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Wertheim's Panhysterectomy for Carcinoma of the Cervix.*

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WERTHEIM'S radical operation for cancer of the cervix uteri consists in removing, through an abdominal incision, the uterus and its appendages and, by means of clamps, sufficient vagina to form a bag in which the diseased cervix can be encapsuled. In addition the parametrium and as much connective tissue of the pelvis as possible is dissected out together with any regional glands which may be enlarged.

W. A. Freund, in 1878, was the first to advocate abdominal hysterectomy for cancer of the uterus, but it is to Ries, of Chicago, that we owe the development of the radical operation as it is practised to-day. In 1895 Ries, by operating on dogs and corpses, satisfied himself and others that it would be possible to remove the uterus and its appendages, the cellular tissue of the pelvis, and the lymphatic glands as far as the bifurcation of the common iliac without killing the patient.

Clark, in 1896, put this suggestion into practice on the living woman at the Johns Hopkins Hospital, and his example was quickly followed by others among whom may be mentioned Werder, Rump, Mackenrodt, and Wertheim. It is, however, to Wertheim that we owe the present position of this operation which he has performed as a routine one for a much longer period, and in far greater numbers, than any other surgeon, and his results are the most interesting we have. It is to be noted, however, that although in England at any rate, the radical operation is known by Wertheim's name, the only point in its procedure that he invented is the application of the vaginal clamp.

The first record I have of a "Wertheim" in this country is one by A. Wallace, of Liverpool, in 1903. Spencer performed the operation in 1904, and is really responsible for the interest awakened in

* Paper read before the Medical Society of London.

England in this operation, inviting Wertheim over to this country in 1905, when the latter read a paper on his operation at the annual meeting of the British Medical Association. During this visit, Cuthbert Lockyer arranged for Wertheim to perform his operation on a patient in St. Mary's Hospital, Plaistow.

For the purposes of this paper I sent a private circular to every recognized gynæcologist of the United Kingdom and received replies from nearly all, in which they either sent me their statistics or stated that they did not follow Wertheim's method when operating. The number of cases thus collected from English operators of the radical abdominal operation for cancer was 313, of which 243 were Wertheim's, and I should like to take this opportunity of thanking all those who answered my circular for their courtesy and particularly those who have allowed me to use their unpublished statistics.* My thanks are also due to Doctors F. E. Taylor, Maxwell and Gray, for the assistance they have given me with the statistics of the Middlesex, London, and University College Hospitals, and to Mr. Bonhôte Henderson for those of the Cancer Hospital. I am also much indebted to Professor Schauta for his recent monograph, to Professor Bumm for his latest papers and statistics, and to Professors Wertheim, Döderlein, Veit and Polosson, for their latest statistics.

The term "Wertheim" is used very carelessly by many people. I remember, when in the United States, being invited by a surgeon to a large hospital to witness the removal of a carcinomatous uterus by "Wertheim's" method. The operation performed was a simple panhysterectomy. I have witnessed similar operations in this country that have been dignified by the name of "modified Wertheim's," and I have ascertained during the compilation of this paper that there are still many operators who are unaware of the fact that if a Wertheim's operation is to be performed, whatever else is done the vagina *must* be clamped across with forceps well below the level of any growth before it is divided. Certain of the statistics in this paper are based upon the particulars of 243 cases collected, as noted above from English gynæcologists, and in each case I was informed by the operator concerned that he had followed "Wertheim's method," using clamps across the vagina in each case.

The performance of a Wertheim's operation fulfils a certain standard from which it is impossible for anyone to escape, and the results of various operators can thus be satisfactorily compared and dealt with. I have therefore in this paper confined myself more particularly to "Wertheim's" operation, although several correspondents have found fault with me for so doing, maintaining that the importance of the operation consists in the pelvic dissection and not in the clamps. An analysis of radical abdominal hysterectomies would, however, be of little use unless one could append a description of the

* Complete tables dealing with every case under the name of each operator will be found in the "Transactions of the Medical Society" for this year.

exact method of procedure followed by each operator, moreover I find the word "radical" conveys different meanings to different minds. Among the answers I have received to my circular occur the following remarks:—

> "I have not yet been able to persuade myself that Wertheim's operation is sufficiently valuable to be any real advance on previous methods,"

and another:—

> "I at present regard it as an operation having only a temporary popularity. When vaginal hysterectomy is not possible I do nothing,"

and in fact these two extracts express the views of many of my correspondents.

It seems to me, therefore, that the main object of this paper will be fulfilled if I discuss the following points:—

> What advantages has Wertheim's operation over simple vaginal hysterectomy, and what over paravaginal section?

What Advantages has Wertheim's Operation over Simple Vaginal Hysterectomy.

We must discuss this under three headings:—

1. Primary mortality.
2. Percentage operability.
3. Percentage of cures.

Primary mortality.

The primary mortality of Wertheim's operation is undoubtedly high. With increased experience this mortality can be lowered. Wertheim's results are an example of this. In his first 200 cases there were 50 deaths, in his last 258 cases 35 deaths. In his first 30 cases the mortality was 40 per cent., in his last 30 cases it was 7 per cent. His total mortality to date is 15·2 per cent. The mortality of the 30 patients upon whom Victor Bonney and I have operated is 16·6 per cent. The mortality of 243 Wertheims that I have collected is 18·1 per cent. Döderlein publishes a list of 715 operations by the radical abdominal method with a mortality of 14·8 per cent. He gives his own primary mortality for 65 cases as 18·7 per cent. Schindler, of Graz, has a mortality of 9 per cent. and Bumm has a mortality of 25 per cent., but having improved his technique this has fallen to 15 per cent. The mortality of all the cases of radical abdominal operation that I have collected, 313 in number, is 18·5 per cent. The mortality for simple vaginal hysterectomy is naturally lower. Schauta gives the following statistics for vaginal hysterectomy:—

Waldstein (Schauta) 10·3 per cent., Hocheisen (Gusserow) 14·4 per cent., Krukenburg (Olshausen) 12·7 per cent., Zurhelle (Fritsch)

6·6 per cent., and Döderlein reports 4,368 vaginal hysterectomies with a mortality of 9·1 per cent. Hirschmann collected 1,241 cases with a mortality of 8·8 per cent., Fehling 770 cases with one of 9·6 per cent. Percentages smaller than these have been reported, by Leopold 5·7 per cent. and by Amann 4 per cent.

