# Bladder and Sexual Function after Surgery for Rectal Cancer

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**Bladder function and sexual potency were studied before and after surgery for rectal carcinoma. Urinary voiding after postoperative removal of indwelling catheter was impaired in seven of 22 men, leading to prostatic surgery in four. Two years later, eight of 16 men reported disturbed voiding, but no significant changes were found in bladder capacity, residual volume, flow rate, or detrusor pressure. Sexual potency was reduced in five of ten men, in one with retrograde ejaculation; and three did not achieve erection. Objective postoperative bladder disturbance was surprisingly rare. Symptoms of denervation were more commonly attributable to sympathetic rather than parasympathetic lesions, possibly as a result of more energetic dissection in the anteroposterior plane than along the lateral pelvic walls. No patient had total autonomic denervation. Wide indications are advocated for prostatic resection in patients who have prostatic symptoms in association with surgery for rectal carcinoma. [Key words: Rectal carcinoma; Postoperative sequelae; Urodynamics; Sexual dysfunction]**

IMPAIRED BLADDER EMPTYING after rectal surgery was believed to be caused by backward displacement of the bladder and loss of its posterior support, with resulting angulation of the bladder neck.[1] Urodynamic and videocystographic observations, however, have permitted diagnostic refinements, and varying incidence of denervated bladder was found.[2,3]

Postoperative sexual dysfunction is difficult to evaluate, especially in women. The incidence after rectal surgery among men has been reported as approximately 20 percent, with wide variations. The incidence increases with the radicality of the operation.[4-6]

This investigation compared bladder and sexual function before and after surgery for rectal cancer. The influence of site and stage of the tumor, preoperative irradiation, and type and radicality of surgery were among the factors studied.

Stapling instruments have made anastomosis of the lower rectum technically feasible. Many patients who previously would have been submitted to rectal excision and colostomy are now managed by low anterior resection.[7] We wish also to investigate the possibility that the use of this technique reduces the incidence of bladder and sexual dysfunction.

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## Materials and Methods

**Patients:** Twenty-six patients who consecutively underwent surgery for rectal carcinoma at Karolinska Hospital from 1981 to 1982 were admitted to a preoperative urodynamic study. They also were interviewed with regard to urinary voiding and sexual habits. The study was approved by the hospital's Committee on Ethics, and informed consent was obtained from all patients. The location of the tumors and Dukes' staging are shown in Fig. 1.

Nine patients were allocated randomly to preoperative radiotherapy, and received 25 Gy to a pelvic field over five days immediately before surgery. Anterior rectal resection was done in 13 patients, the EEA™ stapler was used in eight. Abdominoperineal excision was performed in 12 patients. Local resection only was performed on a woman with liver metastases. All patients had indwelling urethral catheters for seven to ten days after surgery. The surgery was judged to be curative in all but five patients, four of whom died within six months.

Six months after rectal surgery, the urodynamic study was repeated, as were the interviews concerning bladder and sexual function. Two of the surviving 22 patients declined to participate. Of the 20 re-examined patients (mean age, 69.5, range, 54 to 82 years), 16 were men.

At a second follow-up investigation done 24 months after rectal surgery, the surviving men again were questioned about voiding and sexual function. In the interim, three more of the men had died, two of rectal cancer and one of hypopharyngeal cancer.

**Urodynamic Methods:** Patients voided, and a soft, 12-Charrière, two-way catheter was inserted. When the residual volume had been measured, cystometry was performed,

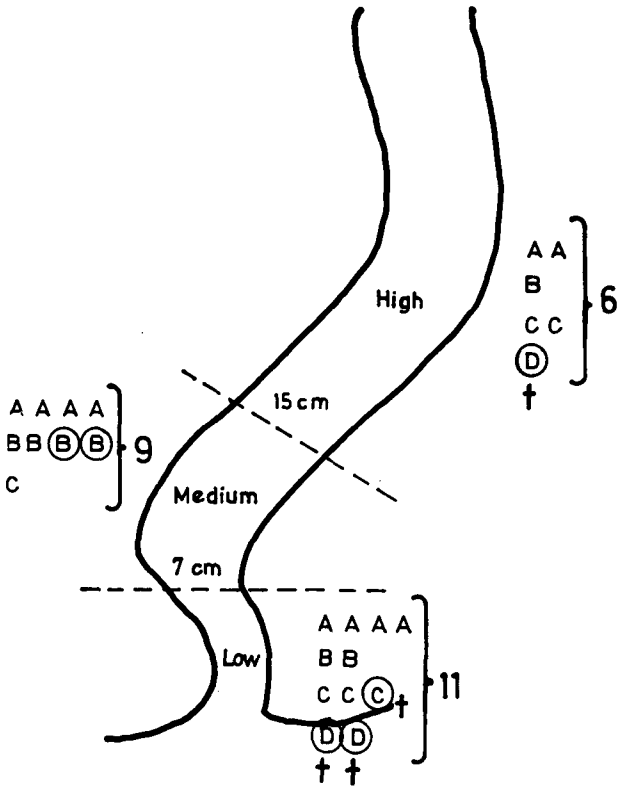



FIG. 1. Location and Dukes' stage of rectal cancer in 26 patients. Six patients (○), four of whom had died (†), were not included in the investigation six months postoperatively.

