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Rectum.

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EXCISION OF CANCER OF THE RECTUM.*

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WHILE the treatment of cancer of the rectum is not followed by brilliant results, yet it must be acknowledged that operative procedures are followed in the majority of cases by prolongation of life and alleviation of pain, and in a few cases by permanent cure. Surgery offers two plans of treatment—radical and palliative. In many of the cases which fall into the surgeon's hands radical treatment is impossible, in others it is questionable, while in a considerable number it is demanded. It is generally accepted that radical measures should be adopted in cases where the disease is confined to the lower three inches and a half or four inches of the rectum, or, in other words, when the finger can reach above the cancer, provided it has not extended to other organs. Are our operations, however, to be confined to such cases? Is there a point higher than which we must not venture, and, if there be such a limit, where is it? In cases where the disease extends higher than four inches, or where the average index finger can not reach healthy gut above it, all surgeons are not agreed as to the propriety of excision.

* Read before the New York Surgical Society, April 13, 1892.

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Especially is this the case if it be certain that the peritoneal cavity must be freely opened during the operation. In such cases, even when other conditions are favorable, some surgeons advise the adoption of the palliative operation of colotomy. It is especially the English who hold this view, and they prefer to give a certain amount of temporary relief by means of a colotomy rather than subject the patient to the dangers of a high operation on the rectum. Thus Treves * says: "In no case should the peritonæum be deliberately opened, or a portion of the vagina, bladder, or prostate excised. Experience has condemned these extensive operations." Allingham † expresses himself as follows: "To attempt to excise the rectum when the growth is four inches up the bowel is most unscientific and unsurgical, as it subjects the patient to great risk, and, moreover, it probably only partially removes the growth." Cripps, at the same meeting, says: "If the finger can pass sufficiently beyond the disease to feel a healthy mucous membrane so far as the height is concerned, a satisfactory removal is possible." In his further remarks he discourages operation on cases where the disease extends beyond the reach of the finger. The great majority of English surgeons hold this same view.

German surgeons, on the other hand, do not hesitate to operate on cases where the disease extends much higher than four inches and where the peritoneal cavity must be freely opened. Indeed, they would hardly be influenced by this latter fact. I do not know that there is any operation for the perfection of which we are so much indebted to our German colleagues as this very one of excision of the rectum. They certainly deserve almost the entire credit for the establishment of this operation on a proper basis.

* *Operative Surgery*, p. 691.

† *Brit. Med. Jour.*, 1889, p. 806.

Our American practice has not been so clearly formulated. We are perhaps in the transition stage from the conservative English to the radical German view. While the majority of surgeons in this country do not take such an extreme position as do the Germans, yet few of us would, I think, be willing to be restrained by the limits with which the English up to the present time have surrounded the operation. So little has been published on this topic that it is difficult to say just where we stand. It is certainly, however, only within the last few years that we have held such advanced views, while in Germany, as far back as 1874, stress has been laid by Volkmann and others on the good results obtained by radical treatment in cases where the disease extended high up in the rectum, and ever since their surgeons have ably maintained this position, which no doubt has influenced in a great measure our practice in this country. On account of our meager literature on this subject, it is important that all cases should be published, and for this reason I report the following five cases, which cover my experience during the past three years.

Before giving the cases in detail I shall describe in a few words the general plan of procedure followed in all five operations. A vertical incision is made in the median line from the posterior border of the anus backward as far as the tip of the coccyx, and, if necessary, extended upward as far as the middle of the sacrum. If the lower part of the rectum is healthy and does not need removal, this incision is deepened until the posterior part of the rectum is exposed. The gut is then divided across below the disease, leaving its lower segment attached to the anus. If this segment is not more than an inch or two in length, it is better to divide it with the sphincter muscles vertically through its posterior wall. In other words, prolong the original incision through the posterior border of the anus. If the lower part of the

rectum is diseased and needs removal, it is left unopened and two semicircular incisions are carried around it, meeting on the perinæum in front of the anal opening. In either case a ligature is tied around the lower end of the rectum to prevent escape of faecal matter and to be of assistance in handling the gut.

If the incision to the tip of the coccyx does not give sufficient space, then the coccyx is removed, and, if necessary, the lower part of the sacrum. The separation of the diseased rectum from neighboring tissues is then carried on until healthy gut is reached above the disease. This dissection should be mainly "blunt," and should be done by the fingers and blunt-ended scissors. If accomplished in this way, but few blood-vessels require to be clamped and still fewer ligatures to be applied. Sponge pressure, kept up for a few moments while the operator attacks another district, will generally be sufficient to control the greater part of the hæmorrhage. This is preferable to the use of artery forceps, as not only is time saved—an important detail in these operations—but also the field of operation will not be blocked by a dozen or more of artery clamps. It will sometimes be found useful to clamp a considerable amount of tissue in a large artery clamp and secure it either by a ligature *en masse* or by leaving on the clamp until the end of forty-eight hours. In an average case three to six vessels require to be secured, occasionally ten or a dozen.