In England the experience of some of those who have performed vaginal hysterectomy to any large extent has been more favourable than this, the difference perhaps may be due to the age of the growth operated on. That the radical abdominal operation has a higher primary mortality is to be deplored, but this fact alone should not deprive any patient of the chance of cure, and after all, this increased mortality is mostly because cases of a much more advanced and serious nature can be and are treated by this method, and therefore it is really unfair to compare the primary mortality of the radical abdominal operation with that of vaginal hysterectomy which can only be performed in early cases. If the percentage mortality is reckoned according to whether the case is one of an early, moderate, or advanced nature, I find in 238 of the "Wertheims" I have collected the following results:—

In 186 advanced cases 23·1 per cent.
In 19 moderate cases 5·2 per cent.
In 33 early cases 6·3 per cent.

which bears out my impression that the mortality of this operation is not appreciably higher than that of simple vaginal hysterectomy if only cases of a similar nature are operated on.

Although it goes without saying that every effort must be taken to reduce the primary mortality of "Wertheim's" operation, still in a comparison of the merits of these two operations I am most distinctly of the opinion that we should not make too much of this. If, after a period of five years, there are more patients alive out of every hundred operated upon by this method than by simple vaginal hysterectomy, then, no matter what may be the primary mortality, the end justifies the means.

Percentage Operability.

The percentage operability is greatly increased by the radical abdominal operation because one is able to separate the bladder, rectum and ureter from the growth without much risk of injury, whereas in simple vaginal hysterectomy in a large number of cases this is impossible.

Spencer remarks that the percentage operability can be made as large as any operator chooses if he operates upon cases in which there is no chance of cure, and he thinks a liberal allowance is 25 per cent. Up to a certain point no doubt this criticism is just, but I do not think it entirely meets the case. It is, as we shall see,

difficult to determine beforehand in which patients there is a chance of cure or not. We are all agreed that if only early cases are chosen the percentage of cures will be much greater and that of operability much less. Still it is quite evident that most operators have not limited themselves in this way, with the result that many women have been cured whose chances from a clinical examination might have been thought to be hopeless. According to Döderlein and Krönig, the average percentage operability of 10 operators by the radical abdominal method was 68. Wertheim has operated upon 49 per cent. of his cases, Schindler 46 per cent., and Bumm 90 per cent., but this latter figure must be due to the fact that Bumm has operated on cases that most other surgeons would refuse, a surmise which is perhaps warranted by his heavy primary mortality. Victor Bonney and myself have noted every case of cancer of the cervix both in the In and Out-patient departments of the Middlesex and Chelsea Hospitals, and also the private cases that we have seen during 1908, and our percentage operability during this period has been 67; this allows for any cases of doubtful diagnosis in all of which the suspected growth has been examined by the microscope.

Very few of my correspondents have kept any records useful for this purpose. The average percentage operability for vaginal hysterectomy is much smaller, and although Gusserow, Olshausen, Kaltenbach, Leopold, Küestner and Döderlein return a percentage of 31, that of Chrobak and Schauta is 15, and of Waldstein 14·7, these last being more in accord with the experience of English operators, which is nearer 12.

Percentage of cures.

If the uterus is removed by simple vaginal hysterectomy practically all the parametrium is left behind; if by Wertheim's method all the parametrium and a large portion of the cellular tissue of the pelvis is taken away.

The results of the pathological investigation of the parametrium extending over a large number of cases and including the microscopical examination of some thousands of sections prove conclusively to my mind that this structure should always be removed. Schauta found in 69 per cent. of his cases that the parametrium was infected. Wertheim in 60 per cent., Kundrat in 55 per cent., Baisch in 50 per cent., and many other observers have similar records. In at least, therefore, half the cases, simple vaginal hysterectomy is useless, because cancerous material is left behind.

These facts do not carry much weight with those who favour vaginal hysterectomy, because they argue that if, on clinical examination, the parametrium is found to be involved, no method of removal is satisfactory, whereas if the uterus is quite mobile and the parametrium is felt to be soft, vaginal hysterectomy holds out as

good a chance of cure as any other operation. The pathological findings have proved this opinion to be untenable. It is impossible to diagnose clinically the real condition of the parametrium. A hard parametrium may contain no cancer, a soft one may be full of cancer. In 22·5 per cent. of Wertheim's cases, although the parametrium felt quite soft, a marked cancer infection had taken place, and in 14 per cent., where the parametrium felt quite hard no infection had occurred, the induration being due to inflammatory reaction. Kundrat likewise found the parametrium infected in 16 per cent. of his cases in which clinically it appeared to be free.

It is almost impossible to estimate accurately the percentage of cures in this country because of the difficulty in tracing hospital patients. It is much easier abroad to keep in touch with patients since the police keep a record of where people live and when they change their addresses. The German method of estimating cures is a very strict one, including as it does by Winter's method, the number of cases per hundred operated upon, added to the number of patients per hundred remaining well, the result divided by one hundred being called the "Absolute cure" for the number of cases taken. Five years seems to be the period chosen by most authorities, after which the patient may be said to be cured as far as her original disease goes. The statistics I have collected from this country are useless for the purpose under discussion, as nearly all the operations have been performed within the last year or two. On the Continent, however, there are a large number of cases that now fulfill this standard. Wertheim has 138 women alive operated upon more than 5 years ago, which equals a percentage cure of 62. Polosson has 60 per cent. free of recurrence after 5 years, Mackenrodt 45 per cent., Bumm 30 per cent. When we compare this with the percentage of cures by vaginal hysterectomy a very great diminution is at once noticeable. Spencer states that carcinoma of the cervix is curable in its early stages in a large proportion of cases by means of high amputation of the cervix and vaginal hysterectomy, but what does this statement really amount to? Simply, I take it, that he has had the great good fortune to operate upon a large number of cases which could be reckoned among the 40 per cent. where the parametrium was not affected. Again he modifies this first statement somewhat by another to the effect that one-third of the cases can be cured by high amputation or vaginal hysterectomy if the disease is limited to the uterus. As we have seen, the disease in at least 50 per cent. of the cases is not limited to the uterus. There is no certain means of diagnosing clinically in each case whether it is or not, but taking those cases where the pathological findings prove that it is, then I think this estimate of the percentage cures to be expected is much too low. In looking up the statistics of vaginal hysterectomy one has to be very careful to exclude cases of carcinoma of the body