using isotonic saline solution at 37° C, rate 50 ml/min, with the patient in the supine position. Two infusion cannulas (170 mm in length, outer and inner diameter, 1.7 and 1.2 mm), equipped with extra sideholes, were inserted into the filled bladder under local anesthesia. One cannula penetrated the bladder wall, and the tip of the other was placed prevesically. The intravesical and prevesical pressures could thus be determined and, by electrical subtraction, the differential pressure, which was equivalent to the detrusor pressure. The transducers (Statham) were placed at the upper level of the symphysis. Patients voided and the flow rate was measured using a uroflowmeter (von Garrelts). Bladder emptying was repeated three times from maximal cystometric capacity, and the residual volume was measured after each voiding.

## Results

Disturbances of bladder emptying were common in the early postoperative period. Seven of the 22 male patients had difficulty voiding spontaneously after removal of the in-dwelling catheter. Four of the seven had reported nocturia and slow stream before surgery due to moderate hyperplasia of the prostate and, in one patient, urinary retention (1800 ml) necessitated the use of an in-dwelling catheter preoperatively. Transvesical prostatectomy (gland weight, 160 g) was performed four months after the rectal surgery in this patient because voiding was still greatly impaired. The three other patients with prostatic hyperplasia had better initial function, but transurethral resection was performed within a year. In the remaining three patients, voiding became satisfactory.

At the six-month examination, two of the 20 patients complained of decreased flow, and six reported urgency and diurnal and nocturnal pollakiuria. After 24 months, these patients still had slow start and weak flow. Six of the 16 examined reported pollakiuria and urgency; two patients had leakage. No patient was totally incontinent. Eight patients observed no changes in bladder function. Data from the urodynamic investigations are surveyed in Figs. 2 and 3. Postoperatively, the maximal bladder capacity and the residual volume decreased, though not significantly, and the urinary flow rate was increased somewhat. The detrusor pressure showed some reduction, both at peak flow and at the start of voiding (opening pressure). Differences in the urodynamic parameters before and after rectal surgery were not statistically significant.

Preoperative irradiation was not associated with significant differences in bladder function (as compared with nonirradiated patients), nor were there differences relating to Dukes' staging or to rectal amputation vs. low stapled anastomosis.

Urethral resistance is shown separately for men[16] and women[4] in Fig. 3, as the flow and detrusor load are not comparable in the two sexes. The changes in values, however, were the same.

The 13 men who were alive two years after rectal resection were investigated in regard to sexual function. One was unable to participate because of cerebral hemorrhage, and two had been impotent before surgery. The mean age of the ten remaining men was 69 (range, 54 to 77 years). Only two declared their sexual potency to be unchanged, while five reported greatly reduced potency, and three never achieved erection. None of these three had subjectively impaired voiding (Table 1).

Normal antegrade ejaculation had remained unchanged in two patients. One man, who had not had surgery for prostatic hyperplasia, had retrograde ejaculation. Seven men had permanent absence of ejaculation, and four of them also reported annoying urgency of micturition.

## Discussion

In this study, seven of 26 patients had impaired urinary voiding in the early course after surgery for rectal cancer. At follow-up after six months, however, there was no significant decrease of detrusor contractility that would indicate persistent parasympathetic denervation. No patient had total detrusor paralysis.

