

Section of Proctology

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[May 9, 1951]

DISCUSSION ON UROLOGICAL COMPLICATIONS OF EXCISION OF THE RECTUM

Mr. D. Innes Williams: Any radical operation for rectal carcinoma involves an alteration in the anatomy of the pelvis simply through a displacement of the parts. In the male the whole of the prostatic urethra drops back with the bladder from the fixed point of the perineal membrane, and the natural urethral curves are lost.

On cystoscopy there is an unusual degree of visibility in the posterior urethra. The explanation of this abnormal visibility lies simply in the displacement of the parts (Fig. 1).

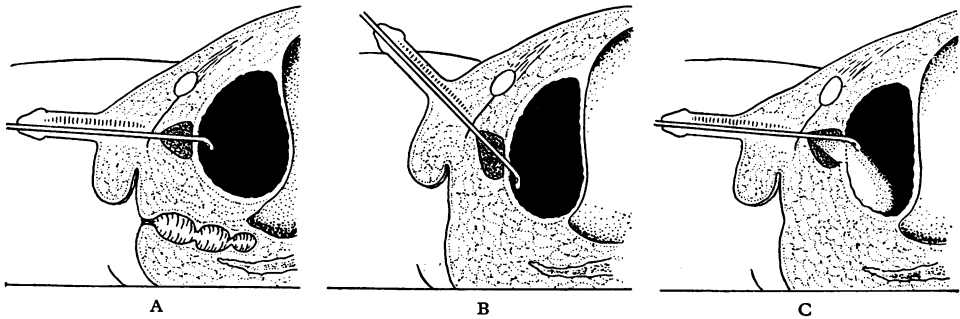


FIG. 1, A.—Cystoscopy before and, B, C.—after excision of the rectum.
For explanation see text.

(A) shows a normal cystoscopy. The field is obliterated when the lens comes in contact with the urethral wall; (B) and (C) show cystoscopy after excision of the rectum. It is found that if the instrument is held at 60 degrees to the horizontal (B), that is to say at the natural inclination of the prostatic urethra in the post-operative case, the field is again obliterated at the level of the internal meatus, but if the eyepiece is depressed into the normal position for cystoscopy (C) the beak of the instrument prises open the urethra and allows a clear view of its walls.

There is nothing in this alteration of anatomy which could constitute a hindrance to the urinary outflow in the erect position, but the recumbent patient is at a disadvantage compared with the normal in having to eject his urine almost vertically upwards from the bladder.

The cystoscopic findings which I have described were altered by two factors: prostatic enlargement and lesions of the pelvic nerve. Where there was moderate or marked hypertrophy of the prostate, no post-operative visibility of the urethra was observed, presumably because the hypertrophied gland was too rigid to be prised open.

In the pelvic nerve lesions the bladder neck is relaxed and the posterior urethra constantly filled. At cystoscopy the lip of the internal meatus is found to be smoothed out. The symptoms of major nerve injury are characteristic and well defined.

In the first stage there is complete retention, when the catheter is withdrawn after operation no urine is passed; the bladder becomes progressively distended and if allowed overflow incontinence occurs. After a variable period micturition is established, by straining of the abdominal muscles. The residual urine is at this time large and heavily infected, but over the course of months its volume diminishes. In this second stage the patients are incontinent by day and night; when the residual has fallen to a negligible volume in the third stage, incontinence remains but is chiefly nocturnal.

The diagnosis can be confirmed by cystometry. The bladder is of moderate or large capacity and the pressure within it rises steadily with increasing volume unaccompanied by any true sensation of bladder distension. The phase of isotonic filling seen in the normal bladder is either absent or very short.

The mechanism of incontinence in the pelvic nerve syndrome is of some interest, since it might be supposed that the external sphincter, whose nerve supply is unlikely to be damaged, would be able to maintain control. The displacement of the posterior urethra, however, must stretch the upper fibres of the sphincter, which will no longer lie at right angles to the lumen, and is therefore at a mechanical disadvantage for sphincteric action. This factor, together with the loss of the levator ani and a straightening of the normal curve, must entail a considerable diminution of urethral resistance. If the internal sphincter is damaged as well there will clearly be a real risk of incontinence. But it is only when a failure of the normal tone mechanism of the detrusor is combined with the sphincter disturbance, as in the pelvic nerve syndrome, that incontinence becomes the rule. The detrusor does not then relax in the normal way to accommodate an increasing volume, and the pressure is soon sufficient to overcome the weakened urethral resistance. The gradual recovery of control has appeared in our patients to be due to voluntary effort. The persistence of nocturnal incontinence may be attributed to the relaxation of voluntary muscles during sleep.

