

Sexual Potency Following Surgery for Rectal Carcinoma

A Followup of 44 Patients

MANDEL WEINSTEIN, M.D.,* MORTON ROBERTS, M.D.†

*From the Surgical Service of the Boulevard Hospital,
Astoria, New York*

Of 157 patients operated upon for cancer of the rectum within the last 10 years, 44 were available for a followup study of sexual potency. After the anterior resection operation, sexual function for both men and women remained practically unchanged. Following the abdominoperineal operation, where the entire rectum was extirpated, the results differed for men and women. Sexual function in men was completely destroyed, but women were capable of continuing sexual enjoyment as before the operation. Anterior resection in both sexes, i.e., leaving 6 cm of the distal rectum, does not destroy nerve fibers or other structures vital to continuing normal sex activity. However, the abdominoperineal operation in men destroys the important parasympathetic fibers to the male genital system and renders the patient impotent. In women, the abdominoperineal operation for cancer spares most of the nerve supply, especially the important pudendal nerve, thus permitting the patient to continue sexual activity as before surgery.

UNTIL RECENTLY, in the course of evaluating the results in patients after operations for cancer of the rectum, the tendency has been to emphasize the anatomic, functional and bowel hygiene aspects of the patient's condition. Most of the return visit has been occupied with questions and explanations concerning the patient's intestinal and urinary systems. Rarely have more personal questions been raised, such as, have there been any changes in the patient's psychologic or social conditions? However, only accidentally did we become aware of any changes in their sexual life when several men thanked us for preserving their sexual ability, which, they boasted, remained the same as before the surgery. Obviously, it had

never occurred to us to inquire into this area of their daily lives because of the seriousness of the surgical pathology, the extent of the operation, and the advanced age of most of the patients.

Since statistics show that people are living longer, and that studies of older people indicate that sexual function is not only possible but can contribute to continued enjoyment and good health, we decided to inquire into this facet of the lives of all patients who would return for followup examination. From our results in interviewing patients after rectal excisional cancer surgery, we are now of the opinion that in addition to planning an operation that will completely eradicate the disease, it behooves us to consider the feasibility of preserving a patient's sexual potency.

From our recent statistical followup we can now predict with a fair amount of accuracy, whether it will be possible to perform a type of operation that will permit the patient to retain the sexual life enjoyed prior to the surgery. Since we have found this subject of more importance to men, usually the more aggressive partners in the sexual act, the preoperative assurance to many patients of continued sexual life lessens the mental trauma of the impending operation. As will be developed later, in men, sexual potency is totally absent where the operation results in complete removal of the rectum. In these patients, sex after the operation was never a topic for discussion before surgery; in many cases impotence, when it occurred, was a keen disappointment. In contradistinction, most elderly women, after the abdominoperineal operation for rectal cancer, exhibited practically no desire to attempt intercourse.

With this new awareness of an undisturbed or almost normal postoperative sexual life in many patients following rectal cancer surgery, we thought

Submitted for publication May 18, 1976.

* Consulting Surgeon Peninsula Hospital Center, Far Rockaway, New York. Director of Surgery, Boulevard Hospital, Astoria, New York. Formerly Instructor of Surgery, N.Y. University Medical Center, N.Y.C., Attending Thoracic Surgeon, Sea View Hospital, Staten Island, New York, Associate Surgeon, St. John's Elmhurst Hospital, Elmhurst, New York.

† Associate Surgeon, City Hospital Center, (Mount Sinai Hospital Services) Elmhurst, New York and Assistant Director of Surgery, Boulevard Hospital, Astoria, New York.

it worthwhile to recall every patient who had been operated upon during the past 10 years. Beyond this period, our efforts to contact patients were usually unsuccessful. Our investigation included only the two most common operations for rectal carcinoma: the anterior resection, or more limited rectal resection, and the very radical abdominoperineal operation. Unfortunately, even though the number of patients operated upon was fairly large, (157) the group for a thorough followup study was only 44. Most patients were operated upon at an advanced age, the average being 70 years old. Some were no longer alive because of the high morbidity and mortality following such major surgery. Many expired from serious medical and neurologic illnesses. A number were without marital partners for many years. Nursing homes, situated in distant geographical regions, cared for many postoperative patients who were therefore unsuitable for followup. The further back we went in calendar years, the fewer the survivors. However, a thorough study of the surgical anatomy and physiology of the systems involved, has strongly corroborated the followup clinical findings of the patients examined.