which all admit can generally be cured by this operation. With cases of carcinoma of the cervix I find that Jacobs had 1·2 per cent., Gusserow 2·5 per cent., Olshausen 6·6 per cent., Küstner 9·2 per cent., Kaltenbach 7·2 per cent., Leopold 8·2 per cent., Döderlein and Pozzi 9 per cent., and Polosson 12 per cent. of patients living after 5 years, so that apparently not one-tenth of the cases operated upon by vaginal hysterectomy are alive after this period. Frommer had 35·6 per cent. recurrences in the first year, Zweifel 69·8 per cent. in the first six months, and Winter out of 148 cases had 115 recurring the first year, 13 in the second, 13 in the third, 5 in the fourth, and 2 in the fifth. Segan out of 49 cases had only 2 living after 5 years. Bouilly had 77 per cent. recurrences with 17 cases. Waldstein out of 274 cases had only 4 living after 5 years, and there are many other records with the same tale. English operators have been more successful than this, as for instance the splendid results of Spencer and Lewers with 24 per cent. and 16 per cent. of cures respectively after 5 years. It must be remembered, however, that these foreign statistics deal with thousands of cases whereas our English ones deal with hundreds. In comparison with vaginal hysterectomy therefore, the percentage of cures by Wertheim's and other radical abdominal operations show a remarkable improvement. This increase in the number of cures by the radical abdominal operation is due entirely to two factors. One we have already discussed, namely the thorough removal of the parametrium and the adjacent connective tissue. The other is due to the means taken for preventing any part of the wound being contaminated by the growth, that part of the operation in fact with which Wertheim's name is particularly associated, I mean clamping the vagina well below any growth before dividing it, so that the diseased cervix is removed in a bag of vagina, and the risk of local implantation of cancer cells on the cut edges of this organ is practically eliminated.

In the past the recurrence of cancer after the removal of the diseased cervix has nearly always been local, due to cell implantation on the cut edges of the wound or from an imperfect removal of the parametrium.

Winter reports recurrence in the vaginal scar in 54 out of 58 cases, Mangiagalli in 114 out of 115. Most other operators have had a similar experience. On the other hand, with Wertheim's operation local recurrence is a rarity.

The standpoint from which any operation must be gauged is its ultimate result with regard to the cure of the greatest number of patients. Even if, therefore, the percentage of cures with Wertheim's operation was not greater than that by the simple vaginal method, nevertheless it would be the better operation because of the increased operability, since a greater number of patients would be saved. But further the percentage of cures by vaginal

hysterectomy is a very low one, whereas that by the radical abdominal methods may, I think, in comparison, be termed high. Supposing, however, there is a recurrence, I still maintain that Wertheim's operation is a more satisfactory procedure than simple vaginal hysterectomy. When the diseased parametrium is not removed the suffering of these patients is terrible. The infiltrated tissue involves the sacral plexus causing great agony, the ureter becomes incorporated with the growth, giving rise perhaps for months to headache, nausea, and vomiting from uræmia due to ureteral obstruction. Again, the patient in a large majority of cases is free from foul discharge and bleeding and has a peaceful death. In some of our own cases I have had letters from the relatives particularly mentioning the absence of all pain and distress right up to the end.

The only point in favour of simple vaginal hysterectomy is its low mortality, although, as I have pointed out, if we take similar cases the difference is not appreciable, but I think you will all agree that the fear of a higher primary mortality should not deter anyone who is worthy of the name of surgeon from endeavouring to cure these unfortunate women.

And now to the second of my questions.

Has Wertheim's Operation any Advantage over Para-vaginal Section?

As I have had no personal experience of para-vaginal section, I can only bring to your notice a few facts upon which the advocates of each operation rely. The whole question, to my mind, depends upon whether there is any necessity to remove the regional glands. Theoretically there is nothing to urge against the routine removal of glands, in fact, the opposite obtains, since I think we are all agreed that if such a procedure were possible this would be the right and proper course to pursue. As a matter of fact, however, it is impossible to remove from the living woman all the glands that drain the pelvic organs. It is open to anyone to attempt this removal on a corpse, and he will find that besides being most difficult, certain structures have to be interfered with, the disturbance of which would kill a living person. Schauta examined the regional glands in 60 corpses dead of cancer of the uterus, and in only 23·3 per cent. did he find it technically possible to remove them. As therefore it is not possible to be certain of removing all infected glands, is it worth while systematically removing any glands on the off chance that they are infected and the only ones infected? One has to consider the subject from a pathological as well as a clinical aspect.

It is only by examining microscopically every gland removed that we shall gain any information worth having on the subject. A large number of my correspondents state that they have removed glands but

that no microscopical examination was made. They judge their cancerous nature or otherwise from their size and texture. It has, however, been proved conclusively that such a method of diagnosis is hopeless, and the wide discrepancy of the gland statistics issued by different operators is I think largely due to the fact that microscopical examination has not been made in each case.

There is no certain means of clinically diagnosing glands which are cancerous from those which are not. Glands which are large and hard have often been found free of cancerous infection on being examined by the microscope. Döderlein reports 18 cases with enlarged glands in 11 of which cancer was absent. On the other hand, glands which are so small and soft that they were perhaps overlooked during the operation, may be found to be full of cancer cells. Then again the statistics of glandular infection vary according to whether they have been calculated from glands removed at the operation or post mortem. Take Schauta's statistics for instance. He examined 1,182 glands by means of 160,000 serial sections and found that in 57·7 per cent. the glands were affected, but then most of the glands were removed post mortem from patients who had died from very advanced cancer when it would have been unjustifiable to have attempted removal of the growth. Riechelmann found 35 per cent. of the glands infected in 86 bodies dead from carcinoma of the cervix. Taking operative statistics Döderlein gives a list of 10 operators whose average percentage is 39·9. Wertheim removed carcinomatous glands in 35 per cent. and Bumm in 33·3 per cent. In my own 16 cases the percentage was 31, and in the 70 cases I have collected where a microscopical examination has been made, 47. During the last 5 years the bodies of 107 patients dying at the Middlesex Hospital of advanced cancer of the cervix have been carefully examined in the Cancer Investigation Laboratories with respect to the question of regional glandular infection. In 27 of these, or 25·2 per cent., the secondary deposits were entirely limited to the lumbar glands; in 42, or 38·3 per cent., both glands and viscera were involved. I think, therefore, we may take that in at least one-third of the patients that come to us for operation some of the glands are infected. Schauta thinks that this percentage is much too small, and is no indication of the true state of affairs, because of the great difficulty of extirpating even those glands which are abdominally removable. Granted, however, that in one-third of the patients who seek relief the glands are affected, is it good surgery or is any advantage gained by systematically endeavouring to remove these glands. This question may be regarded from several points of view. In the first place the systematic removal of the glands in many cases may increase the danger of the operation. Large vessels may be wounded during the necessary manipulations resulting in the immediate death of the patient from hæmorrhage, and at any rate the time taken over the operation is