Mr. P. C. Watson: In 50 males undergoing synchronous combined excision (S.C.E.) the incidence of retention of urine was noted on removal of the routine indwelling catheter two to four days after operation. 21 had no retention, the residual urine being 150 c.c. or less within twenty-four hours of removal of the catheter: the remaining 29, just over half, developed some degree of retention, 16 of them having a residual urine of more than 150 c.c. on the tenth post-operative day. If these 16 cases are now considered, the following factors appeared important in the aetiology.

Poor physique and poor general condition in old men—5 cases.

The recumbent patient after combined excision has to micturate almost vertically upwards. Obviously a greater intravesical pressure is required and can be achieved either by reserves of bladder muscle which are absent in the elderly, or by voluntary abdominal straining which old and ill patients are unable to manage or disinclined to try.

It is worth noting that in none of these patients was there evidence of an obstructive factor.

Postural difficulty—2 cases.

Both patients said that they had never been successful in micturating when recumbent and both had post-operative retention until ambulant. This postural factor is interesting but is not of course peculiar to rectal operations. It has an obvious bearing on post-operative care and is therefore worth eliciting.

There are other inhibitory factors. Loss of the levator ani must be considered because micturition is normally initiated by voluntary relaxation of the perineal musculature—so, too, must the effect of painful wounds in the abdomen and perineum—but none of these factors has appeared to us to play a significant part.

Prostatic enlargement—7 cases.

Particular care was taken to evaluate the size and obstructive significance of the gland, but any such evaluation must be liable to error. The degree of obstruction is not of course proportionate to the degree of enlargement.

The incidence and degree of retention in relation to prostatic enlargement is shown in Table I. It will be seen that in nearly two-thirds of cases there was no enlargement of the prostate at all. Slight degrees of enlargement appeared unimportant in producing retention, whilst of 9 patients with moderate and gross enlargement 7 had severe retention.

TABLE I.—PROSTATIC ENLARGEMENT AND RETENTION IN 50 MALE S.C.E.S

Degree of prostatic enlargement	Total cases	Degree of retention		
		None	Mild	Severe
None	29	13	9	7
Slight	12	5	5	2
Moderate	7	2	0	5
Marked	2	0	0	2

In 6 of these 7 cases no urine was passed until between eight and twenty-one days after operation, but all of them left hospital without delay and with insignificant volumes of residual urine—although one patient returned after eight months and required transurethral resection. The seventh patient did not recover and was transferred to another hospital for prostatectomy. It is barely true even of this patient to say that prostatectomy was precipitated by combined excision. Even before operation he was emptying his bladder with the greatest difficulty and was clearly in need of relief.

While then retention with more than slight degrees of prostatic enlargement is frequent and often prolonged, the outlook is very good. This is to be expected, for once the patient is up there is no reason why—with careful post-operative management—micturition should be less satisfactory after operation than before. Indeed, two patients claimed that their stream was improved after combined excision; in one of them an enlarged middle lobe was considerably less prominent after operation than before—perhaps it simply falls backwards away from the urethra. We noticed a similar change in 2 other patients.

It is difficult therefore to see an indication for pre-operative prostatectomy which gives priority to the innocent instead of the malignant condition, nor should too early a decision be made about the need for post-operative prostatectomy.

Major pelvic nerve injury—2 cases.

The clear-cut syndrome which follows major nerve injury has been described by Mr. Williams. Severe retention is the initial feature and is followed by incontinence.

In each of the 16 cases of severe retention we have been able to point to one probable aetiological factor. But it is unlikely that only a single factor was responsible, and we have also to explain the high incidence of mild degrees of retention. A temporary loss of detrusor power appears unquestionable in these patients, because even when up and about they commonly had a poor stream and a moderate volume of residual urine—both gradually returning to normal. Some other factor must be found which on theoretical grounds should be related to mobilization of the rectum rather than division of the pelvic floor. This seems to be confirmed by the high incidence of retention found in a small number of patients undergoing operations which required complete mobilization down to the levatores ani without actual division of these muscles (anterior resections, extended Hartmann and abdomino-anal procedures).

Presumably the injury is directly to the bladder base or to the nerve supply of the bladder. Of injury to the bladder base it may be said that very little usually occurs. But perhaps very little trauma at this site is necessary to upset the opening mechanism of the internal meatus. Minor nerve injury produces no specific clinical picture but the relative painlessness of the post-operative retention in these cases convinces us that such lesions do occur although it has been impossible to estimate their frequency.

Site and mode of pelvic nerve injury.