When complete separation of the rectum as far as the upper limit of the cancer has been accomplished, the next step will depend upon the condition of its anal portion. If this lower segment must be removed, the entire gut is drawn down until the disease is beyond the margins of the external wound, and the rectum is then amputated at a point an inch above the upper limit of the cancer, and the

cut end united by sutures to the edges of the external wound. If the lower part, with the anus and sphincter muscles, has been saved, the segment of rectum containing the cancer is resected, thus leaving a portion of healthy gut to which the lower end of the proximal portion is sutured. If the lower segment has been split, its edges can be sutured together immediately, or this may be postponed for a future operation. The external wound is then closed partially by suture, drainage being effected by tubes or iodoform gauze. If the peritoneal cavity has been freely opened, no attempt is made to close the opening by suture, but the wound below is packed with iodoform gauze.

If possible, the bowels are kept constipated for four or five days after the operation, and during this time the gauze packing is left undisturbed. After the bowels have been freely moved the gauze is taken out, the wound irrigated, and fresh gauze inserted. For several days previous to the operation an attempt is made, by repeated doses of mild cathartics, to thoroughly empty the intestinal tract, and if this has been possible there will not generally be much difficulty in preventing a movement of the bowels for five or six days following the operation.

CASE I. *Excision of Four Inches of Rectum.*—Male, aged forty-nine; had enjoyed good health until a year ago, when he began to suffer pain about the anus. Since then the pain has increased, and he suffers from constipation and occasional bloody stools. For the past two months there has been marked loss of flesh and strength and obstinate constipation. On examination, a hard nodular mass is felt beginning just above the sphincter and extending upward about two inches and a half. At a point an inch and a half above the anus there is a constriction which will not admit the finger. The mucous membrane covering the growth is ulcerated.

Operation in Presbyterian Hospital in May, 1890. Ether.

Lithotomy position. Sound in urethra. Vertical incision from tip of coccyx to anus, which is surrounded by two semilunar incisions. Dissection carried upward well above the cancer. Rectum drawn downward and divided three quarters of an inch above the disease at a point four inches above the anus. Cut end of rectum drawn down and fastened to margins of wound by silk sutures. Peritoneal cavity not opened. Large rubber drainage-tube behind the rectum and remainder of wound united by suture. Primary union of rectum to skin of edges of wound in part only. Wound healed in twenty-seven days and patient discharged cured. Greatest elevation of temperature, 100.5° . In March, 1892 (twenty-two months after operation), patient was in perfect health. Two movements from bowels occur daily, which he can control fairly well unless he has diarrhoea.

CASE II. *Excision of Three Inches of Rectum.*—Male, aged fifty seven. History of constipation for two years. For past six months pain in rectum, blood in stools, and emaciation. On examination, ulcer on posterior edge of anus, with indurated edges and hard nodular mass extending about two inches up the rectum. Mucous membrane for lower inch ulcerated, bleeds freely, and painful to the touch. Operation, July, 1889. Incision from tip of coccyx to perinaeum surrounding anus by two semicircular incisions. Dissection of rectum upward for three inches, where divided well above the cancer. Peritonaeum not opened. Cancer peeled off urethra, to which it was in close approximation, but neither bladder nor urethra opened. Cut end of rectum drawn down and sutured to skin. External wound closed by sutures, except at anterior extremity, where a small drainage-tube was placed, and at posterior extremity, where a large tube was used. Tubes removed at end of forty-eight hours. Primary union of skin wounds. Slight retraction of rectum—perhaps half an inch. Patient left the hospital cured at end of four weeks. Three months later was well and had excellent control of bowels, except when he had taken a cathartic. Patient has since disappeared.

CASE III. *Excision of Six Inches of Rectum.*—Female, single, aged twenty. For one year pain in rectum and obstinate con-

stipation. During the past three months rapid loss of flesh and strength. Patient very anæmic and feeble. On examination of the rectum, on its anterior wall just above the sphincter is an oval ulcer with broad hardened base and excavated center running upward for two inches. The mass is adherent to the posterior vaginal wall. By vaginal examination, high up behind the uterus, apparently adherent to its fundus, is a hard tumor the size of a hen's egg, supposed to be a uterine fibroid.

Operation, April 16, 1891, in Presbyterian Hospital. Ether. Lithotomy position. The perinæum was divided transversely close behind the posterior vaginal wall, and, the anus being encircled, the incision was extended backward as far as the lower part of the sacrum. Coccyx excised. Lower end of rectum tied by a ligature. The lower two inches of posterior vaginal wall, where adherent to the ulcer, was left attached to the rectum. Peritoneal cavity opened in Douglas's pouch, just behind cervix uteri, and the hard mass supposed to be a fibroid was found to be a separate cancerous deposit on the rectum, slightly adherent to the uterus. The rectum was easily freed on its posterior aspect, and the mesorectum being divided for about two inches and several glands removed, the rectum was drawn downward and cut across well above the cancer at a point six inches above the anus. The cut end of the gut was sutured to the skin about the middle of the wound. The wound was sutured at the anterior and the posterior parts of the incision, and the cavity packed with iodoform gauze. The rectum united to the skin by primary union, and also the edges of the wound where sutured. She made a good recovery, and left the hospital on May 16th. The functional result was good: she had perfect control of gas and fæces under ordinary circumstances. There was no sign of local return, and for seven months she was in excellent health. She then complained of abdominal distention, the liver began to enlarge, and ascitic fluid to collect, and she died from cancer of the liver, nine months after operation. In this case colotomy would have probably given her an equal length of life, but up to the time of her death she was entirely free from local pain, and I doubt if this would have been the case had colotomy been performed instead of excision.

