

UROLOGICAL PROBLEMS FOLLOWING SPINAL CORD INJURY*

Philip H. Smith MB, FRCS**

Key words: bladder outflow obstruction, intermittent self-catheterization, spinal cord injury, spinal reflex

The normal mechanism of micturition is complex and requires:-

1. an intact spinal reflex
2. cortical appreciation of bladder fullness and an intact frontal cortex to allow the voluntary control of micturition with
3. the presence of a functioning midbrain to coordinate the sustained detrusor contraction required for effective bladder emptying.

Micturition involves detrusor contraction with pelvic floor relaxation so that an adequate flow may be established and maintained.

Following spinal cord injury above the second lumbar segment (L2) the cord may be damaged; below this level any injury will be to the cauda equina. Either lesion may be partial or complete. A cauda equina lesion leaves a flaccid bladder and pelvic floor. Following a cord lesion with preservation of the sacral cord the bladder will be capable of reflex but unsustained contractions while the pelvic floor may show a variable amount of spasm which will inhibit the free passage of urine.

The consequences of spinal cord injury are therefore primarily the result of ineffective bladder emptying. They are listed in Table I.

TABLE I

Urological Consequences of Spinal Cord Injury

Residual urine
Chronic retention
Bilateral hydronephrosis and hydroureter
Vesicoureteric reflux
Recurrent urinary infection
Stone formation
Renal failure

* From the Department of Urology, St. James's University Hospital, Leeds, United Kingdom.

** Consultant in Urology. St James's University Hospital, Leeds.

Urinary Drainage

The urological management of patients following spinal cord injury is designed to minimize the above complications.

In the early stages management is classically by intermittent catheterization. This technique is costly in terms of staff and equipment and does not prevent infection of the urinary tract. In some units continuous catheterization is used. The bladder urine in such patients is nearly always infected, and stones may form around the catheter balloon or within its lumen. If a patient on continuous catheterization develops cloudy urine this should be investigated bacteriologically and treated promptly; if so, pyelonephritis will be uncommon and upper tract problems rare. In our own unit we use a Braun pediatric dialysis cannula inserted suprapubically since this prevents urethral contamination, minimizes the chance of prostatic infection and reduces the work of the nursing staff. In half of these patients the urine remains sterile for over one month without antibiotic therapy^{1,2}.

Many years ago the risk of infection and its consequences were so serious that patients were managed by manual expression. This is not safe as obstructive changes may be seen in the upper urinary tract within 2 weeks³, and obstructive uropathy with or without reflux soon follows.

Long-term drainage of the urinary tract may be accomplished in several ways (Table II).

TABLE II
Options for Long-Term Urinary Drainage

- Bladder training + condom urinal
- Indwelling catheter
- Intermittent self-catheterization
- Urinary diversion

If bladder training can be accomplished this is probably the best option. In this system the patient is trained to induce reflex contraction of the bladder by tapping the suprapubic region or stimulating adjacent areas. Attempts should be made to empty the bladder every 1 ½ — 2 hours. In some patients this is sufficiently successful to avoid the need for a collecting appliance, but these form the minority, and most men need to use a condom urinal with drainage bag. The female is less fortunate in that no external appliance is satisfactory, and many ladies find that, although the bladder may be "trained", the result is unsatisfactory and that a catheter life is preferable. If patients using this technique are not conscientious in voiding every 1 - 2 hours they are likely to develop obstructive uropathy and recurrent urinary tract infections.

Long-term catheterization is effective, if clinical urinary infections are treated promptly. Many of the Silastic catheters can be left *in situ* for weeks or months. Other catheters should be changed every 2 - 3 weeks. Many patients remain in good health with normal renal function for 20 years or more with this technique, but others develop bladder spasm and contracture, bladder stones, or catheter blockages. These problems usually declare themselves by by-passing of urine around the catheter, and in these circumstances cystourethroscopy, with removal of any stones and perhaps hydrostatic distension of the bladder, should be undertaken.