often increased, sometimes markedly so, and time in these cases is of prime importance. This fact alone, however, I do not think should deter surgeons from removing as many of the regional glands as possible. After all our great object is to cure as many patients as possible, and if therefore by the systematic removal of these glands a greater number of women are saved, we should not hesitate in their removal because our primary mortality is thereby increased. Unfortunately, however, the statistics, as far as they show anything, seem to prove that the removal of glands in the majority of cases is a useless procedure, for in nearly all cases where carcinomatous glands have been removed there has been a recurrence. This has been the experience among others of Wertheim, most of whose cases died within three years, of Fromme who states that recurrence has occurred in all of Bumm's cases in 1902 and 1903 in which carcinoma of the glands was detected, and of Von Rosthorn in all of whose cases except one, recurrence had occurred where he had removed carcinomatous glands.

The English records are of too late a date to make them of any value for this purpose. The Middlesex Hospital statistics show that the iliac and regional glands were infected 6 times, the mesenteric and sacral once and the lumbar 28 times, that is the surgically irremovable glands were infected in the large majority of cases. The postmortem records of the Middlesex Hospital show what has been repeatedly pointed out, that in nearly all cases where diseased glands have been removed, others which could not be removed have also been affected, and therefore that it was useless removing any glands in the first instance. It is held by many to be bad surgery to expose every patient to the additional danger of searching for and removing glands when one must be uncertain of their nature. Veit, Pankow, and Wertheim, among others, are of the opinion that the routine extirpation of glands does not help the case, and the latter remarks that since in only one-third of the cases are the glands involved, to remove them indiscriminately in every case is injuring the other two-thirds and the occasional cure of a patient does not counterbalance the extra mortality due to routine extirpation. Moreover, the condition of the primary growth is no absolute guide, for while, as a rule, the glands are only affected at a late stage, often being found quite free in very advanced operable cases, still glands markedly enlarged and infected have been found in the earlier stages of carcinoma of the cervix. The removal of glands is, of course, to prevent recurrence therein, but recurrence in the glands is rare.

After simple vaginal hysterectomy, for instance, the recurrence is nearly always in the scar and only rarely in the glands, and then the fact that some patients live 3, 4, and 5 years after vaginal hysterectomy before recurrence, proves that infection of the glands must be a late phenomenon. Schauta argues that when one speaks of glandular

recurrence, one can only consider it as a real glandular recurrence when there is no local recurrence, for in the latter condition it may very well be due to the local state, and in connexion with this it may be noticed that infected glands are found in about 45 per cent. when the parametrium is involved. Again Schauta remarks that facts have arisen which make the spontaneous cure of cancer more likely. In comparing the percentage of recurrences in the extended vaginal operation in which the glands cannot be removed with the radical abdominal operation in which only local recurrences occur, the difference is not very material and therefore a question arises which cannot at present be answered, "what becomes of the carcinomatous glands always in the case of vaginal operations and very often in the case of abdominal operations"? After removal of the primary tumour, carcinomatous masses left behind in the glands may remain latent and only break out very late and perhaps never, death being due to other causes, and that it is noticeable that considering the frequency with which infected glands are found at operation, glandular recurrence should be so rare. Hochcisen had a patient living in 1899, 6½ years after an incomplete operation, without any sign of recurrence. In 35 recurrences Schauta only found 2 in the glands, and in 12 recurrences Franz found one. Wertheim, Zweifel, Döderlein, and others only remove glands when enlarged. Bumm, Ries, Mackenrodt, Amann, Von Rosthorn, and Freund are in favour of removing every gland they can, and there are some cases on record which support this practice.

Döderlein has 2 patients living 4½ years, and three 3½ years after the removal of carcinomatous glands. Wertheim has 4 patients living 3 to 3½ years, Mackenrodt one patient living 5 years, 3 living 4 years, and 7 living 3 years, whilst Bumm has 2 patients living 3 years in each case after carcinomatous glands were extirpated. Lastly, with respect to those surgeons who argue in favour of glandular extirpation from an experience of breast surgery and the brilliant results obtained by a thorough removal of the lymphatics and glands in carcinoma of that organ: it has been pointed out that whilst the ablation of glands and all tissues between them and the primary growth can be efficiently accomplished in carcinoma of the breast, which organ has its own isolated lymph supply, in cases of cancer of the uterus this is impossible.

My practice has been when the state of the patient warranted such a procedure to remove systematically all the glands enlarged or otherwise that I could find short of imperilling the patient's life by interfering with some vital structure, and in those cases when it was necessary to terminate the operation as soon as possible, to remove quickly those glands which were obviously enlarged and which could be extirpated rapidly and without any real loss of time. This also is Victor Bonney's practice, and I think until we have some further

information on this most important subject that this is the wisest and safest course to pursue. Bonney has most carefully microscoped all the glands that we have removed.

The only method by which the regional glands can be removed is through an abdominal incision. They cannot be removed by paravaginal section. The after histories of a large number of cases that are now available seem to show that it is useless to remove the glands. The advocates of paravaginal section allow that if all diseased glands could be removed this would be the best treatment, but maintain that as this is impossible, there is no need to operate through the abdomen, since the operation otherwise can be carried out in every other particular just as well as by the vaginal method. They contend that just as much parametrium and cellular tissue can be removed, with less shock, less danger of infection, no scar, and no greater danger of injury to the ureters, bladder, rectum, or large vessels. Schauta's operation is of course a very great advance on simple vaginal hysterectomy with respect to percentage operability and cure, and in his hands, the results are nearly as good as those obtained by the abdominal method.

Wertheim and others maintain that Schauta's operation is more difficult, that the primary mortality is as great, that the percentage operability is less, and the percentage of cures less, and that the superiority of the abdominal operation lies not only in the opportunity it affords for the removal of glands, but also in the easier removal of the parametric tissue and the less risk of injury to the bladder, ureter, and intestines, in the more reliable hæmostasis, and the greater facility for treating adhesions. Lastly, if the ureter is fixed, it can only be safely freed through an abdominal incision. There are but few published records of Schauta's operation in this country. Sinclair, in the *Journal of Obstetrics and Gynæcology of the British Empire*, expresses himself in no uncertain terms as to the superiority of this operation, which he states "avoids the dangers inherent in those ghastly dissections styled abdominal hysterectomy which have since become the correct fashion and the criterion of an advanced position in scientific gynæcological surgery in some parts of Europe and America," all of which is very picturesque but savours more of the partisan than of the unbiassed critic. I have seen Schauta operate, and it seemed to me that whilst in appearance his operation was not less "ghastly," if I may borrow some of Sinclair's thunder, the anatomical disarrangement of the tissues concerned was not less marked than in the case of Wertheim's operation. In fact, with the exception of the glands, those who have practised paravaginal section most often are insistent that the removal of the affected tissue is just as wide. Schauta's operation in his own hand compares very favourably with Wertheim's or other methods of performing the radical abdominal operation.