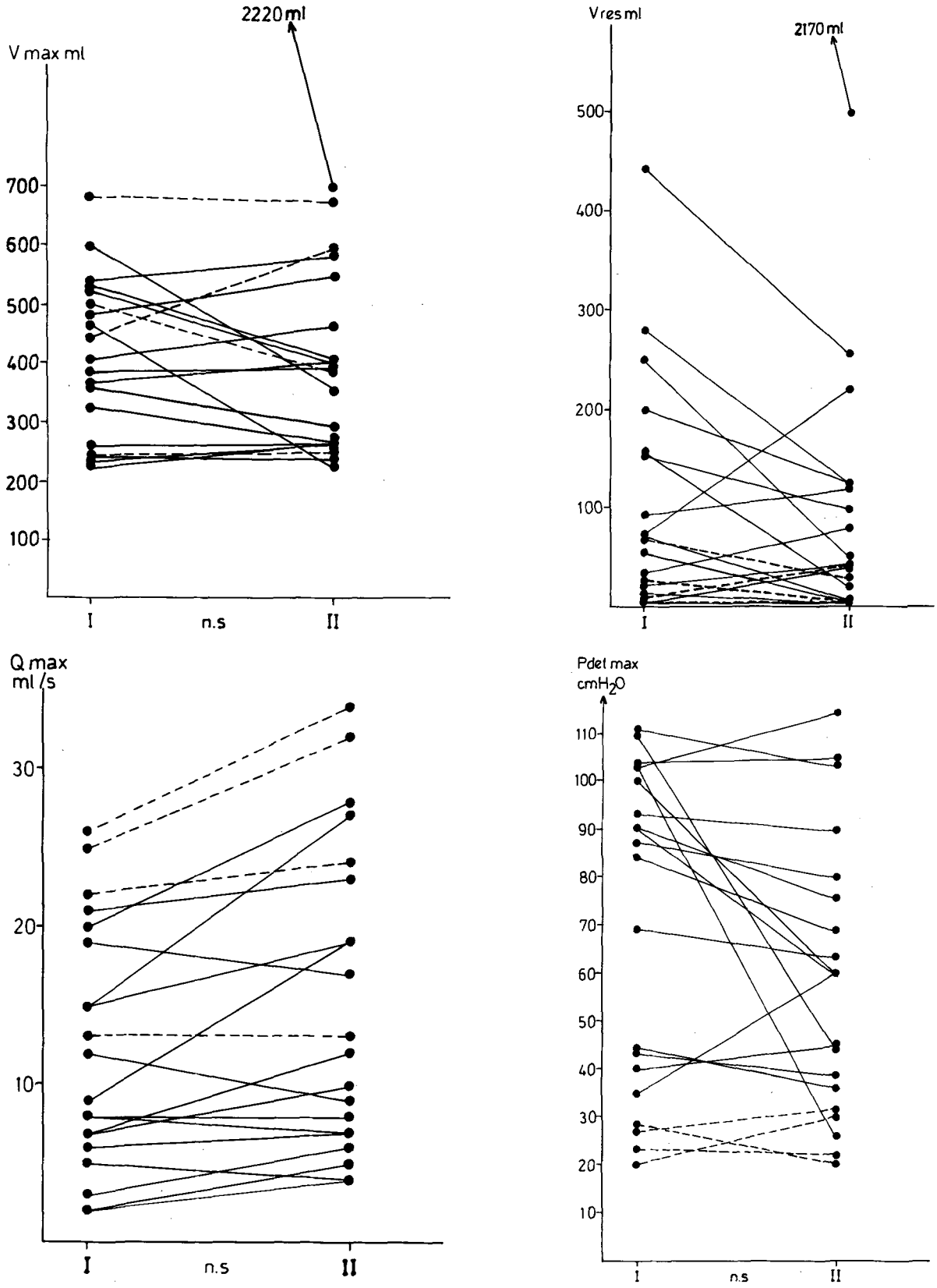



FIG. 2A–D. A: Subjective maximum bladder capacity before (I) and six months after (II) surgery. Males ●—●, females o—o. B: Residual volume of urine before (I) and after (II) surgery. C: Maximum urinary flow before (I) and (II) surgery. D: Opening detrusor pressure (at start of flow) before (I) and six months after (II) surgery.