Intermittent self-catheterization using a 14 - 16 F soft catheter, or commercially available metal catheters with a mirror (Thackrays Ltd) is suitable for some female patients.

Complications

Infection

Infection can be seen in any part of the urinary tract, should be constantly suspected and should be treated with the appropriate antibiotics without delay. Paraplegic patients often have few or no localizing symptoms. One should always be alert for the presence of cloudy urine and in any patient who is ill, but not catheterized, a residual urine should be carried out. This may reveal large quantities of very infected urine and produce immediate improvement. If any doubt remains an intravenous pyelogram should be performed. In paraplegic patients in whom diagnosis is delayed it is not uncommon to find a pyonephrosis, perinephric abscess and epididymo-orchitis. These should be treated by the usual means. If recurrent epididymo-orchitis is troublesome bilateral vasectomy will be of great help.

Reflux

Vesicoureteric reflux is seen in 10% - 20% of patients and is often soon followed by renal damage. Reflux arises following obstructive problems at the bladder outlet and recurrent infection. Reimplantation is difficult because of the thickness of the bladder wall and continuous catheterization may be required.

Stone formation

Stones may form in both the kidney and the bladder and should be removed endoscopically where possible. Percutaneous removal of renal stones represents a very real advance for the management of the paraplegic and quadriplegic patient. The hazards of open intervention in this group of patients are greater than in the normal person since all are liable to develop bedsores and many patients, especially those with high thoracic and cervical lesions, have significant impairment of respiratory function.

Most of the stones are infective in origin, and prolonged antibiotic therapy may be essential if recurrence is to be prevented. Because of the absence of localizing symptoms many patients with stones in the kidney and ureter have developed pyonephrosis by the time that they are diagnosed.

Bladder outflow obstruction

The inadequate and uncoordinated contractions of the bladder and the associated spasm of the pelvic floor including the external sphincter, predispose to the development of residual urine, chronic retention, hydroureter, hydronephrosis, infection and renal failure.

Patients may be investigated urodynamically to confirm that the bladder pressure is not significantly in excess of the urethral resistance. Prompt action *must* be taken. This may involve catheterization or transurethral division of the external sphincter with or without resection of the bladder neck. The results are good in the majority of patients^{4,5}.

Urinary diversion

Diversion of the urine is rarely indicated. When essential it should always be carried out by means of an external loop since ureterosigmoidostomy in patients following spinal cord injury is quite unacceptable as the patient has no means of controlling the anal sphincter.

Rationale for Spinal Cord Injury Units

Patients with spinal cord injury require medical and surgical advice in the first days and weeks after injury and commonly develop complications requiring the services of the urologist, orthopedic surgeon, plastic surgeon, neurologist and specialists in rehabilitation medicine. They are best managed in Spinal Cord Injury Units staffed by doctors with special training in these areas. In this way the early problems of paralytic ileus, respiratory difficulty, deep vein thrombosis and pulmonary embolism are avoided or treated and long-term arrangements can be made for the management of the urinary tract, the prevention of orthopedic problems and the prevention of bedsores. Such patients will require to be reviewed regularly by a neurologist and may need the services of the orthopedic surgeon to correct deformity and to maximize such residual function as persists.

It is only if such patients are managed in the specialized unit that early mortality and severe morbidity can be minimized.

Acknowledgment

I should like to thank Miss L. Halstead for typing the manuscript.

REFERENCES

1. Cook JB, Smith PH. Percutaneous suprapubic cystostomy after spinal cord injury. *Br J Urol* 48:119, 1976.
2. Smith PH, Cook JB, Burt AA. Percutaneous cystostomy in paraplegia - a follow-up of 41 patients. *Paraplegia* 14:135, 1976.
3. Smith PH, Cook JB, Rhind JR. Manual expression of the bladder following spinal injury. *Paraplegia* 9:213, 1972.
4. Smith PH, Cook JB, Arrowsmith WA. Trans-urethral resection of the bladder neck and external sphincter after spinal cord injury. *Proceedings of the 18th Veterans Administration Spinal Cord Injury Conference*, 1971, pp 166-169.
5. Philp NH, Thomas DG, Rickwood AM. The effect of anteromedian sphincterotomy on penile erections in patients with neuropathic bladder. *Paraplegia* 21:301, 1983.