His percentage mortality for 258 cases works out at 10·8 per cent. in comparison with Wertheim's 15 per cent. for 458 cases. The mortality of Schauta's last 45 cases was 8·5 per cent., of Wertheim's last 30 cases 7 per cent. An analysis of Schauta's cases also shows the following:—

In 79 early cases the mortality is 3·7 %
In 126 moderate cases the mortality is 11·1 %
In 53 advanced cases the mortality is 20·7 %

Paravaginal section shows a great advance in percentage operability on simple vaginal hysterectomy. Schauta's percentage is 48·7 per cent., which is only slightly less than that by the abdominal method. Lastly, with respect to the question of cure, Schauta's operation holds a high position, 55·3 per cent. of his patients who were operated upon over 5 years ago being alive.

The Complications of Wertheim's operation.

Ureter. The ureter is seldom involved in the disease because it has its own lymph supply, and the cellular tissue surrounding it acts as a protection, but it may be divided during its necessary isolation or ligatured when vessels are being tied, in each case without the accident being noticed, or its blood supply may be so interfered with that necrosis occurs. Under all these conditions a ureteral fistula will result, which complication may also occur after a portion of this tube has been resected for growth, the point of union between the bladder and ureter breaking down. Wertheim, in his 458 cases, had 24 examples of ureteral fistulæ, but I do not know what percentage of these was due to injury and what to necrosis. Bumm, in his 108 cases, wounded the ureter, accidentally, 4 times, 2 died and 2 healed with fistulæ, and, purposely, 4 times with the same results. In none of our cases was the ureter wounded, but we had 2 fistulæ from necrosis. In the 291 cases collected there were 19 examples of fistula, the ureter being cut 5 times. In 15 of these the fistula closed spontaneously, twice it remained patent and twice nephrectomy was performed. In 156 cases at the Johns Hopkins Hospital the ureter was injured 19 times, *i.e.*, 13 per cent.

In comparison with this Schauta wounded the ureter 11 times in 258 cases (wounded 5 times, resected 5 times, fistula once). Döderlein collected 1,979 cases of simple vaginal hysterectomy (90 operators) with the ureter wounded 50 times, and Olshausen with 638 similar cases had 13 ureters injured.

Bladder. The bladder may be opened when it is being separated from the anterior vaginal wall, more especially in those cases where the growth is adherent. If the wound remains undiscovered, or after suture does not heal, a fistula of course results. The bladder may be opened for diagnosis as to extension of growth, or pieces of it if diseased may be resected. Vesicovaginal fistula may also be due to

necrosis of the bladder wall from diminished blood supply, owing to the ligature of the vesical arteries or denudation of its wall when separating it from the vagina. I have no records of Wertheim for vesicovaginal fistula. Bumm, in his 108 cases injured the bladder 5 times, 2 healed with fistula, 3 died. We had one case and it occurred 15 times in the 291 cases collected, 13 of these closed spontaneously, and in two the fistula was closed by operation; on four occasions the bladder was opened and in each case the wound healed without a fistula, portions of the bladder being removed in three. At the Johns Hopkins Hospital, in 157 cases, the bladder was injured 19 times = 12·1 per cent.

Schindler has collected 362 cases (9 operators) with the bladder and ureter wounded 90 times = 24·8 per cent.

In comparison with this Schauta wounded the bladder 11 times (7 accidental injuries, 4 fistulæ) and Döderlein collected 1979 cases (90 operators) of simple vaginal hysterectomy and found the bladder wounded 61 times, whilst Olshausen had 638 cases with the bladder wounded 22 times. In all of Wertheim's cases where a portion of the bladder or ureter has been intentionally resected, recurrence has been early.

Rectum. The rectum may be injured during its separation from the posterior vaginal wall or may necrose later, in each case causing a rectovaginal fistula. Wertheim, in his 458 cases, had 1 rectovaginal fistula. In our cases there was one and there are two examples in the 291 cases. Schauta wounded the rectum 4 times (accidental injury 2, resection 1, fistula 1).

Cystitis. This is probably due to the fact that as the result of the operation there remains a large cavity abutting on the posterior surface of the bladder. This cavity in a few days becomes septic and the sepsis spreads to the bladder, the cystitis in these cases coming on late, about the tenth day. It is also no doubt encouraged by the injury done to the bladder wall from its diminished blood supply and damage to its nerves. In every case after operation there is residual urine from these causes.

Wertheim states that cystitis occurred practically in all his patients, and was one of the principal causes of their prolonged convalescence. In some instances the infection spread, causing pyeonephritis, in one case with fatal results. In Schauta's cases 67 had cystitis, 24 being in simple cases. In the cases I have collected there is a great difference in the frequency with which this complication is noted by the different operators, due, I think, to the care or otherwise with which the urine has been tested. I have had the urine tested repeatedly in all my cases as also has Bonney, and the case was noted as one of cystitis when any pus was detected. We had this complication 7 times in our patients, and it is noted as having occurred in 53 of the 291 cases collected.

Secondary Hæmorrhage. This is a rare complication. Wertheim has not noted it neither has Bumm, Schauta had one case. We had one case and it occurred 5 times in the 291 cases collected. It is of course due to sloughing from local sepsis.

Abdominal wound. One of the most notable things about the convalescence of Wertheim's operation is the comparatively large number of cases in which the wound fails to heal by primary intention. There may be a stitch abscess, a little local suppuration, or sloughing of the whole wound. This latter is a very tiresome complication. I have noted that it has nearly always been associated with those cases in which odour of the primary growth was markedly and horribly offensive. It is due to infection, by an organism from the site of the primary growth, of the tissues whose power of resistance has already been lowered by the bruising caused by prolonged retraction of the wound edges, the slough having the same odour and appearance as the sloughing growth. This complication occurred in 43 of 291 cases I have collected and in 5 of our own cases.