Reference has been made to two distinct types of nerve injury, major and minor. To consider first the origin of major nerve injuries, we believe that just as the clinical picture of the pelvic nerve syndrome is well defined so is the cause. The injury must be to the pelvic nerves (*nervi erigentes*) on both sides near their origin from the II, III and IV sacral nerves. Once these 6 slender branches (3 on each side) have joined sympathetic fibres to form the pelvic plexuses and been dispersed over the side walls of the pelvis it is difficult to see how the bladder can be extensively denervated by the most radical dissection. On theoretical grounds then a difficult anterior or lateral dissection can scarcely be responsible and there are two possible ways the pelvic nerves can be damaged posteriorly near their origin—firstly in removing a growth of the upper third of the rectum which is closely adherent to the sacrum and secondly by a failure to divide the fascia of Waldeyer in the perineal dissection. Waldeyer's fascia is a layer of the parietal pelvic fascia which descends from the anterior surfaces of the lower sacral vertebrae and the pelvic outlet to be inserted into the ano-rectal ring (Gabriel, W. B., 1950, *The Principles and Practice of Rectal Surgery*, London). It should be divided transversely at the level of the sacro-coccygeal articulation, the incision being carried well

forward on each side where the fascia becomes less distinct. Bulging of the post-rectal fat confirms that the operator is in the correct plane. If this step is not taken and the dissection continues upwards between Waldeyer's fascia and the sacrum avulsion of the pelvic nerves appears inevitable for they are fixed posteriorly at their origin from the sacral nerves and anteriorly where they pierce the fascia (Fig. 1). Profuse bleeding from the sacral veins may draw the operator's attention to his error but this is not always the case.

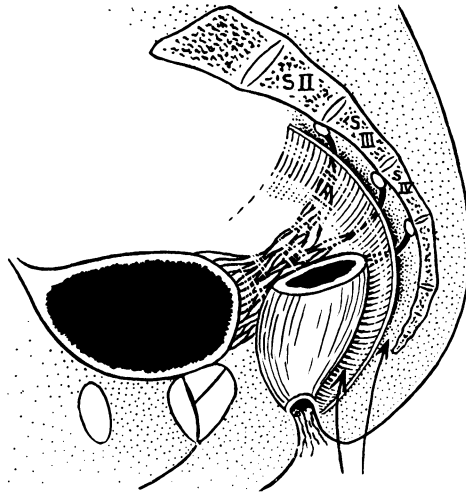


FIG. 1.—Waldeyer's fascia is seen between the anterior arrow, which shows the correct plane in the perineal dissection, and the posterior arrow which indicates how the pelvic nerves may be avulsed in the easy case.

Which is the more common cause of pelvic nerve disruption, the adherent growth or the technical error? 6 cases of pelvic nerve syndrome have been seen in addition to the 2 occurring in this series of 50 S.C.E.s. Reference to the operative procedure in the 8 cases shows that in 4 there was no difficulty anywhere (except for a widely cut right lateral ligament in one case). In the other 4 there was difficulty with the posterior dissection, and in 2 of these additional difficulty with the anterior dissection. Presumably in the straightforward cases an accidental extra-Waldeyer dissection was responsible. This cannot be proved but it is difficult to see any other way in which the surgeon removing a mobile growth can deal the nerve supply of the bladder sufficiently drastic a blow. The error must arise in the perineal dissection—the abdominal operator can scarcely penetrate the fascia of Waldeyer by blunt dissection of a mobile growth from above. It appears then that while the pelvic nerve syndrome may be an inevitable sequel to radical surgery this is by no means always the case. Certainly the syndrome is worth recognizing and its occurrence should lead to a careful review of the operative procedure.

There is of course nothing new in calling attention to the fascia of Waldeyer. But I think we differ from other observers in considering a failure to divide it a cause of the rare pelvic nerve syndrome rather than one of the common causes of post-operative retention.

Minor nerve injuries are a less definite clinical entity and can arise from diffuse bruising or actual section of nerve fibres. Presumably a wide lateral dissection is the most common cause. Whatever the importance of minor nerve injury (or direct trauma to the bladder base) uncomplicated operations performed with great gentleness in the pelvic dissection are likely to be associated with a low incidence of post-operative retention. But a high incidence is to be expected in advanced cases which require considerable force and tenacity. Retention of urine is then the price to be paid for radical surgery and the price is not a high one for all patients in this group recovered normal micturition within three weeks of operation. It is worth noting that in not one of the 50 S.C.E.s we are considering was operation refused, or abandoned once started.

I would like to turn now to post-operative management. The importance to the patient of careful management of his bladder is considerable. It is true that a distended bladder after combined excision is rarely acutely painful but it is usually very uncomfortable, and there are the complications of retention to be considered.