The first important finding was that in the anterior rectal resection operation, where the distal rectum was left intact following the removal of the malignant tumor, in both men and women sexual life was uninterrupted. However, when the tumor was situated low down near the anus, and required an abdominoperineal operation that included removal of the entire rectum with sphincters, and lymphatics, all men were impotent. By contrast, the few women we were able to interview following the same radical procedure, stated that it was possible to resume their sexual life in almost the same manner as before the operation. Of course, the presence of the permanent colostomy, and the postoperative condition of the perineum from where the rectum was extirpated, did cause them some concern at first.

Ever since frequent pathologic studies have demonstrated that cancer disease spreads laterally by way of the pelvic lymphatics, and not distally along the rectum toward the anus, most gastrointestinal surgeons now perform fewer total rectal resections with permanent colostomy. Since all studies indicate that the percentage of five-year recoveries is at least as good with the anterior resection operation, every effort is being made to avoid complete removal of the rectum. With increasing experience, it is possible to perform many more anterior rectal resections, as one becomes accustomed to working in the deep confines of the bony pelvis. The use of the intestinal retractor has been found to be helpful, by giving better exposure

for low lying tumors.¹¹ In our own postoperative series, a smaller proportion of abdominoperineal operations has been evident in recent years.

At this point it must be emphasized that the abdominoperineal operation herewith reported presupposes a wide excision of the entire rectum with its mesentery and surrounding lymphatic tissues. Most of the reports in the medical literature that document only occasional cases of sexual dysfunction following abdominoperineal operations are based upon proctocolectomies for ulcerative colitis.^{4,5,8,9} This type of operation makes it possible to effect only minimal nerve damage. The mesentery is divided close to the rectum. By dissecting close to the bowel wall, lateral mobilization in the area of the middle hemorrhoidal vessels is avoided. The inferior mesenteric vessels are ligated as close to the bowel as possible, so that the fatty tissue overlying the sacral promontory and hollow of the sacrum is not violated. Also, in the perineal stage, wide lateral dissection of the levator ani muscles is avoided. The reported patients with ulcerative colitis who retained sexual function after the abdominoperineal operations were men and women in the younger age group. Criteria for sexual potency for men were often based by the authors upon "fathering children," and for women their "successful efforts to become pregnant."³ In our followup evaluation, we considered a man potent only if he could obtain a full erection, followed by orgasm, emission, and ejaculation. For a woman, childbearing, as a proof of sexual response, cannot be accepted. The recent successes of artificial insemination confirm this as being unrelated to any sexual activity. None of our patients was of the childbearing age, and all who attempted intercourse reported the same orgasmic sensations as before their operations.

Before presenting a detailed followup study of recovered rectal cancer patients whom we personally interviewed and examined, an attempt will be made to correlate the postoperative clinical findings with the altered surgical anatomy and physiology of the male and female genital systems.

Surgical Anatomy

The explanations for the completely different sexual responses following the entire removal of the rectum for cancer (abdominoperineal) as compared with continued sexual activity after the removal of only the proximal portion (anterior resection) can be explained in great part by studying the relationship of the rectum to the surrounding structures of the pelvis, and the nerve supply of the genital system (Figs. 1 and 2). In addition, such a study reveals why, unlike