In one of our cases a bacteriological sample was tested by Mr. Hillier and an anærobic organism isolated.

Causes of death. The commonest cause of death, no matter what the country or who the operator may be, is shock and heart failure due to the severity of the operation, in most cases on women whose health and power of resistance is already markedly depreciated by bleeding, septic discharges and pain. Most of Wertheim's deaths have been due to this cause. In addition he has lost nearly all the remainder from peritonitis, sepsis, and ileus. Bumm has sent me rather more complete statistics on this point. His deaths were due to the following causes:—Sepsis 12, peritonitis 5, pyæmia 4, shock 6, chloroform poisoning 1, pneumonia 2. Bumm, by a new method of operating, has reduced his mortality from 47 per cent. in 34 cases to 15 per cent. in 40, and the sepsis as a cause of death from 38 per cent. to 5 per cent. Schauta gives the causes of his deaths as follows:—Shock 8, peritonitis 8, pelvic suppuration 5, pneumonia 3, volvulus, secondary hæmorrhage, intestinal obstruction, and pulmonary embolus, 1 each.

My three deaths were due to shock, and I find the following causes in 313 cases collected:—Shock 19, peritonitis 15, pyæmia 1, cellulitis 2, uræmia 1, secondary hæmorrhage 3, primary hæmorrhage 1, chloroform poisoning 2, intestinal obstruction 3, heart disease 2, acute bronchitis 1, not stated 8.

Some points in the technique of Wertheim's operation.

Fat patient. If the patient is fat the difficulty of carrying out the operation is very great and at times the operation becomes impossible. Wertheim himself had to abandon one case for this reason.

Cardiac and pulmonary disease. It is unwise to perform this operation on any patient suffering from disease of the heart or lungs, the prolonged Trendelenburg position and the deep anæsthesia militate very seriously against its ultimate success. Wertheim operated upon this class of case successfully with scopolamine for over a year, in 15 cases, only finding it necessary to employ slight general anæsthesia towards the end of the operation.

Preparatory treatment. Patients before this operation should be kept in bed at least a week, during which time they should be fed up and their health improved as much as possible by hypodermic injections of the liquor strychnine minims iii twice daily, regulation of the bowels and any other treatment that may be indicated. This preliminary rest in bed, etc., is very important, since as we have seen the primary mortality in the majority of cases is due to shock. The preliminary local treatment is of equal importance, in fact in some ways it is as important as any part of the operation. In all our cases except one, the growth has been scraped and cauterised some few days before the main operation. The vagina has also been douched twice daily with formalin (1 in 1,000), and in addition the growth has been thoroughly swabbed with peroxide of hydrogen (10 vols.) two or three times, and again finally just before the operation when the patient is under the anæsthetic, after which the vagina is plugged with sterile gauze which is withdrawn with any debris when the clamp is applied.

There are certain drawbacks in thus treating the growth beforehand. The patient has to have an anæsthetic twice, and the inflammation subsequent to the cauterisation sometimes, I think, makes the separation of the bladder more difficult and increases the danger of wounding it. Wertheim always scrapes and cauterises the growth just before the patient is anæsthetised for the main operation, and Russell Andrews tells me he finds this immediate treatment more successful although it increases the time of the operation by about ten minutes. He waits till the patient is anæsthetised.

Bumm points out that in some patients formalin, when used in a strong solution, causes a necrosis of the vaginal wall and rectum, which increases the difficulty of the operation, and it does not by any means always destroy the septic microbes. He has tried covering the seat of the growth with pitch, glue and gum, but these do not fix themselves close enough to the living tissues, and he finds the only reliable method to be scraping and cauterisation. Great care has also to be taken when curetting the growth lest the curette enters the bladder, rectum, Douglas' pouch, or perforates the cervix, so that when the abdomen is opened and the bladder separated there is an opening from the vagina into the abdominal cavity. All of these accidents have occurred.

Hæmorrhage. In advanced cases the enlarged cervix pushes the

ureter toward the pelvic wall, and the "ureteric canal" becoming obliterated, the separation of the uterine artery from the ureter is more difficult. Bleeding from small arterial vessels is easily dealt with, but at times the arrest of venous hæmorrhage presents a great many difficulties. During the isolation of that portion of the ureter between the cervix and the bladder branches of the vesical plexus may be torn, these can as a rule be easily ligatured. The uterovaginal plexus of veins may also be injured during the separation of the ureter, and as the parametrium is dissected out and the wall of the pelvis approached, the large venous plexus, communicating between the veins of the bladder and the hypogastric veins, may be wounded. There is also a large vein running transversely across the floor of the pelvis which may be wounded. The best means of stopping this serious venous hæmorrhage is to clamp the bleeding spot with long fenestrated tongue forceps which are easy to tie over. At times clamping only makes the bleeding worse by tearing fresh holes in the vein, in which case the part must be plugged with gauze.

Some surgeons advocate ligature of the internal iliac artery as a routine method to prevent hæmorrhage. In the majority of cases the hæmorrhage is never serious enough to warrant such a procedure, and there is a certain amount of danger in doing it. Cullen reports a case of gangrene of the leg with amputation due to ligature of the internal iliac artery. Of course if the bleeding is very dangerous, this vessel may have to be ligatured as happened in one of Bonney's cases, or one or more pair of long clamp forceps may have to be left on the bleeding spot as in one of my own.

Ureter. The ureter is best found by rubbing the posterior layer of the broad ligament between the finger and thumb and, on identification, can be exposed by rough dissection, after which an aneurism needle can be passed under it just as it approaches the cervix. Great care should be taken not to "clean" it too much, as this means injuring its vascular supply, and for the same reason it should not be isolated more than sufficient to pull it clear of the growth and parametric tissue. There is a great difference of opinion as to what treatment should be followed if the ureter is cut. I think the best thing is to tie the cut end and leave it in the hope that the corresponding kidney will atrophy. If it does not, nephrectomy can be performed at a later date. The ureter has been many times successfully reimplanted in the bladder after accidental division or resection for growth, but this considerably prolongs the time of the operation, is often not successful, and if it is, the end of the ureter is in great danger of becoming constricted by the scar in the bladder and so causing kidney disease. If a uretero-vaginal fistula results, it will often heal spontaneously, and if not, before proceeding to nephrectomy, the opening into the vagina may be cauterised with sulphate of copper or iodine, and in many cases it will close.