Urinary infection.—2 of 50 patients had an infection before operation: one of them had considerable prostatic enlargement and the other had had instrumentation for a urethral stricture. 44 had an infection after operation and on discharge 37 were still infected. In about half the Dukes' apparatus was used and the remainder had simple continuous drainage. Our figures do not allow any conclusions regarding the value of the Dukes' apparatus in preventing post-operative infection. Urinary infections appear to die out without treatment within a few months of operation and are for the most part symptom free; a clinical *acute cystitis* occurred on only two occasions. *Acute pyelonephritis* occurred once and then in a patient who had had a ureter re-implanted into the bladder at operation. *Acute epididymitis* occurred twice—in both patients the urine had been turbid with infection for several days. It is interesting to note that epididymitis appeared to arise from unrelieved stasis and not from the use of the indwelling catheter. It does seem true to say that urinary infections appear of little importance provided gross stasis is avoided.

Ruptured abdomen in association with a grossly distended bladder I have seen on two occasions (not in this series). The combination is unlikely to be fortuitous. *Rupture of the bladder* through the perineal wound I have seen once (not in this series) in an A case in whom operation was without difficulty. Foul urine gushed from the perineum as the patient rose in his bath on the tenth post-operative day.

I would like now to refer to a few details of post-operative management. We prefer the gum elastic coudé catheter for intermittent use and if an indwelling catheter is needed for more than a few days ideally a soft rubber latex type should be used; the Foley 16F has been found very satisfactory for this purpose. The routine in males at St. Mark's is to leave a catheter indwelling for the first few days after operation and we believe this to be the best method although it does anticipate retention of urine in all cases. There is no discomfort from the indwelling catheter and no significant degree of urethritis has been seen. Intermittent catheterization is the alternative; it is disturbing to the patient but if required for only forty-eight hours or so there can be no other objection to this method. Presumably it is wrong once the urine becomes infected or the urethra sore.

If there is complete retention on removal of the indwelling catheter the patient is rarely well enough to stand but kneeling in bed may be helpful. A single injection of carbachol 1 c.c. may be effective but if these measures do not succeed there should be no delay in inserting a Foley catheter before the bladder becomes unduly distended. It is a mistake to think that overfilling stimulates micturition—it stretches the detrusor and so delays recovery. The catheter is best left indwelling for a further five days, by which time the patient may be up and is then likely to micturate without difficulty. Repeated removal and re-insertion of the catheter at short intervals is pointless; urethral trauma apart, the patient may be much distressed by repeated failure to achieve what is expected of him.

If urine is passed after removal of the catheter it is advisable to estimate the residual urine twelve to twenty-four hours later however satisfactory micturition appears to be. A large and increasing residuum may cause no symptoms until there is gross distension, or even overflow.

If the residual urine is more than 150 c.c. it should be removed once or twice a day according to its volume. And if there is no progress towards complete emptying within forty-eight hours a further period of continuous drainage is indicated.

Persistent retention is always a trial to the patient who tends to wonder if he will ever manage to micturate again, while the surgeon may suspect lack of effort or a large functional element. The tendency is to expect too rapid a recovery and in most cases patience is all that is required.

Investigation of the cause is rarely helpful while the patient is still in bed, but if complete retention or a large volume of residual urine persists after the patient has been up for several days the diagnosis should be established by cystoscopy. There are three causes of persistent retention—enlargement of the prostate alone, pelvic nerve disruption, and a combination of the two.

Enlargement of the prostate alone.—If retention due to this cause persists for more than a week after the patient has been up, prostatectomy is likely to be required, but is in no way urgent. A Foley catheter—changed at weekly intervals—may be worn if need be for months while the patient's general condition improves; a second major operation is obviously best avoided within a few weeks of a combined excision. If prolonged urethral drainage is planned it is wise to tie the vasa to prevent epididymo-orchitis.

Suprapubic cystostomy in the early post-operative period makes prostatectomy or permanent suprapubic drainage inevitable and is not justified by the post-operative course of prostatic patients.

Pelvic nerve disruption alone.—Typically in the pelvic nerve syndrome the volume of residual urine becomes small within a few weeks of operation as the patient acquires the knack of emptying the bladder by straining. In one patient the residual urine fell to 180 c.c. but subsequently increased and was 600 c.c. when he was first seen by us six months after operation. A short course of carbachol enabled him to empty his bladder completely and he then regained complete control of micturition.

Prostatic enlargement and pelvic nerve disruption together.—In one patient who appeared to have sustained a severe nerve injury there was moderate enlargement of the prostate but no other abnormality on cystoscopy. Presumably the rigid prostatic tissue was preventing the characteristic opening of the bladder neck and for this reason the retention persisted instead of being followed by incontinence. The problem is a difficult one, if too much of the prostate is removed by transurethral resection then incontinence is to be expected and if too little is removed retention persists with heavy urinary infection.

