OBSTETRICAL-GYNECOLOGICAL EPONYMS: ERNST WERTHEIM AND HIS OPERATION FOR UTERINE CANCER

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CARCINOMA of the uterine cervix provides one of the few examples in medical history of a method of treatment, once discarded by the majority of the profession, later being reclaimed. Radical hysterectomy, abandoned by most American gynecologists after the advent of radiotherapy in the early part of the present century, has enjoyed an impressive resurgence during the last decade and now bids fair to take a place of equal importance along with irradiation techniques in the treatment of cervical cancer. Whereas earlier generations of gynecologists concerned themselves with the relative merits of the radical abdominal versus the radical vaginal operation, the primary therapeutic choice now lies between surgery and irradiation.

Suggestions that the cancerous uterus might be surgically extirpated were first made by Wrisberg and by Osiander toward the close of the eighteenth century.[7] It was not until almost a century later, however, in 1878, that Freund[2, 3] performed the abdominal operation on which the modern radical hysterectomy for cervical cancer is based; and only in 1895 that Ries, one of Freund's students, carried out the first dissection of the pelvic lymph nodes in conjunction with this operation. Abdominal hysterectomy was soon taken up by a number of gynecologists in their somber efforts to combat the disease.

Foremost among them was Ernst Wertheim, who devoted himself relentlessly to the development of the operation, acquired a vast experience with it, and popularized it to the extent that the procedure soon became known as the Wertheim operation—a designation it still retains although the procedure has been greatly modified during the ensuing fifty years.

Wertheim first performed his operation in 1898 and, in the decade from 1900 to 1910, published a score of papers and discussions[10–28] dealing with various aspects of the problem, his writings on the subject culminating in a monograph, published in 1911, entitled *Die erweiterte abdominale Operation bei Carcinoma colli Uteri*,[29] based on 500 cases. The futility of cervical amputation, founded on the erroneous concept that carcinoma of this organ was slow to invade the parametrium, had already been demonstrated, as Wertheim, arguing for a bolder approach, pointed out in his introduction: "As the hopes that had been placed in partial removal of the uterus as a substitute for total hysterectomy . . . were not destined to be fulfilled, even in carefully selected cases, the teaching lost validity that carcinoma of the uterus is exceptional and that it proceeds beyond the bounds of the uterus only late in its development; and the realization began to mature that one had to strive to remove as much as possible of the surrounding tissue together with the primary tumor in order to achieve better results, as is the case with operative procedures for cancer of other organs."

Then, as now, the parametrium was the objective of the operation and the ureter its bête noire. "It was a priori clear," Wertheim wrote, "that methodical treatment of the ureters was indispensable to a so-called extended operation. Extensive removal of parametrial tissue for a successful approach to advanced cases was associated with the greatest danger to the ureters, unless preliminary safeguard was taken, as is obvious from operative experience as well as from the topographical anatomy.

"At first I sought to achieve this safeguarding of the ureters by retaining the hitherto predominant vaginal hysterectomy, by catheterizing the ureters preoperatively, and by leaving the catheters in place during the operation in order to make sure of the ureters while we accomplished the widest possible removal of the parametrium from the pelvic

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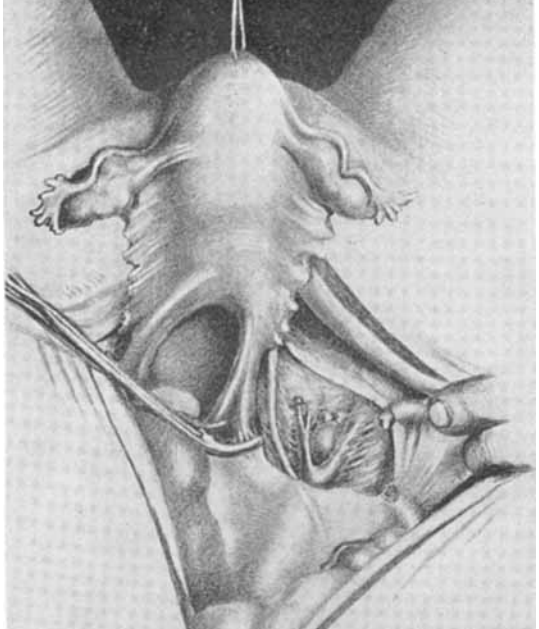

FIG. 1. An illustration from Wertheim's monograph, showing a stage of the operation.

wall . . . The amount of parametrial tissue thus removed did not satisfy us, however, and . . . the blood loss was still quite heavy if very much parametrium was removed.