Some authorities advocate the introduction of ureteral bougies before the operation is commenced. I have never done this, and cannot see what advantage it has except perhaps in very fat women, as the ureter can be identified quite easily after a little practice. On the other hand the treatment may do harm. It certainly increases the time of the operation, and cases of hæmorrhage and inflammation of the ureter have occurred after bougies have been introduced.

Bladder. The bladder is best separated by downward pressure with a swab assisted when necessary by a few short snips with a pair of blunt pointed scissors. There is great danger of wounding the bladder at this stage of the operation. If the bladder has been accidentally injured or a piece of it purposely resected, it is very often a very difficult and lengthy procedure to suture the opening properly, situated as it is at the junction of the posterior wall and trigone, and also because of the fact that sepsis so frequently occurs in this situation, and after operation the sutures are less likely to hold. Russell Andrews tells me that he has in 3 cases very successfully and rapidly repaired the wound, after he had intentionally resected a portion of the bladder for growth, by suturing the vagina over the opening.

Time of operation. The time occupied by the operation must of course vary with the severity of the case. In this operation, perhaps more than any other, one has to be a miser of one's minutes, since the operation, except in the very early cases, is bound to be prolonged and in many cases very prolonged. My experience of pelvic surgery tells me that up to 60 minutes most women can stand the anæsthetic and manipulations without any appreciable harm. After an hour every minute is on the debit side, and this is more marked when operating upon patients already depressed by hæmorrhage and perhaps sepsis. A very early case can be finished somewhat under the hour, an advanced case may take 2 to 3 hours; 26 of our cases were advanced, and our average time has been 89 minutes, the shortest being 55 minutes and the longest 145.

General sepsis. Next to shock, sepsis is the commonest cause of death following the operation, and probably many deaths attributed to delayed shock are really due to this cause. The operator is never safe from the danger of sepsis, streptococci having been found locally in quite early cases. If the patient has fever beforehand the prognosis is bad.

The bacteriology of Wertheim's operation. The value of systematic bacteriological examinations in cases of carcinoma of the cervix, both before and during the operation, is insisted upon by Liepmann from Bumm's clinic in Berlin. His procedure is as follows:—Three long-handled sterile swabs are taken and inoculated

(1) From the carcinomatous ulcer exposed by Doyen's specula as soon as the external genitals have been disinfected.

(2) From the peritoneal cavity as soon as it is opened.

(3) From the interior of the growth, the glands, or parametrial tissue, the surface of the masses being first sterilised by a glowing knife, and the tissues being incised by a sterile knife. The three swabs are each placed in a sterile Petri dish as soon as they are taken and transferred to the laboratory where bouillon tubes are inoculated.

Liepmann thus gets his "three swab test." The first gives the primary bacterial content of the carcinoma, the second of the peritoneal cavity, and the third of the parametrium and glands. In only one of more than 100 cases had complete sterility been procured throughout. In this case the operation lasted 2 hours 10 minutes, the carcinoma was broken into during the separation of the bladder and the peritoneum was closed without drainage. Nevertheless recovery was nonfebrile and uninterrupted, and the patient passed flatus on the first day, showing absence of intestinal paralysis.

In all other cases streptococci have been found, either in pure culture, or along with staphylococci and bacilli. Streptococci from carcinoma possess an extremely high virulence, especially for the peritoneum.

Although it has been shown that peritoneal streptococci are non-hæmolytic, and streptococci from carcinomata are markedly hæmolytic, and although hæmolysis has been considered to be a test of the virulence of streptococci, Liepmann has not used hæmolysing media but has relied upon the clinical course of the cases.

Where streptococci were found in the peritoneal cavity and drainage was not employed, the fate of the patients was, with few exceptions, sealed. Thus in one case where the operation was easy and short, lasting only 1 hour 23 minutes, where streptococci in long chains were found in the carcinoma and in the peritoneal cavity, the patient died from septic infection on the fourth day.

Influenced by Liepmann's bacteriological findings, Bumm proceeded to leave the peritoneum open and to employ drainage from below with the following results:—

	No. of Cases operated upon	No of Deaths	No. of Deaths from Septic Infection
Prior to July 1907 (peritoneum closed)	34	16=47%	12=38%
Since July 1907 (peritoneum open, drainage from below)	40	6=15%	2=5 %

Liepmann believes that it is not the magnitude of the operative procedures which accounts for the high mortality of Wertheim's operations, but that it is due to operating in a bacteria-laden medium, *i.e.*, to sepsis.

As a precaution against sepsis Charles Ryall passes a sound into the uterus before the operation in case a pyometra is present, this

condition being a very serious complication as, during the operation, pus may escape through the holes made by the volsellum or in some other way. We had 1 case of pyometra and in 291 cases I have collected there are 7 examples.

As a further precaution against sepsis the vagina should be swabbed out with perchloride of mercury 1 in 2,000, after the clamp has been applied and the gauze packing withdrawn, but before the vagina is divided, and during the section of the vagina, the surrounding pelvic tissues should be well protected by swabs. It is also better to use a new set of instruments and gloves for suturing the abdominal wall.

Laceration of the cervix. At times, if the ulceration is far advanced and the preliminary scraping has removed much tissue, when traction is made upon the uterus with the volsellum during the radical operation, the body is torn away from the cervix. This, though unpreventable, is a most unfortunate complication, because the field of operation must be infected. Under these circumstances, as also in the case of pyometra, when the pus has oozed through the holes, we have found the best thing to do is to cover the body of the uterus or the remains of the cervix, whichever it may be, with a swab and clamp it in position with the volsellum. This accident occurred in two of our cases, and increased the difficulty of the operation.

Local sepsis. I have already drawn attention to some particulars of local sepsis when mentioning sloughing of the abdominal wound. The more thorough the preparatory treatment and the less the traction on the wound edges, the rarer will this complication be. To prevent its occurrence I have covered the wound edges with various materials, and have found the material suggested by Bonney—thin sheet india-rubber, stitched over the raw edges of the wound, so that it overlaps the skin and peritoneum respectively for about three inches,—to be the best.

Clamps. There are various shapes of vaginal clamps on the market all fashioned more or less after the pattern of Wertheim. A certain difficulty and danger is associated with the use of this class of forceps. It is sometimes very difficult or even impossible to fix the clamp across the vagina if the growth has extended far outwards, a difficulty which has caused several surgeons to give up using the clamp and to devise other methods of preventing local cell implantation. Then if the growth is at all extensive there is a special danger of including the ureter in the heel of the clamp when the latter is being fixed. I have with Bonney invented an instrument which we think obviates this difficulty and danger, and at any rate it is very easy of application and very effective for the purposes required.