CASE IV. *Excision of Ten Inches of Rectum; Sphincters retained, to which the Rectum was united by a Secondary Operation.*—Female, aged thirty-seven. Habitual constipation for two years. Pain in back and left side, and loss of flesh and strength during the past six months. On examination, a hard, nodular, annular stricture of rectum, two inches above the anus. Extending upward beyond the reach of the finger is a large nodular mass. Under ether the finger could not pass through the constricted portion, and in the vagina could not reach the upper limit of the tumor.

July 3, 1891.—Operation in the Presbyterian Hospital. Ether. Patient in knee-elbow position. Incision from tip of coccyx to posterior border of anus. Dissection carried down until the posterior surface of the cancerous rectum was reached. An attempt was made to leave undivided the lower inch and a half of rectum, but, in order to define the limits of the disease, the sphincters and lower inch of the rectum were divided posteriorly. The dissection was carried upward until the lower two inches and a half of the rectum were freed. At this point the tumor bulged out into each ischio-rectal fossa and was difficult to separate from the neighboring tissues. In passing the finger around the tumor to free it from its attachments on the left side, an artery was torn across and a tremendous hæmorrhage took place before the vessel could be seized by a large clamp in the midst of hardened tissue. The vessel, from the size and force of the jet, must have been abnormally large. The clamp was left *in situ*. In the mean time a ligature had been tied around the rectum just below the disease, and the gut was cut across below it, leaving the lower inch with the sphincter muscles undisturbed. This lower portion was then split vertically through its posterior border, and, remaining attached in front and at the sides, was drawn apart with the margins of the wound. To give more room, the coccyx was excised and the lower inch of the sacrum removed by cutting that bone across by bone forceps at the level of the fourth sacral foramen. The patient's condition was not good, and the remainder of the operation was done rapidly. The peritoneal cavity was freely opened, the meso-

rectum drawn down and divided for three or four inches, a few hardened glands removed, the rectum drawn well down and divided across above the cancer at a point eight inches above the anus. It was intended to fasten the cut end into the sphincter, which had been left attached to the skin, but the patient was suffering from so much shock that the cut end of the gut was fastened to the skin about the middle of the wound by a few sutures. The margins of the posterior part of the wound were approximated by a deep suture, and the cavity packed with iodoform gauze. No vessels had been tied, but four artery clamps were left in the wound. The patient rallied from the operation. The bowels could not be controlled, and from the third to the sixth day there was considerable elevation of temperature, but at the end of a week the condition of the patient and of the wound was satisfactory. The rectum did not unite with the skin, and its lower inch necrosed. In order to surround the lower end of the rectum with its sphincter muscle, on July 28th a second operation, under ether, was performed. There was a healthy granulating cavity through which the rectum passed, to within an inch of the skin. The wound was irrigated, the adhesions surrounding and fastening the rectum in its new position were freely broken down by the finger, and the peritoneal cavity reopened. The gut was drawn down by dividing the mesorectum still further, until its end projected well beyond the skin margin. An inch was then removed from its lower end, so as to be sure that all diseased tissue was removed. The inner surface of the sphincter muscles, which at the first operation had been left attached to the skin, was then denuded and the end of the rectum implanted within the denuded surface, and the circle of the muscle completed behind by suturing its ends together.

Deep sutures of silver wire approximated the posterior margins of the wound, the remainder being packed with iodoform gauze. The patient suffered but little from shock after the second operation. On August 23d she left the hospital, the wound being nearly healed. On September 11th the wound was completely healed. The end of the rectum had united with the sphincter muscles, and while the grip of the muscle was not perfect, yet it was sufficient to give the patient fair control over

her bowels. On April 3, 1892, the patient reported she had gained thirty pounds since the operation and her general health is excellent. She has no pain and no sign of local recurrence. Except when she has loose diarrhoeal movements, she exercises perfect control over her bowels. She affirms that she is as well as at any period of her life. Microscopical examination declared the tumor to be a carcinoma.

CASE V. *Excision of Seven Inches of Rectum.*—Female, aged sixty-three. History of constipation for several years. For the past six months rectal pain and loose blood-stained movements. On examination, beginning an inch and a half above the anus, was an irregular, hard, nodular mass constricting the lumen of the rectum, so that the finger could not pass farther than two inches and extending upward beyond the reach of the finger into the hollow of the sacrum.

Operation, August 3, 1891, in the Presbyterian Hospital. Ether. Lithotomy position. Incision began just behind the anus and ran backward as high as the middle of the sacrum. The sphincters were found infiltrated, and two semicircular incisions were made surrounding the anus and meeting on the perinæum. The incision was still further extended through the perinæum, dividing the lower inch and a half of the posterior wall of vagina. The lower part of the rectum was tied with a silk ligature. The dissection of the rectum from neighboring tissues was difficult. In front it was adherent to the vagina, part of which was removed. Behind, the mass was adherent to the anterior surface of the sacrum as far up as the promontory. To give access to this region, the coccyx and the lower inch and a half or two inches of the sacrum were removed by cutting across the latter bone by bone forceps at the lower border of the third sacral foramen. The peritoneal cavity was freely opened, and, after dividing the mesorectum, the diseased rectum, which formed a very bulky tumor, was drawn down and the gut divided an inch above the cancer at a point about seven inches above the anus. Two large indurated masses, consisting of enlarged glands and infiltrated fat, were afterward removed. Hardened and probably diseased tissue was felt running upward and to the right, but no attempt was made to remove it on ac-

count of the condition of the patient. The cut end of the rectum was fastened by silk sutures in the center of the wound. A deep suture was inserted at the posterior part of the wound to approximate the margins. The anterior part of the wound, consisting of what remained of the vagina and perinæum, was united by suture. No vessels were ligatured, but four clamps left in position. The cavity was packed with iodoform gauze. The patient rallied well from shock. The highest temperature after the operation was 101.4° .

