures, inflammatory effusion thrown out between its anterior surface and the broad ligament. Free border not sloughy; a small friable clot adherent to it. One of the ligatures traversed an abscess cavity in the broad ligament, and a soft, dark red clot, commencing in the substance of the pedicle, extended into the abscess.

A coil of small intestine was adherent to the stump posteriorly. The abdominal cavity exhibited no traces of peritonitis. The kidneys showed signs of chronic interstitial nephritis. The right Fallopian tube was dilated, and contained a drachm or more of fetid reddish fluid. There was great hypostatic congestion of the lungs.

Considering the very distinct local appearances, it is not difficult to account for the cause of death. The pedicle was supplied with large veins, and these must of necessity have suffered injury from the constriction of the firm ligature. The throm-

[1] This is the pedicle figured in the lithograph facing p. 203 of the thirteenth volume of the Reports.

bus, which was found extending a considerable distance on both sides of the ligature, had become disorganised and undergone suppurative changes. It is not necessary at present to consider minutely the different theories concerning phlebitis. The pus is as likely to have arisen from the sole disorganisation of the clot, excluded by the coats of its veins from the tissues around, as to have originated externally and entered the vein at the free border of the stump of the pedicle. The thrombus might have induced phlebitis and suppurative inflammation outside the vein, or the compression of the vein by inflamed or œdematous tissue around it may have caused thrombosis, after the manner so distinctly noted by Billroth.[1] The coagulum itself, whether primary or secondary, was actually breaking up in the abscess cavity. The tendency to unfavourable changes in the thrombus must have been very strong in this case, for the blood was evidently impure owing to long-standing kidney disease. Hence, after the local changes came septicæmia, of which there were marked clinical symptoms, particularly obstinate vomiting. The fetid fluid in the dilated Fallopian tube was significant.

Thus a serious complication may follow complete intra-peritoneal ligature. But this does not in any way condemn the practice as contrasted with the extra-peritoneal treatment, for the clamp might have produced the same changes in or around the veins of the pedicle. As to the renal disease, it is hard to diagnose this complication beforehand, as the pressure of an ovarian tumour on the ureters may affect the kidneys, and cause albuminuria and deviations from the normal daily amount of urinary secretion, accurately counterfeiting primary disorders of the kidney, but disappearing when the operation has removed the source of pressure. Nor might it be unwise to operate even when the kidneys were known to be diseased, provided there were no serious general symptoms due to nephritis, since the removal of an ovarian tumour would in that case improve the condition of the kidneys.

Case VIII.

E. E. H., 54. Removal of a very large multilocular tumour of the right ovary. Death in three days. The patient was very corpulent.

Pedicle of tumour firmly secured by the ligatures; edges of free margin uniting by lymph without any overlying coagulum. Stump of Fallopian tube dilated to dimensions of a cob-nut, and containing a small partly decolorised clot.

[1] General Surgical Pathology and Therapeutics, Lecture xxv.

The heart, liver, and kidneys were all involved in fatty changes, and there was much ecchymosis of the abdominal walls produced by the separation of intimate adhesions. About half a pint of reddish serum lay in the pelvic cavity.

The condition of the stump was certainly satisfactory, if such a term can be used in speaking of a fatal case. The absence of a clot on its free margin is not altogether a favourable condition. Case I. was similar in this respect, and the subject will be presently discussed in relation to Case X. But the complete union of the edges of the margin by inflammatory exudation shows a healthy state of the tissues in the immediate vicinity of the pedicle.

The blood-stained serum had evidently oozed from the abraded surface of the abdominal wall where an extensive adhesion had been broken down. This complication and the morbid state of the viscera explain the fatal result. Shortly before death, after the development of septicæmic symptoms, the peritoneal cavity had been washed out, and much serum was cleared away from it.

Case IX.

J. F., 27. Removal of both ovaries for cystic disease; numerous adhesions to abdominal wall, omentum, intestines, and uterus. Death on the 6th day after distinct pyæmic symptoms.

The pedicle of the right tumour (which alone had contracted adhesions to neighbouring parts) included a portion of the cyst-wall which was adherent to the back part of its own pedicle. This remnant of the cyst was partly sloughy and partly suppurating. The left pedicle was capped by dark, soft clot, but had contracted no adhesions, although lymph was thrown over the ligatures. There was universal peritonitis, consolidation of the base of the left lung, and metastatic abscesses in the right kidney.

The separation of so many intimate adhesions had entailed much damage to the parietal and visceral layers of peritoneum, sufficient to have produced the pyæmic symptoms. But the close adhesion of a piece of cyst-wall to the right pedicle was a serious although unavoidable complication. The piece was thickened, and contained few vessels; its tissue did not favour the changes which take place in the substance of an ordinary pedicle and save it from gangrene. The sloughing and suppuration of this remnant of the cyst might possibly have been secondary to peritoneal mischief higher up, but it is equally probable that it was the origin of the fatal pyæmic changes.