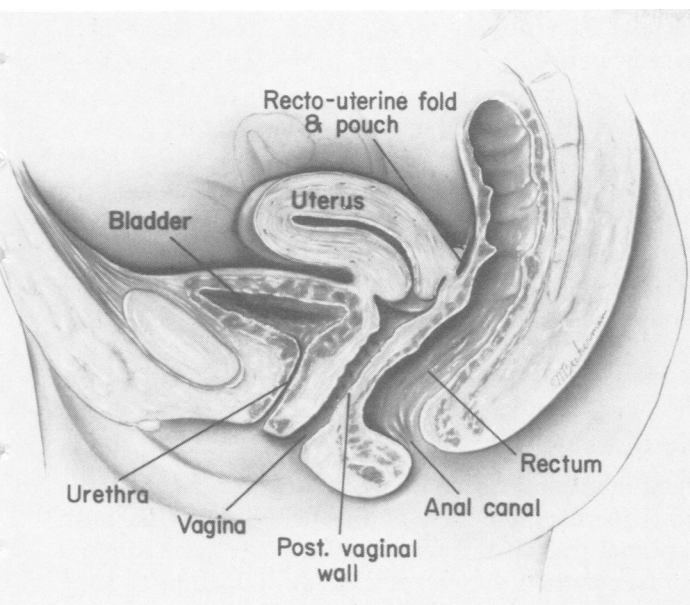


FIG. 1. Median sagittal section of female pelvis. Essential female genitalia not in relation to upper or lower halves of rectum.

men, women with the entire rectum missing may retain the ability to effect an orgasmic response. The essential female pelvic genital apparatus (clitoris, labia, urethra, and anterior vaginal wall) is located at a distance from where the extensive dissection took place in the pelvis to remove the rectum. The rectum is located in the sacrococcygeal hollow of the pelvis, 12.5 to 15.0 cm long, and attached in front of the spine by loose fibrous tissue. Below the peritoneal reflection, the distal portion has no mesentery and is thoroughly immobilized. The upper part of the rectum has a mesentery and is movable. Posteriorly and laterally, it is in relation with the superior hemorrhoidal vessels, the piriformis muscle, and the sacral plexus of nerves. The latter separate it from the pelvic surfaces of the sacral vertebrae. In its lower part posteriorly it lies directly on the sacrum, coccyx, and levator ani muscles, with only a dense fascia intervening.

Anteriorly, in women, lie the uterus with its appendages. Also, there are some convolutions of the small intestine, and occasionally the sigmoid colon. Below and in front, the rectum is bound to the posterior wall of the vagina by a thin layer of fibrous tissue. In men, unlike women, the anterior rectal wall is intimately adherent to many of the actively functioning organs of the genitourinary system. These are, from above downward, the triangular portion of the fundus of the bladder, the seminal vesicles, and the deferential ducts. More anteriorly is the prostate with the ejaculatory ducts, and the urethra.

Since in the anterior resection operation for both

sexes, the dissection never reaches below the top of the bladder, or further than the pelvic diaphragm, serious trauma to any of the vital organs of the genitourinary system rarely occurs. If mobilization extends to a greater depth, as for small tumors in the middle third of the rectum, in men, the top of the prostate and the seminal vesicles can be gently pushed forward in a bloodless manner.⁶ In women, the posterior vaginal wall can be separated without any postoperative effect. However, according to our followup study, if the entire rectum is removed, as in the abdominoperineal operation of Miles, or in our abdominoperineal modification, unlike women, all men are totally impotent.¹⁰

Nerve Supply

In humans, the three major components of the nervous system involved with sexual function are: cerebrospinal, sympathetic, and parasympathetic. All are important participants, but locally in the pelvis, the parasympathetic has the greatest role (Fig. 3). The pelvic parasympathetic is part of the craniosacral portion of the autonomic nervous system. It contains visceral afferent fibers that originate in the second, third, and fourth segments of the sacral portion of the spinal cord.⁷ To make clear the status of the genital system following the two most frequent operations for cancer of the rectum, the pelvic nerves will be reviewed as to their origin, location, and distribution.

The pelvic plexus of the autonomic system is formed by the hypogastric plexus, by rami from the