August 30th.—Union by secondary intention throughout the posterior part of wound. Union had been primary throughout its anterior portion.

September 15th.—Wound entirely healed and patient able to walk.

The pathologist reported that the tumor was a carcinoma.

During the operation I felt that the case was not a suitable one for excision and that colotomy would have been the wiser procedure. I formed this opinion on account of the extensive and firm adhesions of the tumor on all sides, especially at the lateral borders of the sacrum. I felt that I was working in dangerous territory and that removal of all the cancer was impossible. The subsequent condition of the patient has shown, however, that excision has given greater comfort than would have colotomy. In February (seven months after operation) the patient was alive and comparatively well. Her general health has improved and she suffers but little pain. She has, however, but very imperfect control over the rectum.

There are a number of steps in the operation about which there is considerable difference of opinion.

1. *The Incision.*—Many different methods of approach to the disease have been employed during the past century without, perhaps, much difference in the results obtained. Since, however, the plan of attacking the growth from behind rather than from below has been introduced, operations can now be performed with comparative safety which, fifteen years ago, would have been considered as unjustified.

ble. While the sacral method is appropriate in a considerable number of cases, yet many satisfactory operations can be done without encroaching on that bone. Of the many methods of approach, it may not be amiss to mention a few of them. The oldest method is that of Lisfranc. He made two semilunar incisions around the anus, and carried the dissection upward. Hueter made a horseshoe-shaped incision, the bow in front of the anus and the arms running backward. Separation of the gut begins in front, and it is then divided across below the disease, and the flap containing the anus and sphincter muscles thrown backward, to be replaced after excision of the diseased segment.

Velpeau made his incision from the tip of the coccyx downward through the posterior part of the anus, and the tumor can then be seen and handled from the interior of the gut.

Kocher* makes a long posterior incision from the coccyx to the edge of the anus, and removes the coccyx if necessary. Dissection is carried down till the posterior wall of the rectum is exposed, and the flaps are held apart by retractors. If the cancer does not involve the anus, the posterior healthy rectal wall, with the sphincters, is cut through vertically as high as the point where the gut is to be divided below the cancer. If the anus is diseased it is excised with the rectum.

The sacral methods have many distinct advantages. By adopting one or other of these, freer access is gained to the disease. The opening through which we work being larger and leading more directly to the seat of cancer, our manipulations can be carried on by sight rather than by touch. A much higher point on the rectum can be reached, even above the sigmoid flexure. If suture of the cut ends be neces-

* *Contrib. f. Chir.*, 1874.

sary, this can be accomplished directly under the eye of the operator.

There may be disadvantages, but they are certainly more than counterbalanced by the undoubted advantages. It is alleged against the method that by it the pelvic floor is weakened, that there is greater tendency to prolapse of the bowel, and that, by disturbance of the sacral nerves, the functional control of the rectum must be lost. The first two objections, however, are largely theoretical, and even were the last a valid one, it can not be considered as important, for the control over the sphincter muscles after any rectal operation is apt to be very imperfect. In all sacral operations certain of the nerves must be divided, and it is not a matter of indifference which ones are sacrificed. In this connection it will not be amiss to make the following statements, which, I think, are correct: Division of the posterior branches of the sacral nerves is of little moment, as no important tissues are supplied by them. Division of the anterior branches of the fifth nerve is also unimportant. Division of the anterior branches of the fourth nerve, if confined to one side, is not followed by serious disturbances. Division of the anterior branches of the third nerve should be avoided, as they enter into the formation of the ischiadic plexus, and serious changes in the innervation of the pelvic organs are liable to follow injury of either of these branches.

The most prominent of the sacral methods are as follows:

1. *Kraske's Operation*.*—The patient is placed on the right side. The incision begins in the median line, at the middle of the sacrum, and extends downward to the anus. The soft parts being retracted from the bones, the lower part of the insertion of the left gluteus maximus muscle is

* *Arch. f. klin. Chir.*, Bd. xxxiii, p. 563.

loosened from the side of the sacrum. The coccyx is excised. The lower part of the sacro-sciatic is divided. The lower part of the left wing of the sacrum is then cut away with the chisel, following a bowed line which begins on the left edge of the bone, at the level of the third sacral foramen, and curves inward and downward along the lower border of this foramen, and then around (on the median side of the left fourth foramen) and down to the end of the bone. After the bone is made smooth the patient is placed in the lithotomy position, and, the tissues being retracted, the cancer is freely exposed.