Rather than end on this perplexing note I would point out that of the 50 S.C.E.s 49 were passing urine within three weeks of operation and the vast majority were emptying their bladders.

I must thank the Staff of St. Mark's for entrusting their patients to our investigations and acknowledge with thanks a grant from the British Empire Cancer Campaign.

Mr. J. C. Goligher: *Sexual function after excision of the rectum.*—It is well known that sexual function is often seriously disturbed or abolished after excision of the rectum, but this unfortunate sequel to operation has received little attention in the literature, and standard texts such as those of Gabriel (1948), Lockhart-Mummery (1934), Miles (1944), Rankin, Bagen and Buie (1932) and Bacon (1949) do not even mention it. Reliable data on the state of sexual function following rectal excision are therefore badly needed. At St. Mark's Hospital over 1,000 male patients have had their rectums removed in the last eighteen years and have subsequently all been carefully followed up. It seemed to me that it would be a simple matter to determine the precise incidence and nature of the alterations in sexual function that occur after this procedure by recalling a substantial number of these cases for special interrogation on the subject. It very soon became apparent, however, that only a small percentage of the patients were suitable for such an enquiry for the following reasons:

(1) A personal interview was considered essential and therefore only patients living in reasonably close proximity to the hospital were available for study.

(2) Many of the patients were already distinctly elderly at the time of operation and with them sexual function had often completely abated years previously, or was so much on the wane that the general effect of a major operation would perhaps have been sufficient to bring about its total cessation quite apart from any damage to pelvic nerves. In them therefore it was impossible to assess with accuracy the incidence of true neurogenic disorders of sexual function. A short pilot survey indeed showed that this was so frequently the case with patients over the age of 60 when operated on, that it was decided to restrict the enquiry to men under that age.

(3) Finally in this selected group the investigation was only pursued if the patients were married and leading an active sex life up to or shortly before the time of operation.

The winnowing effect of the application of these criteria to our series of cases is shown in Table I.

TABLE I.—SELECTION OF RECTAL EXCISION CASES FOR INVESTIGATION OF SEXUAL FUNCTION

Number of male patients who had excision of rectum at St. Mark's Hospital 1933-49 inclusive	1,024
Number who were 60 years of age or under at time of operation	522
Number who were still alive and well at time of investigation	280
Number who were living sufficiently near hospital to be interviewed	176
Number who actually attended in response to call-up letters	121
Number of these who had been enjoying active sex life up to the time of operation	95

It should be explained that when the patients were written to no indication was given as to why they were being asked to report to hospital. Further, it is unlikely that any patient's decision whether to attend or not was influenced by the effect of the operation on his sexual function. The 95 patients eventually chosen for investigation may thus be regarded as a fair sample of the younger group of cases. As for the operative technique employed for removal of the rectum, 45 had had a synchronous combined excision, 36 a perineo-abdominal excision and 14 various forms of sphincter-saving resection (low anterior resection 11, abdomino-anal 2, Hartmann's operation 1).

The Disturbances of Sexual Function Noted

In many patients who eventually regained full sexual function, it was four or five months before normal sexual relationships were resumed. In no case therefore was the interrogation carried out less than six months from the time of operation and usually an interval of several years had elapsed. The first point that emerges from our enquiry is that the majority of the patients had perfectly normal sex function, though intercourse was rather less frequent than before operation—and, with the passage of years, naturally became even less frequent or was finally terminated. A certain proportion of the patients, however, found themselves *completely and permanently impotent*. The actual percentage affected varied slightly with the different operative techniques employed as is shown in Table II. Thus after all forms of

TABLE II.—SEXUAL FUNCTION AFTER VARIOUS FORMS OF EXCISION OF RECTUM
Type of operation performed

	Combined excisions			Sphincter-saving resections
	Synchronous combined	Perineo-abdominal	Total	
No. of patients interviewed . .	45	36	81	14
No. capable of erections . .	29	29	58 = 72%	12
No. having intercourse and achieving orgasm . .	25	27	52 = 64%	12
No. securing ejaculation . .	13	19	32 = 61% of those having intercourse	7

combined excision some 72% of the patients were capable of erections, and in 64% these were adequate for intercourse. Though all patients having intercourse reported that they experienced a more or less normal orgasm or sensation of seminal fluid coming away, only 61% of them actually produced an ejaculation. The others were therefore presumably sterile and this is borne out by the fact that 3 or 4 of them who particularly wished to have further children were unable to do so. By contrast it may be mentioned that one of the patients in the group having normal ejaculation claims to have become a father since operation. To summarize then we can say that after combined excision of the rectum, which is the usual operation employed in the treatment of rectal carcinoma, one third of the patients—selected as has been described—will be impotent, and of those retaining potency one-third will be sterile.