"It thus came about," he explained, "that we trusted more and more in the idea of the abdominal approach. The resulting view and accessibility of the ureters in their course through this region is incomparable and can be achieved in no other way. This approach provides the further advantage that the other surroundings of the uterus are also most accessible and can be dealt with precisely in relation to the spread of the carcinoma."

The previous experience of others in exposing the ureters at hysterectomy was meager and conflicting. Wertheim therefore embarked on this surgical venture "only with great care and under strict control. After a few cases, however, we had the feeling that our approach was correct. Exposure of the ureters succeeded easily; the insight that we gained into the method of spread of the carcinoma proved surprisingly instructive; removal of the surrounding tissue and the regional lymphatics became very extensive; and, the greatest achievement of all in our opinion, the operation could be performed in cases so advanced that, according to the prevailing views, they were considered as absolutely inoperable by the vaginal approach. Although the mortality was disturbingly high at first, we had the confident conviction that we could succeed in reducing it."

The pathological findings encouraged Wertheim to continue. "The correctness of our procedure was proved to us," he wrote, "by histological examination of the extirpated organs. These showed the teaching to be false that cervical cancer transgresses the bounds of the uterus only late, for in a considerable number of apparently early cases the carcinoma had already sent its offshoots and advance guards to the parametrium and regional lymph nodes. This had not been shown previously by histological examinations of this sort; for everything that was known at that time about the spread of cervical cancer was based on cases in which the illness had proved fatal, that is, on far advanced cases, long inoperable."

Under the caption of indications for the operation, Wertheim wrote: "The extended abdominal operation demonstrated, at the outset, that the entire surroundings of the diseased uterus can be extirpated, and this knowledge has broadened the indications for the operation. Whereas infiltration of the parametrium with fixation of the uterus so that the organ could not be pulled down . . . was a contraindication to the vaginal operation, with our operation we can attack cases with parametrial infiltration and feel confident that fixed organs, such as the bladder, rectum, and ureters, can be freed and the diseased uterus removed completely, even in advanced cases of carcinoma.

"We therefore gradually broadened the indications for operation. Before the year 1898, 15 operations were done among 100 patients with uterine cancer who presented themselves at the Vienna Clinic. With the aid of the extended abdominal operation this number soon rose to 30 per cent; with our increasing experience it rose to 50 per cent; and in the last 2 years it has been 61.9 per cent . . .

"Since it is impossible to determine the extent of spread of the disease by examination, one must consider every operation for carcinoma of the uterus as an exploratory laparotomy. Only after the abdomen is opened is it possible to say whether the operation can

be completed or not. Laparotomy provides the opportunity of seeing the condition of the lymph nodes, the ureters, the bladder, and the rectum. The eye can see, the fingers can palpate, and, if this is not enough, the peritoneum can be opened up without the operation losing its exploratory character. Even dissection of the ureters and loosening of the bladder or rectum do not prejudice the situation, for the incised peritoneum can be resutured and closed. This is an advantage over the vaginal method, in which one often becomes aware of the uselessness of the procedure at a stage of the operation when turning back is no longer possible.

". . . We first palpate the regional lymph nodes. If enlarged lymph-node tumors are present, an attempt is made to remove them. If this proves impossible, the operation is abandoned and the abdomen closed . . . Next comes investigation of the ureters. If the ureters are dilated, showing themselves through the peritoneum, then they must be dissected; for the dilatation simply indicates that the carcinoma is compressing them, and only by dissection, particularly of their vesical portion, can one determine whether it is possible to liberate them. After this the bladder and rectum are investigated. Bladder fixation is usually revealed by the formation of a collar and a wrinkled appearance of the peritoneum over the affected area . . . If the bladder is already invaded by the carcinoma, then loosening it . . . is of no avail; resection is the only thing left."

A chronological listing of the 500 patients operated on from November 16, 1898, to October 29, 1909, is presented, with a tabulation of the cardinal clinical and pathological details and the follow-up data. A detailed description is given of the operative technique, and the many problems associated with the operation are dealt with minutely.