2. *Bardenheuer's Method*.^{*}—The patient is placed in the lithotomy position. The incision runs from the middle of the sacrum to the anus and through the sphincters. The soft parts are separated from the coccyx and lower part of the sacrum until the edges of the bone are exposed. The ligaments are divided. The sacrum is then cut transversely across, just below the third sacral foramen. The soft parts may be divided by a transverse incision on each side if more space be needed.

3. *Heineke's method* † was devised because he feared that removal of so much bone would weaken the floor of the pelvis. He divides the sacrum vertically, and afterward unites the lateral halves by suture. His incision extends from the level of the third sacral foramen down below the tip of the coccyx, and from the upper end of this a transverse incision is carried outward on each side. The bones are then sawed through vertically in the median line as high as the fourth sacral foramen (found by probing), and at this point the sacrum is sawed transversely across and each half retracted. After excision of the cancer the bones are united by sutures.

^{*} *Sammlung klin. Vorträge*, No. 298.

† *Münch. med. Woch.*, 1888, No. 37.

4. *Kocher's Method* (reported by Arnd).—The incision extends in the median line from the level of the posterior superior spine of the ilium downward as far as the coccyx. On each side the soft parts are separated from the bone as far laterally as the posterior sacral foramina and as high as the third foramen. By means of the chisel a groove is then cut on each side of the sacrum along the inner edges of the foramina, beginning at the third and extending to the end of the bone. The flat segment of bone (*Knochen-sponge*) included between these lines and consisting of the posterior layer of the bone is then removed, which freely opens the spinal canal. The course of the sacral nerves can then be plainly seen, and they can be drawn aside, so as to be safe from injury during the operation. The sacrum and coccyx are then divided vertically in the median line, by means of a saw, as high as the third foramen, at which point the bone is divided transversely and, the important third and fourth nerves being carefully guarded, each half of the sacrum is drawn aside and the rectum freely exposed. When the diseased rectum has been removed, the lateral halves of the bone are approximated and sutured.

5. *Levy's Method*.*—A transverse incision is made a finger-breadth above the cornua coccygea, from each end of which incisions run downward for 8 ctm. through the glutæus magnus muscle. The ligaments are divided, and the connective tissue separated from the anterior surface of the sacrum. This bone is then cut across opposite the transverse skin incision, and the flap, in which is the lower part of the sacrum and the coccyx is drawn downward and, after the cancer has been excised, is replaced, and the bones united by suture.

This operation has been slightly modified by Delbet and by Jaennel (*Gaz. hebdom. de méd. et de chir.*, 1890, p. 569).

* *Ctrbl. f. Chir.*, 1889, No. 13.

Methods which do not injure Bone. — Zuckerkandl * places the patient on the left side, and begins his incision at the tuberosity of the ilium and extends it along the left edge of the sacrum, slightly bowed toward the right, downward into the ischio-rectal space, where it ends midway between the anus and tuberosity of the ischium.

Wölfler † makes a somewhat similar incision, beginning on the right side of the sacrum, a little above the coccyx, one to two centimetres external to it, and extends it downward, with a slight concavity toward the right, to near the anus, and it ends at a point on the perinæum corresponding to the posterior commissure of the vulva. This incision keeps closer to the sacrum than Zuckerkandl's, and ends nearer the perinæum.

Lange ‡ advocates an operation which, in certain cases, may prove of great assistance in allowing the cut ends of the rectum to be united by circular suture. He makes his incision from one tuber ischii to the other, across the perinæum in front of the anus, and carries it deep enough to allow the whole muscular apparatus of the anus, with the lower segment of the rectum, to be pushed upward for two or three inches, so as to bring the cut ends of the gut into easy apposition. It is applicable in cases where the upper end of the rectum can not be easily brought down to the anal portion.

In cases of extirpation shall the cut end of the rectum be sutured to the skin? Many surgeons say it should not. Thus Cripps § says: "I consider that the risks of both peritonitis and cellulitis are greatly increased by the practice of drawing down and stitching the cut end of the bowel to the

* *Wien. klin. Woch.*, 1889, Nos. 14 to 18.

† *Ibid.*, Nos. 15 and 16.

‡ *N. Y. Med. Jour.*, 1891, p. 309.

§ *Brit. Med. Jour.*, October 12, 1889.

margin, for, owing to much bruised tissue, many ligatures, and the inevitable tension on the gut, primary union is most unlikely to occur." I can not agree with this view. It certainly seems to me a wise procedure to suture the rectum to the margins of the wound, and I think it should always be done. The faecal matter will thus be guided through its proper canal to its point of exit, whereas, if the gut be left *in situ*, it will have to work its way out for three inches through a funnel the walls of which consist of a raw surface recently made in cellular tissue where a certain amount of infection is liable to occur in spite of enforced constipation, gauze packing, or frequent antiseptic irrigation. If the rectum is properly loosened above—and it is most important that this should always be done—there ought to be but little tension on the sutures. Experience has shown that it is but seldom that recession of the rectum thus fastened takes place. Arnd* collected 110 cases where the gut was sutured to the skin, and out of these 9 died, a mortality of 8.18 per cent. In 17 cases where the gut was not sutured 3 died, a mortality of 18.6 per cent.; but he adds 18 other cases where the same result was brought about by tearing out of sutures and escape of faeces after circular suture with 4 deaths, which brings the mortality to 20 per cent.