As will be seen from Table II the incidence of impotence and of sterility differ slightly after the synchronous combined and perineo-abdominal operation respectively, the figures being apparently rather favourable to the latter technique. However, Dr. D. D. Reid of the M.R.C. Department of Medical Statistics of the University of London has kindly examined these figures and reports that the differences are not statistically significant. The number of cases analysed after sphincter-saving resections is obviously too small to allow of comparison and all we can say of our findings here is that they demonstrate that similar disturbances of function do occur after these operations as well.

It would be reasonable to suppose that these nerve injuries would be more liable to occur in patients with advanced adherent growths involving difficult, more extensive excisions, but when their frequency was analysed according to the extent of spread of the tumour it was found that the differences were not significant.

The Mechanism of These Disturbances

Impotence.—It will readily be appreciated that after excision of the rectum with establishment of a permanent colostomy the patient tends to lead a more secluded existence and, because he feels unclean or fears that the colostomy may act during the night, often sleeps apart from his wife. Circumstances therefore are less conducive to a normal sex life after operation than before, and this environmental factor alone might conceivably be responsible for the apparent impotence in some cases. But the majority of our patients complaining of post-operative impotence have experienced quite strong libido, yet despite this they have been unable to obtain erections, so that with them a nervous injury seems almost certain.

It is an established fact of physiology that erection is due to impulses proceeding along the *nervi erigentes* which arise from the second, third and fourth segments of the spinal cord. According to Ashley and Anson (1946) these 6 nerves penetrate the stout layer of parietal pelvic fascia on the front of the sacrum known as the fascia of Waldeyer and, keeping close to the side wall of the pelvis, join the pelvic plexus on either side formed by

the ramification of the presacral nerve. The subsequent course of the fibres concerned with erection is not quite clear but presumably they accompany the pudendal artery out of the pelvis and eventually run along the dorsal and deep arteries to the penis.

How may this parasympathetic nerve pathway be damaged during a combined excision of the rectum? Presumably a complete or nearly complete division of the pathway on both sides would be necessary to abolish the mechanism of erection. It would seem that this total severance could be more easily accomplished early in the course of the fibres, when they are still collected into the 6 slender *nervi erigentes*, than later when they are spread out on the side walls of the pelvis intermixed with the sympathetic fibres in the pelvic plexuses or subsequently on their way to the penile arteries. Injury to the *nervi erigentes* themselves might arise from an error of technique on the part of the perineal operator. Instead of dividing the fascia of Waldeyer transversely at the tip of the sacrum after disarticulation of the coccyx and mobilizing the rectum from the front of the sacrum *inside this fascia*, he may misjudge the depth of his incision through the fascia and find that when he attempts to free the rectum posteriorly he is stripping up in the plane between the sacrum and Waldeyer's fascia with almost certain disruption of the *nervi erigentes*. However this can hardly be the usual explanation of impotence in these rectal excision cases, *firstly* because in a personal series of several hundred perineal dissections in which this extra-fascial separation was strenuously avoided—because of the risk of causing bleeding by tearing the middle sacral vessels—impotence is known to have resulted occasionally in quite young patients, and *secondly* because undoubted impotence has occurred in 2 of our 14 patients treated by sphincter-saving resections in which of course there was no perineal dissection at all (*see* Table II).

It is hard to believe that the pelvic plexuses, which lie so close to the side walls of the pelvis, could be completely or even mainly severed by the ordinary combined excision of the rectum, however widely the lateral ligaments might be cut. In view of the notorious difficulty of securing a permanent interruption of autonomic nervous pathways by deliberate operative section in diseases such as Raynaud's phenomenon it would be remarkable if simple pressure on the pelvic plexuses during excision of the rectum were sufficient to destroy their conductivity for more than a very short time. Yet it is difficult to see how else the parasympathetic nervous mechanism governing erection can be damaged in most of these cases.

Failure of ejaculation.—It appears from the work of Learmonth (1931) that the seminal vesicles and the trigonal region of the bladder are both innervated by the sympathetic fibres running down in the presacral nerve. An injury to the sympathetic supply could therefore result in failure of ejaculation either from abolition of seminal vesicular contraction or alternatively from paralysis of the internal urethral sphincter allowing seminal fluid to regurgitate back into the bladder as in post-prostatectomy cases. In the latter event, however, one would expect that at the next micturition the urine would be intermixed with semen. 33 of our patients were specially questioned on this point, and they were all emphatic that the urine passed after intercourse appeared perfectly normal. To make these observations conclusive microscopical examination of the urine would be necessary, but there is a limit to what can conveniently be carried out in the way of investigation. As the evidence stands, therefore, it is against regurgitation of semen into the bladder and in favour of seminal vesicular paralysis as the explanation of the failure of ejaculation. In this connexion it is to be noted that despite the absence of an ejaculate these patients all experienced satisfactory orgasm. Presumably therefore the orgasm is not due, as is often imagined, to the contraction of the seminal vesicles, and a patient whose seminal vesicles had been removed along with the rectum might still be able to achieve an orgasm. The few patients at St. Mark's Hospital subjected to this form of extended excision for carcinoma of the rectum were unfortunately unsuitable for investigation of sexual function because of their advanced age.