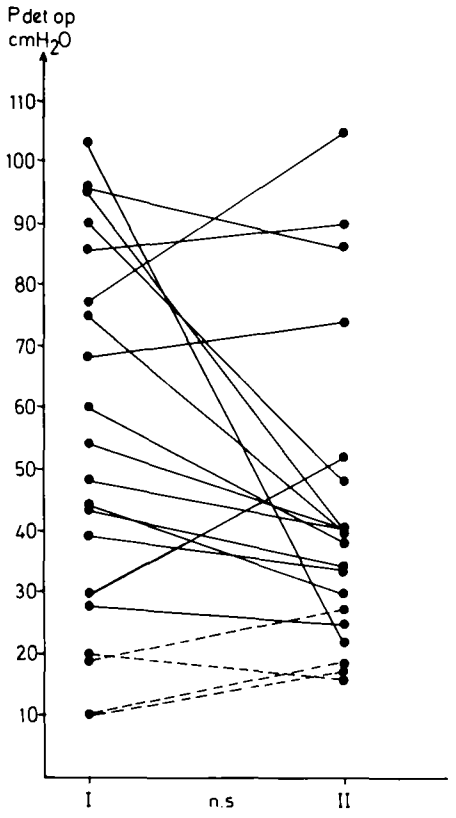
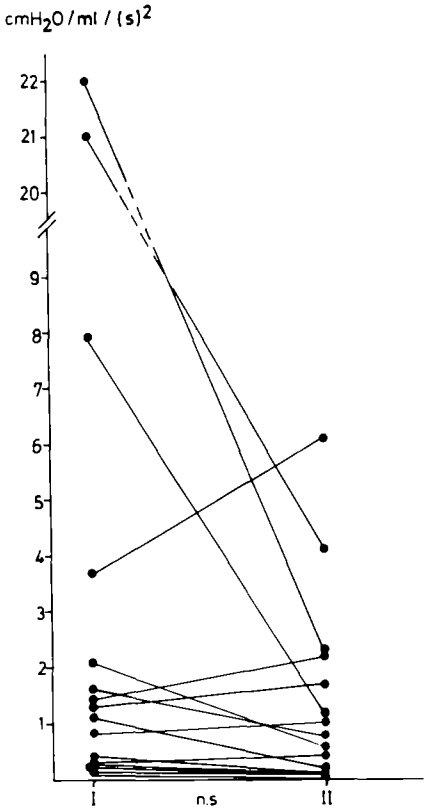



FIG. 2E: Maximum detrusor pressure before and after surgery.




Neurologic disturbances have been reported in 60 to 65 percent of patients after abdominoperineal rectal excision.[8,9] Selection of patients—examined long after surgery because of bladder symptoms—probably explains the high incidence in some studies.[9] Parasympathetic denervation in 20 to 30 percent of patients probably is a more reliable estimate of immediate postoperative dysfunction.[10] Long-term observation, however, shows a declining incidence of bladder dysfunction, *e.g.*, impaired voiding after 6 to 12 months in 10 to 12 percent of patients[11,12] and, in a study of 13 men, normalization of detrusor areflexia in three of four patients within three months.[13] In our study, the low incidence of bladder dysfunction in the late postoperative phase may indicate either incomplete peripheral transection of nerve fibers in the pelvic plexus or time-related nerve regeneration. Recent histologic studies[14] seem to prove the latter theory. Bladder biopsies performed soon after surgery for rectal carcinoma showed a markedly reduced ratio of cholinesterase-positive nerves. After 10 months, however, there were nerve terminals of the same appearance as in the normal bladder, and the cholinesterase-positive nerves had increased.

Early postoperative bladder dysfunction is not necessarily neurogenic. Inflammatory changes in the perivesical tissues[15] and altered anatomic position of the bladder[1,16] are other possible causes, and may explain the transient nature of symptoms in some patients.

A 20 percent requirement of prostatic surgery in close association with operation for rectal cancer was reported

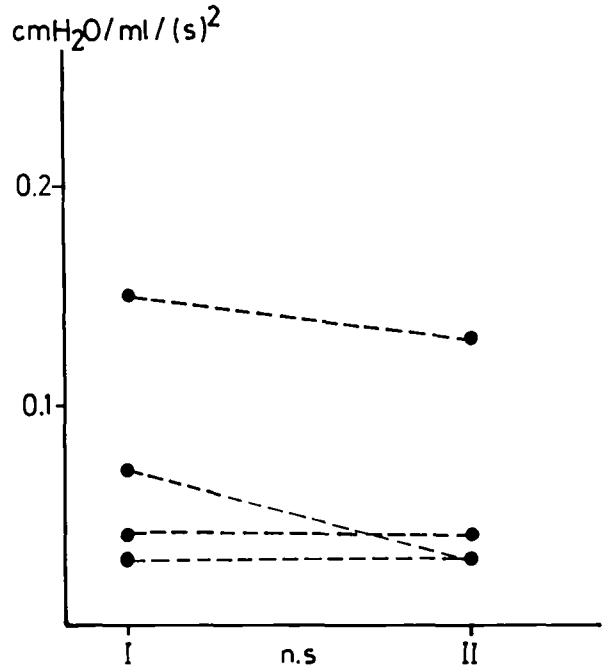



FIG. 3A, B. A: Urethral resistance at maximum flow rate in 16 male patients before (I) and after (II) rectal surgery. B: Urethral resistance at maximum flow rate in four female patients.

previously.[17] In the present series, four of 22 men underwent prostatic resection in the first year after rectal surgery, but all four had some previous history of urinary obstruction. Slight deterioration of detrusor contractility may increase emptying difficulties.