Considering first the prevention of infection from the primary carcinomatous focus, Wertheim wrote: "The great mortality that followed the ordinary abdominal uterine extirpation was caused principally by septic infection. In uterine carcinoma this danger is particularly great because pathogenic organisms are invariably present in large numbers in the carcinomatous focus . . .

"We had originally hoped to solve this problem by cleansing the primary focus of the cancer by means of the curette and Paquelin cautery, but this procedure did not prove effective (4 of our 23 patients died of peritonitis). It then occurred to us . . . not to open the vagina at all from the abdominal side, but to leave the liberated organs attached to the vaginal tube and remove them from below after the peritoneum had been sutured and the abdominal wound closed.

"This would have made it impossible for infection to occur from the primary focus, but in severing the vagina according to this method we find much bleeding from the paravaginal tissues, which is difficult to control because of inadequate visualization . . . We now sever the vaginal tube from above after all the organs have been liberated, but with the additional precaution of clamping off the vagina first and severing it below the clamp . . .

"We invariably carry out this preparation [excochleation and Paquelin cauterization of the primary tumor] immediately preoperatively. If it be done several days before the operation an inflammatory reaction often occurs as a result of organisms being squeezed out during the excochleation. In spite of the most careful preparation and antiseptic tamponade, a new discharge will soon issue from the carcinoma, with the development of bacteria. If a tampon of very strong antiseptic is used (10 per cent zinc chloride or formalin, for example) it may severely damage the tissues, and this has an unfavorable effect on the patient's postoperative recovery . . . We fill the vagina with 1 per cent sublimated gauze.

"We are not completely satisfied even with all these precautions, because during the manipulation of the uterus incidental to the operation . . . infective particles may still be expressed from the carcinoma. Before the vagina is opened and immediately after the clamps have been applied, the sublimated gauze is removed . . . The vagina is then opened sufficiently for us to push enough sterile gauze through to again cleanse the vagina and remove every bit of fluid that may have collected. One cannot guard too carefully against possible infection from the primary focus . . . It is absolutely essential that the vaginal tube be opened only as the last step in the operation."

Discussing care of the wound, Wertheim stated: "The best way to drain the peritoneum after gynecological operations is through the vagina. This holds true after complete hysterectomy . . . We resort to peritoneal drainage only when indicated as in other laparotomies

—namely, after pus is spilled, when large raw areas are left, or where there is danger from bowel perforation.

"We consider it wise to drain in cases where the entire pelvis has been laid bare, where large masses of parametrium and paravaginal tissue, and perhaps lymph nodes, have been removed, and where relatively large dead spaces have been created. We drain the pelvis after peritonization in such cases, to prevent the accumulation of blood or serum. The possible presence of streptococci in the dissected connective tissues increases the need for drainage.

". . . The chief consideration is to prevent contamination of the operative field from particles of the primary focus, which is infected with hemolytic streptococci in about half the cases."

Wertheim next considered the problem of hemostasis. "The control of bleeding," he wrote, "is the most difficult problem associated with the radical abdominal operation. This problem does not result, as has been thought, from the extirpation of the regional lymph nodes, but from the removal of the parametrium. The more thoroughly the latter is removed the nearer one gets to the pelvic floor and the more difficult it is to avoid the adjacent veins of the pelvic fascia, which bleed more or less, and the control of which is by no means easy. For this reason . . . we carried out prophylactic ligation of the hypogastric arteries after the thirteenth case but were disappointed in our expectations . . . Despite hypogastric ligation the uterine artery, on being cut, spurted as vigorously as though no ligature had been applied, and we therefore soon discontinued this practice.

"From the ninety-seventh case on we availed ourselves of the so-called parametrium clamps . . . of which three or four suffice for each side. These clamps, applied against the pelvic floor, on the roots of the parametrium, prevent bleeding from individual points. Because of their curves, the clamps are easily replaced by ligatures. The use of these clamps provides certain protection against air embolism . . ."

A lengthy and detailed discussion is devoted to management of the ureters and the prevention and treatment of ureterovaginal fistulas. "Liberation of the ureters," Wertheim began, "is a necessary step in the radical abdominal operation.