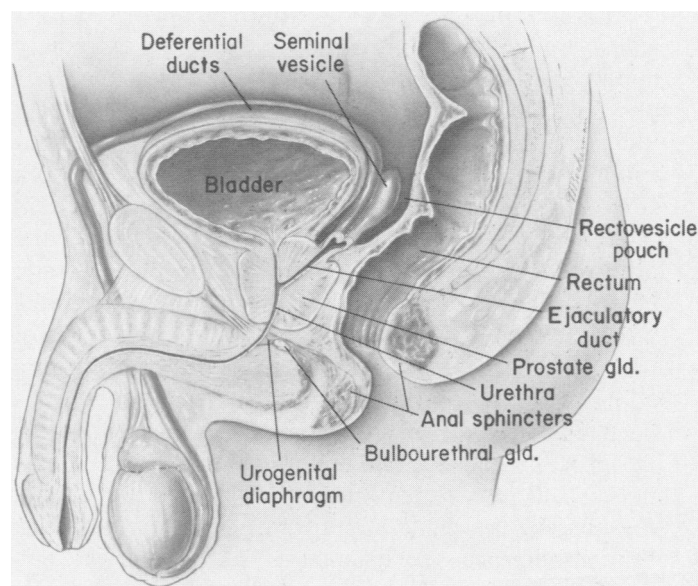


FIG. 2. Median sagittal section of male pelvis. Important genital organs in close relation only to lower half of rectum.

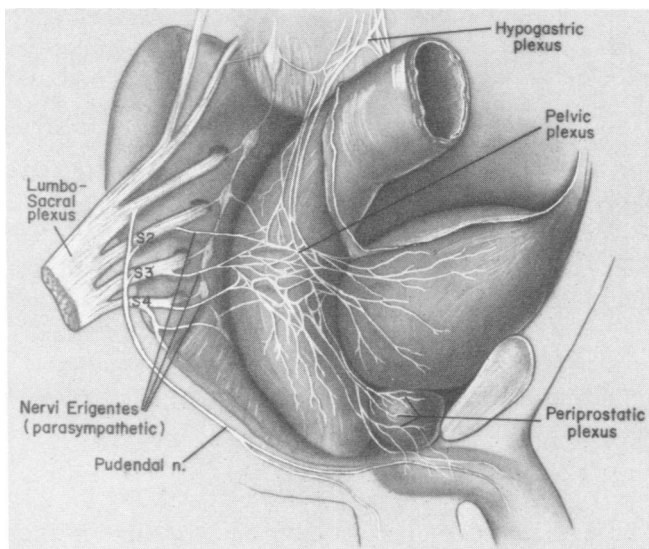


FIG. 3. Nerve supply of male pelvis: note vulnerability of nervi erigentes (parasympathetic) but not pudendal nerves in total radical extirpation of rectum.

sacral portion of the sympathetic chain, and by the visceral branches of the above mentioned second, third, and fourth sacral nerves. Through secondary plexuses, branches are distributed to all the pelvic viscera. The nervi erigentes of the parasympathetic plexus, (multiple in humans, but singular in experimental animals), originate by fibers from the second, third, and fourth sacral nerves. These join with the inferior hypogastric nerves from the sympathetic, and form the pelvic plexus. The latter is located between the rectum and posterolateral part of the bladder. It gives rise to the periprostatic plexus, an extremely important subdivision. Most of the fibers of the periprostatic plexus are made up of nerve elements from the nervi erigentes, while a lesser number are contributed by the inferior hypogastric nerves. In both sexes, the nervi erigentes innervate and cause a dilatation of the pudendal artery, as well as of the arteries of the corpora cavernosa. The periprostatic plexus distributes fibers to the prostate, seminal vesicles, corpora cavernosa, and the terminal parts of the vas deferens. The nerves supplying the corpora consist of two sets, the greater and lesser cavernous nerves. These arise from the anterior part of the periprostatic plexus, join the branches of the pudendal nerve, and pass beneath the pubic arch. Filaments at the base of the gland supply the prostatic and membranous urethra, the ejaculatory ducts, and the bulbourethral glands. From the greater cavernous nerve, branches pass to the dorsum of the penis, join the dorsal nerve of the penis, and are distributed to the

corpus cavernosum penis. The lesser cavernous nerves perforate the fibrous covering of the penis near its root, and are distributed to the corpus cavernosum urethrae, and the penile urethra.

The pudendal nerves, with their somatic components (motor and sensory) are distributed to the external sphincter of the bladder in men and women. They also supply sensory perception to the pelvis and perineum in both sexes, and motor activity to the striated muscles of the pelvic floor (levator ani).