To achieve radical resection in rectal cancer, a wide dissection should be performed close to the sacrum and lateral pelvic walls. Anatomic studies[18] have shown that during its performance on the anterolateral aspect of the lower rectum, the dissection is potentially deleterious to the pelvic parasympathetic nerves arising from the second to fourth sacral nerves and to the pelvic plexus, with both sympathetic and parasympathetic fibers.

The incidence of parasympathetic denervation of the bladder during surgery for cancer or inflammatory bowel disease was found previously to be greater after abdominoperineal resection than after low anterior resection only.[19–21] In the present study, there was no difference in parasympathetic dysfunction, as reflected in slightly decreased detrusor contraction pressure, between the patients with amputation and those with resection.

The dominant bladder discomfort after rectal surgery in our patients was caused by symptoms referable to sympathetic denervation instead of by the irritant type, with urgency and frequency of micturition. The sympathetic nerve fibers emerge at $Th_{10}$ to $L_2$ and join with the hypogastric nerves, which can be damaged close to the middle rectal arteries at the promontory of the sacrum when lymphatic tissue is removed *en bloc* around the iliac vessels, or when the posterior wall of the prostatic capsule is dissected.[22]

Parasympathetic denervation was thought to predominate after rectal surgery. Several patients, however, have been shown to have diminished proximal urethral pressure and incompetent bladder neck after abdominoperineal resection, indicating sympathetic dysfunction.[13] In our study urethral pressure was not measured during micturition, and voiding urethrocystography was not performed, so that comparisons cannot be made with the mentioned observations. However, the increase in flow rate concomitant with the fall of the detrusor opening pressure may indicate relaxation of the bladder neck, possibly due to sympathetic denervation.

Sexual function is hard to evaluate in elderly men, who may find declining potency an embarrassing subject of discussion. The six-month interval before the first investigation of sexual function proved to be too short. Most of the men were still anxious concerning the outcome of rectal surgery, and, consequently, were not much concerned with sexual activity. Two years postoperatively, with increased vitality, the men reported their sexual habits more openly. That seven of ten men had no ejaculation seemed remarkable, particularly because four of the seven still had erectile potency. Hygienic problems

TABLE 1. Changes in Bladder and Sexual Function 24 Months After Operation for Rectal Cancer

| Patient | Impaired Bladder Emptying (Parasympathetic) | Pollakiuria and Urgency (Sympathetic) | Erectile Potency (Parasympathetic) | Ejaculative Function (Sympathetic) |
|---|---|---|---|---|
| 1 | No | No | Decreased | Maintained |
| 2 | No | Yes | Decreased | Absent |
| 3 | Yes | Yes | Decreased | Absent |
| 4 | No | Yes | Unchanged | Absent |
| 5 | Yes | No | Decreased | Absent |
| 6 | No | No | Decreased | Retrograde |
| 7 | No | Yes | Absent | Absent |
| 8 | No | No | Unchanged | Maintained |
| 9 | No | No | Absent | Absent |
| 10 | No | No | Absent | Absent |

and emotional factors undoubtedly influenced erectile potency. Absence of ejaculation in a potent patient who has not undergone prostatectomy probably indicates a neurogenic lesion. Presumably, these four men had sympathetic partial denervation.

In an earlier retrospective study,[5] one-third of 110 men had sexual dysfunction following surgery for rectal cancer, and 18 percent were completely impotent. The mean age at surgery in that study was 55 years, and the patients were questioned up to 25 years later. Our patients, with a higher incidence of sexual dysfunction, were older but presumably had a clearer memory of their preoperative performances. In another series,[23] only one of 24 men had permanent erectile impotence, and two had transient dysfunction after low anterior resection for rectal cancer. Younger patients and the absence of perineal dissection may explain the more favorable results in that study. No impotence was found after anorectal resection for coloproctitis when dissection was close to the bowel wall.[24] Other authors showed age to be the most important influence on sexual activity after abdominoperineal resection, while Dukes' tumor stage was of no prognostic value in this respect.[6]

No patient in our study had total autonomic denervation after surgery for rectal cancer. Decreased detrusor pressure at micturition possibly indicated incomplete parasympathetic denervation. Absence of voiding dysfunction in these patients may be due to contemporaneous sympathetic lesions with diminished urethral resistance, permitting an adequate flow rate. The high incidence of erectile and ejaculatory dysfunction also suggests combined parasympathetic and sympathetic lesions. Observation for bladder dysfunction is advisable for all patients undergoing surgery for rectal carcinoma. In symptomatic cases, the indications for prostatic surgery should be wide, as even a minor obstruction added to slight neurogenic detrusor dysfunction can cause severe voiding difficulties.

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