Site of injury to sympathetic.—There are two places where the sympathetic fibres for the vesicles are most likely to be damaged during an excision of the rectum; (1) where they lie in the presacral nerve which is, of course, liable to be torn during the separation of the rectum from the front of the sacrum and common iliac vessels, and (2) just before they reach the vesicles themselves, where they might easily be divided during the anterior dissection in which the vesicles are usually laid quite bare. The sympathetic nerves could also be injured in the pelvic plexuses on either side of the pelvis, but if so then one would expect a concomitant injury to the parasympathetic with resulting impotence. It is probable that in many or most of our impotent patients a sympathetic lesion co-exists but we have no means of knowing for certain. We are now only considering the cases that have managed to avoid a parasympathetic injury. A very high ligation of the inferior mesenteric artery at its origin from the aorta might also conceivably result in damage to the sympathetic fibres descending on either side of this artery to form the middle root of the presacral nerve. It is generally considered, however, that the normal pathway of sympathetic supply for the seminal vesicles is via the lateral root of the presacral nerve, so that an injury to the sympathetic at the

base of the inferior mesenteric artery would probably not interfere with the innervation of the vesicles. Further in the majority of our cases the artery was tied well below its origin opposite the bifurcation of the abdominal aorta and division of the middle root of the presacral nerve was thus unlikely.

Conclusion

With any operation involving freeing of the rectum posteriorly from the sacrum and side walls of the pelvis, and anteriorly from the seminal vesicles and bladder, nerve injuries interfering with sexual function are liable to occur and this applies even when the anal region and lower part of rectum are conserved as in sphincter-saving excisions. Our figures for this latter type of operation are small but they are in accord with what one would expect, because in most of the sphincter-saving resection operations performed by us a very extensive mobilization of the rectum was practised. By contrast in 6 patients who had resection and anastomosis for carcinomata of the pelvic colon, where no freeing of the rectum itself from its sacral bed was carried out, no alteration of sexual function was noted.

Obviously there is no certain preventive and no cure for these neurogenic sex disorders after excision of the rectum. They are part of the price which the patient must pay for attempted cure. Fortunately, as our enquiry very clearly shows, to the great majority of patients having this operation the loss of this particular function is of little or no import, but to the younger patients it is often a most distressing complication causing far more inconvenience than the much maligned colostomy, and sometimes resulting in the gravest domestic repercussions. The only encouraging thing that can be said in regard to these patients is that the chances of sexual disorder are distinctly less than has hitherto been imagined and, expressed briefly, amount to a one-third chance of impotence and between a half and a two-thirds chance of sterility.

I am greatly indebted to my colleagues at St. Mark's Hospital for permission to investigate their patients for the purposes of this enquiry. Some of the expenses involved in the work were defrayed by a grant from the British Empire Cancer Campaign, for which I also wish to express my thanks.

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Mr. E. W. Riches considered that there were certain factors common to enlargement of the prostate and carcinoma of the rectum; firstly they affected the same age-group, secondly they were both diagnosed essentially by digital examination of the rectum, and thirdly each could be a lethal disease. Just as the Urologist must be on the lookout for carcinoma of the rectum so also the Proctologist must assess the condition of the prostate in making a rectal examination. In cases where the possibility of prostatic obstruction existed the blood urea should be estimated, an intravenous pyelogram done, and a cysto-urethroscopy performed, and these investigations should precede the excision of the rectum. When retention of urine occurred after rectal excision the Urologist was confronted with a difficult problem; the patient had recently undergone a serious operation, he probably had a colostomy and he had no rectum through which the size of the prostate could be assessed. Endoscopic resection of the prostate in such a case might succeed, but Mr. Watson had mentioned its shortcomings, and prostatectomy in the presence of a colostomy although possible was not desirable. There were two alternatives. Either the prostate could be removed before the rectum; this was giving the non-malignant lesion priority over the malignant, but it should only delay the rectal excision for about two weeks and might well be justifiable in some cases. Or the prostate should be removed via the perineum at the time of a synchronous combined abdomino-perineal excision of the rectum; the exposure was excellent.

With regard to vesical infection he agreed that it generally subsided in time after the rectal excision, but a persistent infection in the absence of prostatic obstruction should raise the possibility of secondary growth in the bladder; he showed slides of one case where this had been proved by cystoscopic biopsy.