When the peritoneal cavity has been freely opened, how shall the opening be occluded? Shall it be carefully closed by suture or shall the cavity be simply packed with antiseptic gauze without any attempt at suture? Some surgeons prefer the first, others the second plan. The results do not seem to differ to any great extent. The complete suturing consumes valuable time, and if blood or other secretions have been left within the cavity they can not escape, and therefore drainage is less perfect than if the cavity is left unsutured and gauze packed below to shut it off from

* *Deut. Zeitsch. f. Chir.*, Bd. 32, p. 1.

infection after the operation. If sutures are employed there is less danger, however, of after-infection. My own feeling is that the packing of the cavity with mild iodoform gauze is the safer method. Stierlin * has collected 26 cases where the peritonæum was sutured, with 20 recoveries, = 77 per cent., and 26 cases where no sutures were employed, with 16 recoveries, = 61·5 per cent.

Is it wise to take special pains to preserve the lower part of the rectum? Are the results as to mortality and freedom from recurrence as good when this is done? Is the functional result decidedly better? It is not easy to answer explicitly these questions. If the lower portion of the gut is left it is necessary to unite the two ends by circular suture. These sutures are apt to tear out and then no advantage has been gained. In fully one half the cases leakage has resulted, and then an artificial anus is established and the sphincters are useless. Thus in 5 cases of suture by Billroth, † leakage resulted in 3. Arnd ‡ collected 15 cases of circular suture, and in 8 of these the sutures tore out. More time is consumed in the operation when the circular suture is done, and, unless the functional result can be shown to be decidedly better, it seems to me that we should not be too anxious to preserve the lower part of the rectum. Heineke # thinks it better to remove the lower part of the rectum on account of the liability for the sutures to tear out and because of subsequent contraction. Von Bergmann || does not deem it important to save the sphincters in the sacral operation, as he has not much faith in the future usefulness of these muscles, and he considers that the patient's

* *Beiträge kl. Chir.*, 1888, p. 607.

† *Wien. kl. Wochensch.*, 1891, No. 34.

‡ *Loc. cit.*

Münch. med. Wochenschr., 1888, p. 37.

|| *Berl. kl. Wochensch.*, 1889, p. 193.

chances are better when a large open funnel is left. Kocher (Arnd) also thinks it doubtful if circular suture is advisable, as in his experience more cures have followed complete extirpation. Arnd in his most valuable and elaborate paper has collected 24 cases of radical cure, and in 14 of these extirpation (amputation) had been done, in 5 excision, and in 4 resection.

In Case IV, recorded above, by leaving the sphincter attached to the skin and joining it around the rectum at a second operation the dangers of the circular suture were avoided, and, as far as functional result is concerned, its advantages retained.

Rehn* advises the division of the operation into two stages. At the first operation he frees the diseased rectum and, packing it around with gauze, leaves it *in situ*. At the second operation, done ten days later, he removes the diseased portion and sutures the two ends together. He claims for his method less danger of shock, less danger of infection, and greater security for the circular suture.

In cases of extirpation is it better to cut through the rectum behind and insert the finger into the gut, or to ligate the lower end and remove it as a closed tube? The finger inside the gut may in some cases be of use as a guide, but, in my opinion, this advantage is more than counterbalanced by the danger of infection from the intestinal contents which are apt to escape over the wound, which is also liable to be infected by the contaminated finger and hand.

How shall infection be avoided after operation? One of the main dangers in this operation lies in the escape of faecal matter into the cellular tissue of the pelvis, resulting in a phlegmon which, in many cases, has ended fatally. Especially is this apt to be the case after circular suture. How can we avoid the possibility of this infection? To obviate

* *Arch. f. kl. Chir.*, 1891, p. 317.

this danger various plans have been proposed. Disinfection of the intestinal contents by drugs, such as naphthol, etc., has been tried, but without success. The most rational proposal, and one which in the hands of some surgeons has given satisfactory results, is the performance of a preliminary colotomy. By this plan the intestinal contents escape before they reach the rectum, or at least the greater portion finds exit at the opening in the loin. The disadvantages are that two additional operations are imposed on the patient, for the artificial anus must afterward be closed. Are the advantages to be gained equal to the additional risk of these two operations? In extirpation I certainly think not, and I do not consider in such cases that a colotomy is at all necessary, provided the gut is sutured to the skin. The space around the rectum can be sufficiently packed with gauze to prevent infection in the great majority of cases. On the other hand, where resection and circular suture have been done, it seems to me a very proper procedure. In the greater number of these cases the passage of fæces through the rectum has caused leakage, and has often resulted in infection of the cellular tissue. If the preliminary colotomy will prevent this occurrence it will certainly be a great gain. I do not feel that there is sufficient experience as yet to decide this point. The colotomy may be made either in the right or left inguinal region. If the descending colon be attached to the abdominal wall it is apt to interfere with the necessary descent of the gut at the time of the radical operation, whereas if the ascending colon be attached, a certain amount of fæcal matter will be liable to still find its way down through the rectum. Apart from the necessity of two additional operations, this procedure is therefore not without its disadvantages.