Physiology

For both sexes, active sexual function depends upon increased vascularity resulting in pelvic congestion. In men, erection of the penis plays the most essential role. It results chiefly from visceral afferent parasympathetic impulses causing dilatation and engorgement of the penile vessels and venous sinuses. The tumefaction of the penis is accounted for by distention of the three corpora with blood. The blood flows into the corpora by way of the internal pudendal and dorsal arteries. The flow into these spaces may reach pressures approximating that in the carotid arteries. Psychic stimulation may produce the act of erection, but this may also take place purely as a sacral reflex arc. \bar{S}_2 , \bar{S}_3 and \bar{S}_4 send impulses through the pelvic nerves (nervi erigentes) and pudendal nerve. The former carry parasympathetic impulses responsible for active dilatation of the arteries, whereas the pudendal nerve causes contraction of the bulbo and ischiocavernosus muscles. Also, skin sensory fibers of the penis are carried over the pudendal nerve to complete the arc.^{1,2}

In contrast, for women to function sexually, the higher cerebral sex centers and the peripheral sensory nerve stimuli in the perineum and pelvic region are more important. In women, most sensory stimuli traverse the pudendal nerves, whose fibers are mostly sensory. Thus these stimuli reach the brain where they are integrated in the sexual centers. The pudendal nerves are situated close to the periosteum of the pelvic bones, covered and protected by a thick layer of endopelvic fascia.

In comparing the genital systems of the two sexes, one can readily observe that in the pelvis, the male genital system is larger, more complex, and therefore much richer in nerve supply. The proximity to the lower rectum of the important male genital organs within the pelvis creates serious irreversible sexual incompetencies if the entire rectum must be removed.

In men, the inviolability of parasympathetic fibers is essential for sexual activity. Erection of the penis cannot occur if the nerve erigentes (parasympathetic)

are severed, or their essential branches totally defunctionalized, as in radical removal of the distal rectum for cancer. These vulnerable nerve fibers lie below the peritoneal reflection on either side of the rectum, and in close proximity to it and the middle hemorrhoidal vessels.

In the anterior rectal resection operation for cancer, for both men and women, at least 6 cm of distal rectum remains behind untraumatized in the deep pelvis, available for the anastomosis. In the limited rectal dissection that takes place here in the upper level of the pelvis, no large important nerve fibers of the pelvic plexus are severed or destroyed. Thus, no changes have taken place that would prevent the pelvic congestion mechanism essential for sexual activity. From the foregoing surgical anatomy and physiology, one can assure men and women before operation that no marked sexual deficiencies will result if it is possible to perform an anterior resection operation to remove their tumor.

However, after the abdominoperineal procedure for cancer, with complete extirpation of the rectum, unlike women, men are completely impotent. The parasympathetic fibers at the pelvic plexus side, coming from the second, third, and fourth sacral nerves and going to the periprostatic plexus, corpora cavernosa, and seminal vesicles, are totally destroyed. The following stages that would ordinarily result in a complete sex act fail to occur: erection, orgasm, emission, ejaculation, and detumescence.

In women, since sexual enjoyment depends locally in great part upon the intact somatic pudendal nerve and its afferent sensory nerve fibers, an active sexual life with orgasm may be resumed after the abdominoperineal operation. Fortunately, as was stated previously, the pudendal nerve is well protected even if the entire rectum is removed. Therefore, unlike men after the abdominoperineal operation, sexual stimuli will continue to be sent uninterruptedly proximally to the brain where they are integrated into the sex centers.

Results

Table 1 summarizes the results of our followup. In our questioning, the genital system and the status of intercourse was the last subject reviewed. It was obvious that, particularly in women, considerable tact was necessary. In men, the criteria for successful intercourse were erection, emission, and ejaculation. In women, since the whole subject of orgasm in successful intercourse is still controversial, we relied upon the production of sudden extremely pleasurable sensations, utilizing the terms orgasm, and orgas-

TABLE 1. *Sexual Intercourse Following Rectal Cancer Surgery (44 Cases)*

Type of Operation	Anterior Resection		Abdominoperineal	
	Male	Female	Male	Female
Number examined	11	13	13	7
Successful intercourse	8	4	0	3
Unsuccessful intercourse (impotent)	2*	0	12	0
No attempt	1	9	1	4
Average age at followup	66	69	67	70

* Both had prostatectomies.

mic-like sensations. In essence, if their sexual experience was the same as prior to the rectal surgery, we considered their sexual function positive.