Mr. W. B. Gabriel agreed that the fascia of Waldeyer should be cleanly and definitely divided by a series of transverse scissor cuts at or slightly below the level of the coccygeal

disarticulation; the forward dissection of the rectum which follows should be kept *reasonably close* to the middle line and he never did this except with sponge-holding forceps and a forefinger, once the correct plane of cleavage had been reached.

44 out of 50 cases was a high incidence of urinary infection in male cases. This might be due to the fact that (so far as St. Mark's Hospital was concerned) the original concept of Dukes' apparatus for use with a retained catheter had been lost sight of and in recent years the apparatus had been used, in the majority of cases, merely as a convenient method of effecting continuous drainage of the bladder. They should now revert to the original method and use this apparatus for intermittent drainage, with a 3 or 4 hourly release, with an anti-septic seal of 1 in 5,000 oxycyanide solution at the outer end of the catheter. In his original paper Dr. Cuthbert Dukes (*Proc. R. Soc. Med.*, 1929, 22, 259) reported that by the use of this apparatus with an antiseptic seal and certain precautions for the prevention of urethritis, urinary infection had been prevented in two-thirds of the male cases investigated. They should make a determined effort to get these male excision cases through the post-operative period without a urinary infection developing.

He agreed with Mr. Riches that they should more often advocate a preliminary prostatectomy prior to excision of the rectum in patients who had an operable carcinoma of the rectum complicated by a greatly enlarged benign prostate which, if left untreated, would almost certainly cause severe urinary retention after excision of the rectum. In 1929 he reported before this Section the case of a man aged 68, for whom Mr. E. T. C. Milligan did a suprapubic prostatectomy in between a two-stage colostomy and perineal excision of the rectum (*Proc. R. Soc. Med.*, 1929, 22, 1329). The patient made a good recovery and lived for nearly eleven years subsequently. In the majority of elderly patients a rectal carcinoma is a slow-growing tumour, therefore the slight delay necessitated by the modern operation for removal of the prostate, especially by the retropubic method of Millin, is one which they should have no hesitation in recommending.

Mr. L. N. Pyrah said he had notes of 9 cases of urinary retention or difficulty occurring in association with excision of the rectum for carcinoma, 8 being personal cases. In 6 male patients the difficulty in micturition either followed very soon after abdomino-perineal resection of the rectum or developed within a period of two years after operation; these 6 patients were all successfully treated by per-urethral resection of the prostate using the Thompson punch.

In 2 cases in the series, on account of difficulty in micturition or urinary retention, the prostate was removed simultaneously with the rectum using the synchronous combined abdomino-perineal technique. The first such operation was performed by my colleague, Mr. H. S. Shucksmith. The patient was a man, aged 76, who was operated on for sub-acute intestinal obstruction. Laparotomy revealed a carcinoma at the rectosigmoid junction and a temporary cæcostomy was performed. Post-operatively the patient developed retention of urine which needed catheter drainage and the patient did not void spontaneously again. Two weeks later a synchronous combined abdomino-perineal resection of the rectum together with removal of the prostate by the perineal route was performed; apart from some fistulous drainage through the perineum, the patient made a satisfactory recovery. The second case was that of a man suffering from carcinoma of the rectum, who, in addition, had considerable difficulty in micturition and nocturnal frequency resulting from an enlarged prostate; he was similarly treated by Mr. Shucksmith and the speaker. Again, he had a temporary fistulous leak from the suture line in the prostatic capsule but this did not interfere very greatly with his convalescence and he was discharged fully healed and passing urine five weeks after operation.

The last case in the series of retention of urine occurred in a woman who was operated on for a complicated growth of the rectum which had resulted in a fistula into the bladder. The fistulous track involved the upper part of the vagina, the uterus having been removed seven years previously. At operation, a coil of small intestine was also found to be attached to the growth. She was treated by a synchronous combined abdomino-perineal resection of the rectum, removal of a foot of small intestine attached to the growth, the upper part of the vagina and the posterior third of the bladder including the lowest two inches of both ureters; the divided ureters were re-implanted into the upper part of the reconstructed bladder. This patient developed retention of urine after the operation but otherwise her convalescence was very satisfactory. After being treated by an indwelling catheter for a fortnight, after which time some urine leaked through the suture line of the reconstructed bladder, the natural urinary flow was restored by resection of the bladder neck. The patient made a satisfactory recovery. Intravenous pyelograms later showed practically no dilatation of the pelvis and calyces. She had no nocturia and the urine was free from infection. In addition to the successful treatment of the urinary retention, this case illustrated what could be done by way of reconstruction of the urinary tract when it was involved by a growth in the rectum.