"It is usually easy to locate the ureters. The pelvic portion of the ureter is often visible through the peritoneum, and, to reach it and free it from the connective tissue, one needs only to split the peritoneum in the appropriate place. If the subperitoneal fat is thick or the parametrium thickened, the ureters will not be seen; they can be reached readily nevertheless by splitting the peritoneum . . . Sometimes the ureter will reveal itself by its peristalsis . . .

"We have never catheterized the ureters preoperatively and allowed the catheter to remain in situ during the operation. This is superfluous and inadvisable, in our opinion, for it does not leave the ureteral mucosa undamaged.

"To reach the vesical portion of the ureter easily, liberate the parametrium as well as the uterine vessels and proceed in the following manner: The index finger is forced along the ureter through the parametrium until the fingertip is visible near the bladder, the latter organ already having been freed from the uterus. The index finger being under the part of the parametrium that contains the uterine vessels, clamps can now be applied to these vessels and leisurely tied off . . . It is usually easy to force the index finger under the parametrium. The uterine vein is torn occasionally, but this accident is of no great moment. Only when the parametrium is infiltrated with carcinoma is difficulty encountered in forcing the finger through . . .

"After the parametrium is separated, the vesical part of the ureter is easily reached, either by a few snips of the scissors or a little teasing of the tissues. Liberation of the bladder itself now becomes a relatively easy matter . . .

"In advanced cases it is very difficult to free the vesical part of the ureter; and in a few instances it literally has to be dug out. At first we did not expect the ureter to be free of carcinoma in these advanced cases, and we deliberated on the advisability of resection. Histological examination of these ureters, however, taught us the extraordinary resistance these organs have to carcinomatous invasion . . . and this was further corroborated, for we can show brilliant results even in very advanced cases.

". . . There is no doubt in our minds that the cause of ureteral fistula is necrosis of the wall of the ureter from interference with its nutrition, resulting from isolation of the ureter itself. Opinions differ as to the manner in which isolation of the ureter leads to necrosis.

Preservation of the vessels leading to the ureters is only of minor importance; it is more important to preserve the sheath of the ureter . . . If we notice that the wall of the ureter has been injured we carry out immediate resection."

One of the most important differences between Wertheim's procedure and the modern operation for cervical cancer is revealed in Wertheim's attitude toward the regional lymphatics. "This question has been attacked from various points," he wrote. "In opposition to the view that removal of the entire lymphatic system is the foremost requirement is the fact that this is neither possible nor necessary. Even if one admits that in a few cases carcinomatous metastases may be found in nodes slightly enlarged, say to the size of a pea, it is still a fact that carcinoma is never found in the spindle-shaped nodes normally present in the pelvis, as well as in some that have become enlarged into a chainlike formation.

"Reliance only on palpation of the various regions is inadequate for making sure that no enlarged regional lymph nodes are overlooked. It is necessary to split the peritoneum and expose the vessels, so that one can palpate between and under them and pick up the cellular and fatty structures between the fingers. Only in this way can one avoid leaving enlarged lymph nodes behind.

"It was our aim at first to free the lymph nodes and include them with the removal of the parametrium . . . Theoretically this method offers an advantage, for the lymph vessels are also included with the removal of the nodes. Experience proved, however, that these lymph nodes tear away during the operative manipulations; so we arrived at the practice of extirpating the lymph nodes at the close of the operation. Only in those advanced cases of carcinoma where inspection and palpation show the lymph nodes to be enlarged and fixed do we begin the operation with the removal of the lymph nodes, and if we find it impossible to extirpate them the operation is abandoned . . .

"In searching for enlarged nodes we proceed in the following order: First we search along the common iliac; then we follow the external iliac to the internal abdominal ring. The index finger is then advanced into the obturator foramen, in order to reach the triangle between the external iliac and hypogastric, and, when enlarged nodes are found in this space, the obturator nerve is dissected entirely free. In some cases this nerve is completely surrounded by diseased nodes, but the nerve can almost always be freed from them. Only in one case did we have to resect it. We complete the search in the sacral region.

"The greatest caution must be exercised where the carcinomatous nodes have become fixed to the iliac vessels . . . Injury to the iliac veins is a most unpleasant occurrence . . . "

The conclusions to Wertheim's treatise portray his continuing efforts to establish the superiority of the abdominal to the vaginal operation: "It cleared up so much that could not be explained by the vaginal operation, and one began to understand why the vaginal operation was inadequate to achieve success in such a large number of cases . . . Our knowledge of the behavior of the regional lymphatics and parametrium, of the mode of spread of the carcinoma, and of what might be expected from a surgical operation, was put on a secure basis for the first time by the extended abdominal operation.