As has been stated in many cases, radical operation is not to be considered. When the cancer is so adherent to

surrounding parts that it will be impossible to completely remove it, then we must be content with palliative procedures. In cases, however, where we feel that there is a reasonable prospect that we can remove all the disease, what are the facts and reasons which should influence us in our decision between colotomy and excision? There can be no doubt but that colotomy is the safer operation of the two, so far as the death rate is concerned, and were there in either case no prospects of cure or of long immunity from disease, then beyond question it should always be preferred to excision. Such, however, is not the case. On the one side stands an operation which, while affording no chance of permanent cure, prolongs life and makes that life a comparatively comfortable one. On the other side stands an operation which, while attended by greater danger, offers on the average a greater prolongation of life and perhaps less suffering, and in a few cases effects a permanent cure. The mortality of the radical operation is considerable—about twenty per cent.—but are we not justified in taking this large risk when we consider the disease which we seek to defeat? We are not dealing with a benign disease, but with one which can end only in a terrible death. Were the prospects of cure even less than they are, it seems to me that we would still be justified in performing the radical operation, for many patients have been given years of a comfortable existence before the relapse comes, and, even after the disease returns, the suffering is less intense than it would have been had the original trouble in the rectum been left undisturbed.

The premises on which this comparison is based are: (a) Excision is the more dangerous operation; (b) excision radically cures a certain number of cases; (c) excision affords greater prolongation of life; (d) excision may be repeated a second and third time and yet result in cure; (e)

excision affords greater relief to the patient even when relapse occurs.

Are these premises correct ?

First, the mortality. Different operators report as follows :

REPORTER.	OPERATOR.	REFERENCE.	Number of operations.	Deaths.	Mortality.	Excluding complications.
Hildebrand...	Göttingen clinic...	<i>Deut. Zeitsch. f. Chir.</i> , Bd. xxvii, p. 329.	57	20	35	24·5
Arnd.....	Kocher's clinic...	<i>Deut. Zeitsch. f. Chir.</i> , Bd. xxxii, p. 1.	35	10	28·5	14·29
König.....	König....	<i>Centralbl. f. Chir.</i> , Beilage 24, 1888.	60	14	24	....
Bardenheuer..	Bardenheuer.	<i>Centralbl. f. Chir.</i> , Beilage 24, 1888.	13	2	15·5	....
Küster.....	Küster.....	<i>Berl. klin. Wochenschr.</i> , 1889, p. 193.	16	2	12·5	....
Billroth.....	Billroth.....	<i>Wien. klin. Wochenschr.</i> , 1891, No. 31.	13	2	15·5	....
Krönlein.....	.....	<i>Correspondenzbl. f. Schweiz. Aerzte</i> , Jan. 15, 1881.	21	2	9·5	....
Bloch.....	.....	<i>Centralbl. f. Chir.</i> , 1892, p. 65.	9	2	22·2	....
Rehn.....	Rehn.....	<i>Arch. f. klin. Chir.</i> , 1891, p. 317.	7	3	42·8	....
Arnd.....	Genzmer....	<i>Deut. Zeitsch. f. Chir.</i> , Bd. xxxii, p. 1.	17	4	23·3	11·6
Arnd.....	Kraske.....	<i>Deut. Zeitsch. f. Chir.</i> , Bd. xxxii, p. 1.	10	4	40	....
Arnd.....	V. Wahl....	<i>Deut. Zeitsch. f. Chir.</i> , Bd. xxxii, p. 1.	18	3	16·5	11·11
Arnd.....	Czerny.....	<i>Deut. Zeitsch. f. Chir.</i> , Bd. xxxii, p. 1.	25	1	4	....
Schwider.....	Bergmann..	.....	46	5	11·3	6·25
Hochenegg...	Albert.....	Thorndyke, in <i>Bost. Med. and Surg. Jour.</i> , vol. cxxix, p. 453.	55	6	10·9	....
Cripps.....	Cripps.....	<i>Brit. Med. Jour.</i> , 1889, Oct. 12.	30	2	7	....
Kelsey.....	Kelsey.....	<i>Stricture of the Rectum</i> , second edition, p. 47.	7	2	28·5	....
Total.....	.....	.....	439	84	19·1	....

The number of operations recorded above is 439, with 84 deaths, which gives a mortality of 19·1 per cent. No attempt has been made to collect all reported cases, but the results of several prominent operators, who have reported a series of cases, have been simply tabulated. Arnd collected 230 cases of operation, and estimated the mortality at 12·17

per cent. Welhaminow, from 335 cases, gives a mortality of 20·5 per cent. Esmarch estimates it at 20 per cent.; König, at 16 per cent.; Bardenheuer, at 10 per cent. Thorndyke computes the mortality in 88 operations by the sacral method at 14·7 per cent.; Iversen,* in 80 cases by the same method, at 25 per cent. The difference in these estimates is caused by the diversity of method of different reporters, some of whom reckon only such deaths as are caused by shock, while others include all deaths which are due directly or indirectly to the operation. The death-rate of English operators is somewhat less than that of German surgeons; but this is due to the fact that the English are much more conservative in their selection of operative cases. Thus Cripps states that only from 15 to 20 per cent. of cases are suitable for operation, while among German surgeons about 75 per cent. of all cases submit to radical operation.

It is difficult to compare this death-rate with that of colotomy, because the cases on which this latter operation is performed are, as a rule, in a much more desperate condition. The mortality, however, in cases of an equal gravity can not be more than half as great as that of the radical operation.