Bumm objects to using a clamp for two reasons:—One is that just stated, and the other which he considers the most important is

because he finds that its application prevents the perfect removal of the parametrium. To apply any clamp the parametrium has to be divided along the sides of the cervix so that after the uterus is removed there is still a certain amount left, and the lymphatic channels have been opened, increasing the risk of cell implantation. Bumm argues that the parametrium and cellular tissue can only be properly separated when the vagina is cut through before the separation commences. For this purpose he packs a swab close up against the cervical growth and then separates the vagina well below this at the junction of its middle and lower third. The "cuff" that is thus fashioned is sewn together over the swab, and the rest of the vaginal wall is thoroughly disinfected. This takes 10 minutes. A new set of gloves and instruments having been obtained, the patient is placed in the Trendelenburg position and the operation continued per abdomen. After the ureter has been separated and the uterine artery ligatured, the rectum is separated from the posterior vaginal wall till the cut end of the vagina is reached. The hand then pulls up the growth encased in the bag of vagina and gradually the uterus, parametrium and cellular tissue, is separated from below upwards and outwards, as far as the lateral wall of the pelvis, in one piece.

Drainage. We have not drained any of our cases. I omitted, when sending out my circular, to make any enquiry on this point, but I know that several surgeons with a considerable experience have now given up drainage. Schauta drains the supra-vaginal cellular space and not the peritoneal cavity because of the danger of ascending peritonitis from the large cavities left. Drainage was employed in the early days of the operation, but the results were not encouraging. At this time the lateral pouches formed by the dissection of the parametrium were packed with gauze which was covered by the sutured peritoneum, and the end the gauze was drawn through the vagina. On the other hand, since Bumm has drained the peritoneal cavity he has reduced his mortality from 47 per cent. to 15 per cent., and his deaths from septic infection from 38 per cent. to 5 per cent. Bumm douches the cavity left at the end of the operation thoroughly with 6 to 10 quarts of normal saline solution, which escapes through a tube put in the vagina, he then sutures the peritoneum over the lateral pouches as far as the external angles of the vagina, the vesical peritoneum to the anterior vaginal wall, and the rectal peritoneum to the posterior vaginal wall. The vagina is then in communication with the peritoneal cavity, the lowest part of which is packed with sterile gauze which presses upon the lateral pouches and the end of which is drawn into the vagina By the employment of this method, not only has the death rate from sepsis been markedly decreased, but ulceration of the abdominal wound is much rarer and the number of convalescences free from fever has been much greater.

Exploratory laparotomy. I have already insisted upon the great difficulty one experiences in diagnosing clinically the exact stage of the disease in these cases. With vaginal hysterectomy it has been customary to rely on the lessened mobility of the uterus and induration as a contra-indication, and yet such a condition may be present and due to old inflammation, adhesions and salpingitis. Unless, therefore, by the local ulceration it appears that the case is absolutely hopeless, I think it is good surgery, in cases of doubt, to give the patient the benefit of an exploratory incision which, in itself, is without danger when the local condition can be carefully examined. By following this method a certain number of patients will be saved who are otherwise doomed. Acting on a suggestion of Lewers I have asked for information on this point, and find that in the 298 cases I have collected exploratory laparotomy was performed 23 times without the operation being continued.

I also asked for a return of incomplete operations where, owing to an error in starting, or to some insurmountable difficulty arising, the operation has to be abandoned, and I have collected 8 examples of this.

Cystoscopic examination. In only a few cases will a cystoscopic examination of the bladder give any information as to whether the carcinoma is advanced or otherwise. Schauta examined 158 cases with the cystoscope, and found bullous œdema of the bladder, swelling of its base, and dragging of the ureter in 95, of which 7 were early cases, 10 moderate, 27 severe, and 51 inoperable, and negative signs in 63, of which 15 were early, 18 moderate, 24 severe, and 6 inoperable.

The choice of cases. Patients who are very fat or who suffer from cardiac, pulmonary, or renal disease form very bad subjects for this operation and should be left alone. Other things being equal the younger the patient is the better, although a considerable number of patients over 60 years of age have been successfully operated upon. Schauta had a patient 78 years of age, Bumm one 10½.

The radical operation for advanced cases must have a higher rate of mortality and a lower percentage of cures than when it is performed for early cases, and it is in these latter that I think the operation is most particularly indicated.

The following summary of 30 cases includes my own, 16 in number, and 14 of Victor Bonney's whom I assisted.

Number of patients operated upon by Wertheim's method	30
Percentage operability	67
Percentage mortality	16·6
Ureteral fistula from necroses	2

Vesicovaginal fistula	1
Rectovaginal fistula	1
Cystitis	7
Secondary hæmorrhage	1
Sloughing of abdominal wound	5

Glands removed and submitted to microscopical examination in all cases, in 9 carcinomatous.

Causes of death, 5 in number, shock a short time after operation.

The following figures have been sent me in private communication and contain the latest results of the respective operators:—

Professor Veit, Halle a S.

From October 1908 to January 1909, 21 operations by Wertheim's method: 10 cases advanced, 9 cases moderate, 2 cases early.

Percentage operability	80
Percentage mortality	19
Time of operation	30 to 70 minutes

Anæsthesia in all cases medullary (Stovain Billor).

Augustus Polosson, Lyons.

1st series—November 21st 1904, to July 1905.

Operations	27
Percentage operability	54
Mortality	18·5%
Free of recurrence	35%

2nd series—July 1908, to December 1908.

Operations	68
Percentage operability	88·3
Mortality	13·2%
Free of recurrence	61%

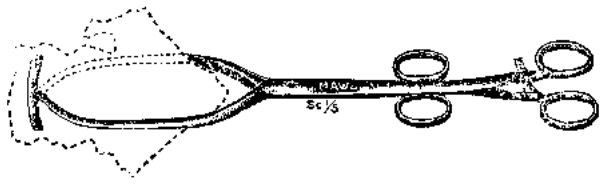
3rd series—1907.

Operations	35
Percentage operability	76
Mortality	8·5%
Free of recurrence	69%

4th series—1908.

Operations	57
Percentage operability	77
Mortality	22·8%

Prof. Polosson had *36* consecutive cases, October 1906—1907, *without a death.*



THE BERKELEY-BONNEY CLAMP.

The dotted outline represents the uterus, appendages, parametrium and vagina. The lower handles are used when applying the instrument, the upper handles when clamping the vagina. (Makers, Maw & Sons, Aldersgate Street.)

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