". . . There is no doubt that the indications for the vaginal operation for uterine cancer had been too conservative . . . Most gynecologists went so far as to reject operation in cases where the parametrium was only slightly infiltrated and the mobility of the uterus only slightly limited! Histological examinations of the parametria widely excised in the extended abdominal operation showed that not every infiltration is invariably carcinomatous; and that rather stiff and infiltrated parametria are often free of carcinoma, while contrariwise parametria that feel quite supple on clinical examination, may be carcinomatous or may have transmitted the carcinoma to the regional lymph nodes.

"We are convinced that simple vaginal hysterectomy, had it utilized this knowledge, would surely have improved its end result. Many a patient has undoubtedly been sent away who could have been helped even by a simple vaginal hysterectomy, and it appears altogether possible that attention to this fact might have succeeded in raising the absolute performance of this operation somewhat beyond the present limits . . . "

Wertheim realized the futility of surgery for many patients with cervical cancer, and with the priceless wisdom of the seasoned surgeon he counseled, in conclusion, against the unbridled extension of the operation.

"Not in the progressively wider extension of the indications," he insisted, "but in the most precise possible execution of the operation do we see the possibility of a further improvement of the end results. The precision of execution can be achieved without an increase in the operative mortality, while an extension of the indications is scarcely possible without it . . ." Modern surgical experience continues to demonstrate the validity of this principle.

Ernst Wertheim, one of Austria's most renowned gynecologists, was born in 1864 in Graz, where his father was a chemist.[1, 4, 5, 6, 9] After completing his early education and medical training there, young Wertheim worked for a period in Prague as assistant to Schauta. When the latter was invited to Vienna in 1891, to be head of the I Universitäts-Frauenklinik, Wertheim went along with him and continued to serve as Schauta's assistant until 1897. Wertheim was then made chief of the II Universitäts-Frauenklinik, a position he filled with the greatest distinction for the next thirteen years, during which time physicians from all over the world were attracted to his clinic, to witness the work of this master surgeon.

Wertheim also held an appointment at the Cancer Hospital, which had been endowed by one of the Rothschilds in memory of his wife, who had died of mammary cancer. This hospital, devoted primarily to gynecological cancer, was equipped with the most modern laboratories and facilities, and it was here that Wertheim developed the operation that bears his name. It is said that he performed more than thirteen hundred such operations and that not a single patient was lost to follow-up! In eighty of these cases he carried out histological study of the parametrium and lymph nodes, examining the prodigious total of 40,000 serial sections. An automobile accident in 1913 resulted in a fracture of the base of his skull, leaving him with permanently impaired hearing.

Wertheim's name is associated with two other major achievements: his work on the gonococcus and his contributions to the understanding and cure of uterine prolapse. Early in his professional career he developed a method for culturing the gonococcus and followed this up with fundamental observations on the bacteriology of the organism and its method of propagation in human tissues. Although best remembered today for his abdominal hysterectomies, Wertheim showed consummate skill as a vaginal operator as well and became known for his vaginal plastic procedures and vaginal operations for uterine suspension. His *Die operative Behandlung des Prolapses* enjoyed an excellent reception.[30] Wertheim was one of the leading advocates of the vaginal approach to the pelvic viscera. Together with Micholitsch he published an atlas on vaginal operations, describing the removal of the uterine adnexa and even large myomas by this route.[31] Although rubber gloves had been part of the surgeon's accouterment for a number of years, Wertheim spurned them, stating to his students: "Das sicherste Mittel, Infektionen zu vermeiden, ist gut zu operieren."

In 1906 Wertheim came to the United States on a lecture tour. With Bumm he served during his last years as editor of the *Archiv für Gynäkologie*. He was notoriously brusque in manner, but those close to him ascribed this to his conscious efforts to conceal the depression that plagued him so frequently. He found his principal source of relaxation in deer hunting and athletic sports. He was an excellent skier and had the reputation of being one of the best skaters in Vienna. On one occasion he made a balloon trip over the Alps. Wertheim died on February 15, 1920, at age 58.

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