Still, although, the right pedicle was so seriously involved, the

left was in a favourable condition. Hence this case does not reflect on complete intra-peritoneal ligature, but illustrates a complication which may make that process difficult of application. After dwelling on the bad results of leaving parts of a tumour in the pelvic cavity, it is fair to bear in mind how the evil has already been counteracted. In one case where extensive adhesions had been torn from the fundus uteri, Dr. Bantock sewed a flap of cyst-wall which he could not have safely removed, on to the raw surface on the uterus with perfect success.[1] In a similar manner Mr. Spencer Wells brought together two layers of broad ligament after shelling out from between them a uterine tumour, and the patient recovered.[2] When such a proceeding is impossible, and a piece of cyst-wall cannot be removed, the cautery is perhaps preferable to the clamp or ligature. This method is, indeed, employed by Dr. Keith at the present day in most of his remarkably successful antiseptic cases.[3]

Case X.

This interesting case will be found fully recorded in the "Obstetrical Journal," August 1878.[4] The patient, aged 56, had symptoms of cardiac and renal disease. The presence of a large tumour made her life miserable, and aggravated the visceral affections to which she was subject. Tapping was not deemed advisable, as it had already been resorted to with unsatisfactory results. Mr. Knowsley Thornton removed a large multilocular tumour of the right ovary, and also took away the left ovary, as it was cystic, and already more than three times its natural size. Thirty pounds of solid and fluid were removed from the abdominal cavity. The operation was performed under the most rigid antiseptic precautions. The patient died before the completion of the fourth day with uræmic symptoms, which had been preceded by great dyspnœa of cardiac, not pulmonary origin.

The history of the case and the explanation of the symptoms observed before death will be found in the memoir referred to above. At present it only interests us to compare, side by side, the description of the process of ligature, as given by the operator,

[1] On Drainage in Ovariotomy, British Med. Journ., ii. 1877, p. 436.

[2] Successful Removal of a Solid Uterine Fibroma, British Med. Journ., i. 1878, p. 674.

[3] Report of Fifth Series of Fifty Cases of Ovariotomy, British Med. Journ., i. 1878, p. 8. Results of Ovariotomy before and after Antiseptics, ibid. ii. 1878, p. 590.

[4] Case of Ovarian Tumour complicated by Cardiac and Renal Disease—Ovariotomy—Death. By J. Knowsley Thornton, M.B., C.M., with Report of Post-mortem.

and the appearance of the stumps of the pedicles as seen at the post-mortem examination.

Mr. Thornton states: "I ligatured a very broad, short pedicle on the right side of the uterus with two transfixions with medium silk, a special fine ligature being applied to the veins in the outer part of the pedicle, and the middle ligature, which I had purposely left long, being tied again round the whole pedicle after the tumour had been cut away. The left ovary was turned into a cyst of the size of a small hen's egg; and I also removed it, transfixing and tying the pedicle in two halves, and afterwards passing one of the ligatures round the whole. The stumps were then dropped in with the ligatures cut short, and the wound closed by fine silk sutures. Very little sponging was necessary. I was careful, in ligaturing the pedicles, not to draw the ligatures tighter than was absolutely necessary to control the hæmorrhage.

"After death I found that the pedicle of the right ovary, securely ligatured, was capped by a dark friable clot. The left pedicle was similarly secured. A dark, firm, partly decolorised clot, about the size of a walnut, was found in the pelvis. It was already undergoing absorption. I must add that the bulging parts of the stumps immediately above and below the ligatures stuck firmly together by means of a thin layer of organised lymph."

There is no proof whatever that the treatment of the pedicles had the least share in bringing about the fatal result. Mr. Thornton considers the presence of the blood clot on the cut surface of the stump "as the perfect condition to aim at in the treatment of the ovarian pedicle by ligature. This cap of blood clot shows that the ligatures, while tight enough to prevent serious hæmorrhage, were not so tight as to cut off all supply from the distal portion of the stump; and in an aseptic case this clot forms a most useful covering to the ligatures and cut surfaces, forming very soon as it organises free vascular connections between the proximal and distal portions, and preventing the latter from injurious adhesions to neighbouring coils of intestine or other organs in seeking its blood supply." The condition of the pedicle in Case VIII. shows that the distal part of the stump may not slough, even when there has been no hæmorrhage from its cut surface sufficient to form the cap of coagulum. Only in consequence of severe shock the circulation had been very feeble after operation, which may account for the absence of bleeding, less probably due, in this instance, to great tightness of the ligatures. The same explanation may account for the absence of the clot on the pedicle in Cases I. and VI., where both the patients were over fifty years of age.

This closes the instructive series of post-mortem examinations which I have made under circumstances already explained. The following deductions will conveniently serve as a summary:—

1. In this series but a small minority were cases of death evidently due to complete intra-peritoneal ligature.

2. In cases which recover, the proportion of instances of unfavourable changes in the pedicle must of necessity be still less than in those which end fatally.

3. The theories of Maslowsky, Waldeyer, Spiegelberg, Bantock, and others on the vitality of the ligatured pedicle, and the similarity of the changes in women to those observed in animals, are verified even in these unfavourable cases. In the lower mammalia the bad results seen in human subjects may occur, but we more frequently observe in women the satisfactory changes which are the rule in cases where certain pelvic structures are ligatured in animals.