Second. Is a permanent cure effected, and, if so, in what proportion of cases? It is difficult to affirm that a patient is cured after operation for cancer in any organ. The period of exemption may be a long one. Most writers consider that immunity for three or four years makes the probability of a relapse so small that the great majority of such cases may be declared as permanently cured. If we take a period of four years after operation as our standard, how many patients do we find perfectly free from disease at this time?

* *Trans. of the Internat. Med. Congress, Berlin, 1890.*

Kocher	reports	9 cases out of	35 operations.
Bardenheuer	"	3 " "	45 "
Hildebrand	"	3 " "	57 "
Czerny	"	3 " "	45 "
König	"	3 " "	60 "
Krönlein	"	3 " "	22 "
V. Wahl	"	2 " "	18 "
Von Bergmann	"	3 " "	46 "
Genzmer	"	1 " "	17 "
Cripps	"	2 " "	30 "

Total 32 cases out of 375 operations.

This means that out of 375 patients operated on by excision, 32 were perfectly well at the end of four years. In almost all of these cases the diagnosis had been confirmed by the microscope. This proportion of permanent cures is comparatively correct. While a few of these patients may at a later period suffer from a relapse, yet out of these 375 cases a certain additional number will be cured, for many have not been operated on as long as four years ago, and therefore, while quite well at the time of report, could not be included in the number of cured. These will certainly equal, and probably exceed, the number of patients relapsing after the expiration of four years, so we may consider the figure of 11 per cent. as approximately correct. While this is not so favorable a result as is obtained after excision of the mamma or uterus, yet it certainly gives us some encouragement to persevere in our efforts to perfect the radical operation.

Many of the cases reported as cured were alive and well long after the expiration of four years. Kocher has five patients who were perfectly well more than nine years after operation, one having lived sixteen years and a half. Czerny reports a case perfectly well at the end of twelve

years after operation when he excised more than five inches of the rectum. We may, therefore, say that our second premise is correct.

Third. Excision affords greater prolongation of life than does colotomy in cases where relapse occurs. Arnd reports from Kocher's 35 cases 4 patients who lived more than three years, 2 of them having lived more than five years. Hildebrand reports out of 57 operations 2 patients alive after four years, and 5 alive after two years. König reports 4 cases alive after three years. Volkmann reports 5 cases alive after three years. Almost every operator reports a certain number of patients who live from three to five years after operation and then die from a relapse. Stierlin has reckoned the average duration of life after the radical operation as 43 months, after colotomy 28·8 months. This is a longer life than is usually granted by most surgeons.

Fourth. A cure may yet result even where for repeated relapses a second and third operation has been performed on the same patient. A typical excision has been done, a relapse occurs; after several months' interval a second operation is done, followed by a third relapse and third operation, and yet a cure finally results. Thus Arnd reports a patient who had four relapses and five operations, and who was well at the end of thirty-nine months after his last operation (ninety-one months after the first excision). Turner, Volkmann, and Sihle have each reported a patient where, after three operations (two for relapses), permanent cure resulted. These and other writers have reported a number of cases where, after the second operation, for return of the growth, cure has resulted, as proved by the good health of the patients at the expiration of from five to eight years.

Fifth. Excision affords greater relief than does coloto-

my in cases where the cancer returns. The recurrence is generally external to the rectum, in the glands and cellular tissue of the pelvis, and therefore ulceration of the mucous membrane is less liable to occur and constriction of the caliber of the gut is less apt to result. More than this, many nerves must have been divided at the original operation, and, in consequence, the tissues are less sensitive than they otherwise would have been.

One point remains to be considered, and it is difficult to form any definite conclusions in regard to it: Are the functional results after excision better than after colotomy? What is the local condition as regards function in those patients whose rectum has been excised? What control do they have over the bowel movements? Have they absolute control (continence), or only partial control (relative continence), or is all control absent (incontinence), or does a stenosis exist?

Hildebrand * followed 4 cases of extirpation; there was incontinence in 3, stenosis in 1. König † has been able to follow 21 cases after operation; of these, 6 had so much control over their bowels that they were not annoyed by incontinence; 15 had so little control that they were made uncomfortable by the incontinence. Out of 4 cases of extirpation, there was complete incontinence in 3, stenosis in 1. In 17 cases of resection there was complete continence in 6, incomplete continence in 9, and stenosis in 2.

Out of 36 cases operated on by Cripps, ‡ in only 7 was there incontinence, while in 6 there was relative continence, and in the remainder (23) there was complete continence.

It may be stated, I think, as regards functional results, that, while the anus is situated in the natural position, yet

* *Loc. cit.*

† *Loc. cit.*

‡ Butlin. *Surg. Malignant Dis.*, p. 245.

the control over the rectum is no better than is obtained after colotomy.

While many of the assertions which have been made in the above article, especially as to the operative technique, are largely matters of opinion, yet I think the following conclusions can be reached and are approximately correct :

1. The mortality of the operation is about nineteen per cent.
2. Cases can be successfully operated on when the disease extends higher than the peritoneal attachment.
3. Certain patients are permanently cured, probably about eleven per cent. of all cases operated on.
4. In patients who have a recurrence of the disease, excision gives a longer life and a more comfortable one than does colotomy.



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