The total number of patients suitable for a radical rectal resection operation for cancer in the last 10 years was 157; 60 (38%) were men, 96 (62%) were women. The average age at operation of all 157 patients was 70 years.

For the present study, only 44 (28%) were available. Their average age at followup was 73 years. Men numbered 24 (54%), women 20 (45%). Four patients were interviewed satisfactorily by telephone; their current ages 92 (blind), 66, 88, and 79.

Anterior Resection Patients

All men and women who attempted sexual intercourse found no change in sexual activity following anterior resection for rectal cancer. The average age of men who had successful intercourse was 66 years; the average age of women was 69 years. The two oldest survivors were men, 79 and 89 years old. The older man had fairly normal intercourse for 6 years following the anterior resection. However, in May 1975, he underwent a retropubic prostatectomy with bilateral vasectomy. Since then he has become impotent. The 79-year-old patient had a prostatectomy 5 years before the excision of the cancer tumor, but this operation did not affect sexual intercourse before or after the anterior resection.

Abdominoperineal Operations

After this type of rectal cancer excisional surgery, with removal of the entire rectum and a permanent colostomy, all 12 men who attempted intercourse failed to obtain an erection and are completely impotent. Many expressed considerable disappointment and showed varying degrees of psychologic trauma.

The three recovered women, after removal of the entire rectum, although few in number, presented a

completely different result from the men. One was 62 years old at the time of examination, and only 54 years old at the time of her abdominoperineal resection. She attempted intercourse with her husband 6 months after operation and was successful in attaining orgasm. The second was 63 years old at the recent followup and operated upon a year before. She was successful in enjoying intercourse 6 months after the operation. The third patient was 68 years old at the time of her followup examination. Since we limited our study to patients operated upon within the last 10 years, her appearance was unexpected. She recovered from an abdominoperineal operation performed twenty-three years previously at the age of forty-five. Her current visit was for an unrelated condition. When questioned, she stated that in spite of living all those years with a permanent colostomy, she experienced successful intercourse, until the death of her husband.

The ability to enjoy sexual intercourse with orgasm confirms the anatomic and physiologic genital differences of both sexes as previously presented. No women besides these three attempted sexual activity after the abdominoperineal operation. They were women in an advanced age group without marital partners, and totally disinterested in sex.

Since modern medicine is becoming increasingly concerned with the psychological and social problems of older people, we suggest additional followup studies such as ours.

References

1. Bernstein, W. C. and Long, D. M.: Is Sexual Dysfunction Following Radical Surgery for Cancer of the Rectum and Sigmoid Colon a Justifiable Complication? *Proc. R. Soc. Med.*, (Suppl.) 52:77.
2. Campbell, M. F. and Harrison, J. H.: *Urology*, Vol. 1., Philadelphia, W. B. Saunders Co., 1970; pp. 190, 191.
3. Davis, L. P. and Jelenko, C.: Sexual Function after Abdominoperineal Resection. *South. Med. J.*, 68:4:422, 1975.
4. Dennis, C. and Karlson, K. E.: Surgical Measures as Supplements to the Management of Idiopathic Ulcerative Colitis. *Surgery*, 32:892, 1952.
5. Donovan, M. J. and O'Hara, M. D., *N. Engl. J. Med.*, 262:719, 1960.
6. Garlock, J. H.: *Surgery of the Alimentary Tract*, New York, Merideth Corp., 1967; p. 479.
7. Gray, H. and Goss, C. M.: *Anatomy of the Human Body*, Philadelphia, Lea and Febiger, 1956; p. 1089.
8. May, R. E.: Sexual Dysfunction after Rectal Excision., *Br. J. Surg.*, 53:1:29, 1966.
9. Stahlgreen, L. H. and Ferguson, L. K.: *N. Engl. J. Med.*, 259: 873, 1958.
10. Weinstein, M. and Roberts, M.: The Perineoabdominal Operation for Cancer of the Rectum. *A. M. A. Arch. Surg.* 72:691, 1956.
11. Weinstein, M.: New Method of Abdominal Retraction. *Arch. Surg.* 98:633, 1966.