4. The presence of a cap of firm coagulum is favourable, because (as Mr. Thornton has remarked elsewhere) this condition indicates that the ligatures have not been tied so firmly as to cause sloughing, yet have been drawn tightly enough to prevent dangerous hæmorrhage.

5. A soft clot, larger than any observed in my own autopsies —large enough, in fact, to fall off the stump and half fill the pelvis—would be harmless if antiseptic precautions were taken or thorough drainage efficiently carried out.

6. On the other hand, the pedicle may partially slough in cases where there is fair reason to suppose that the unfavourable change is due to the ligature, as in Case I. In such instances the results cannot fail to be very grave.

7. Hence, from the three last observations, it follows that it is much more dangerous to draw the ligatures a little too firmly than to leave them somewhat looser than is strictly advisable.

8. The absence of any coagulum on the free border is evidently frequent, even when the ligatures have not been drawn very firmly. This condition mostly occurs when the patient is old, or when there has been much depression for some time after the operation.

9. In these cases where the clot is wanting, the free edges of the stump may curl in over the raw surface between them and rapidly unite by adhesion. This is a satisfactory change, since as long as a raw surface exists there is risk of adhesion to neighbouring structures. It matters little whether the edges unite in this manner or become capped by a clot, since in both these conditions the cut surface is covered.

10. Small stumps, and those which are broad but not heavy,

are the least likely to adhere to the broad ligament, since they remain upright and do not fall backwards or forwards. This fact is not of much clinical importance, since adhesions to the broad ligament are not likely to produce bad results; moreover, the consistence and size of the pedicle is a matter beyond the surgeon's control.

11. The presence of sarcomatous or colloid material between the layers of the pedicle is a dangerous complication, as not only is the rapid recurrence, or rather extension, of the morbid growth rendered certain, but neoplastic tissue of this kind is sure to undergo unfavourable inflammatory changes after ligature. The destruction of all traces of new growth by the cautery, or the dissecting out of the morbid material, and the bringing together of the edges of the pedicle, as in a flap operation, might be suggested. But the complication in question must remain very grave, whatever known method of securing the pedicle be attempted.

12. The presence of a clot in the substance of the stump of the pedicle, or injury to its veins after ligature, may produce phlebitis or some allied local disorder. But this must be rare, judging from there being but one case of this complication in a series of ten post-mortem examinations, and that instance was associated with chronic renal disease.

13. Old-standing disease of the thoracic or abdominal viscera was detected in every case in this series, several organs being frequently involved. Fatty heart existed in three cases; hypertrophy and valvular disease in one; atrophy of the heart in one; chronic pleurisy (old adhesions) in two; fatty liver in four; chronic interstitial nephritis in two; large fatty kidney in one; large mottled kidney in one;[1] changes in the coats of the large intestine through an old adhesion in one; sarcomatous deposits in the omentum, capsules of the liver and spleen, in one.

These complications may be given as below, showing how they were combined in each case in the series, not only for convenience, but because in the full account above I did not always enter into the condition of all the viscera.

Case I. Old adhesion of cyst-wall to bowel, with changes in the coats of the intestines.

Case II. Weight of heart, 4 oz.

Case III. Acute pleurisy and old adhesions.

Case IV. Sarcomata in omentum and capsules of liver and spleen; fatty heart.

Case V. Fatty liver; large mottled kidneys.

Case VI. Old adhesions in left pleura.

Case VII. Chronic interstitial nephritis.

[1] In nearly every other instance the kidneys were much congested.

Case VIII. Heart, liver, and kidneys fatty.

Case IX. Heart and liver fatty.

Case X. Hypertrophy and valvular disease of heart; fatty liver; chronic interstitial nephritis.

It would be out of place to consider at present whether these visceral disorders were antecedent or secondary to the ovarian tumours.

I have entirely omitted any discussion on antiseptic questions. The probability of fatal results from the absorption, under any circumstances, of minute particles of injured or inflamed tissues, must present itself to the mind of every surgeon. Such fragments of broken-down organic matter may produce deadly results when perfectly free from any material derived from without. The seventh case suggests this theory. It is impossible to provide securely against this danger; but that certain organisms from without contaminate fluids within the body, there can be no doubt. It is quite possible to exclude these minute germs, hence it is the duty of the surgeon to do so. That the antiseptic system of surgery effects this object I do not think there can be much doubt. When it fails, death is, I believe, always due to internal agencies, which its supporters do not profess that it can overcome. When it succeeds, we see at least two favourable conditions of after-treatment, hitherto found hard to combine. For to the maximum of cleanliness of the wound is joined the minimum of frequency of necessary dressings. Thereby the patient is spared annoyance to others, and at the same time discomfort to herself. Moreover, she is free from one source of peril, danger from without. I feel confident that the gradual perfection of antiseptic ovariotomy and of the complete intraperitoneal method of ligature, two objects which my senior colleagues ever pursue with unflagging energy, will reduce more and more my opportunities of making researches like the above, and oblige me to turn my attention solely to more congenial considerations with regard to the operation.