DISCUSSION

Chisholm: What's the place of urodynamics in spinal injury symptoms?

Smith: Would you like me to give you the honest truth?

Chisholm: Yes, have you got the machine?

Smith: Yes, we've got the machine.

Chisholm: Is it used?

Smith: No.

Chisholm: Not plugged in?

Smith: I was taught by a neurologist who said:

"If you talk to a patient, you would nearly always know what the problem was. If you then did a simple filling cystometrogram you would get a great deal of further information". He offered me a simple cystometrogram, and I did cystometrograms — after talking with the patients — and I discovered that if I put in fluid for the thing, I got one result, if I connected the patient up to the machine, and let him do his own cystometrogram over three or four hours, I got quite a different result; if I connected him up for 24 hours, it was really quite fascinating, and the results, the pressure in the patient's bladder as changes were occurring were quite dissimilar to the cystometrographic finding, and I was greatly relieved when Bob said "well, somebody from Liverpool had suggested that a simple cystometrogram was probably as good as anything else".

Şimşek: I believe it is customary to set an upper limit to the degree of enlargement of the prostate gland in such operations? What is your upper limit? What's the largest prostate you've resected transurethrally?

Blandy: I resect very large prostates only by accident because I find myself quite incapable of guessing the size of a prostate. It seems to me that the difficulties don't entirely depend on the size of the gland in terms of grams, but upon whether you've got a bladder neck which is comfortable. If you've got a fairly wide bladder neck and you can see what you're doing and the distance isn't too enormous, you can go on resecting all afternoon and take out 100 grams of prostate, and it's not difficult.

Whereas if you've got a long, thin, stiff and rather tight urethra, it's almost impossible to remove a prostate this way even if it is only 40 grams. If I can't see into the bladder properly, I do open prostatectomy.

Şimşek: What is your ratio of incidental prostatic carcinoma in transurethraly resected BPH?

Blandy: It runs about 10% in our series, 10-15% ; but our pathologists don't like to do serial sections of every chip. There's a very nice study that was carried out in Helsinki. The pathologist was bullied into examining an increasing proportion of prostatic chips till eventually step sections on every chip were done, and when they got to that it was almost 100% of incidental carcinoma and prostate.

Avanoğlu: In comparing zero degree lenses and 30 degree lenses, what are the advantages and disadvantages? And which one do you usually prefer?

Blandy: I'm trying to teach myself to resect with the zero lens but I find it very difficult. Last week I was in Karlsruhe and had a most unhappy experience there; I was offered an unfamiliar resectoscope and a zero telescope. The patient was trying to help me, and then he got the most fantastic erection just before I started. I nearly went home. I would have preferred to. Can I just make a point here? Perhaps some less experienced resectors in the audience need to be warned about the dangers of an erection. I think if a patient gets an erection you should stop. Sometimes I'm asked to look at the medico-legal documents of patients who are suing their surgeons for being made incontinent. And if you look between the lines it's quite clear that the patient who has started to bleed has got an erection; and the surgeon has got lost because the instrument has got pushed out; at such times it's easy to start resecting what you think is prostate but what is in fact sphincter. Have you experienced the same?

Remzi: Exactly.

Blandy: It's terribly dangerous.

Barlas: I remember one case of resecting. The patient had a tremendous erection and I cut the sphincter. Last year I had two cases of erection. With both I stopped surgery and sent the patient back to his room. I couldn't get the erection down.

Tellaloğlu: Most patients wouldn't believe that they had an erection, you know. Postpone the operation for an erection, they wouldn't believe you.

Blandy: I have no hesitation about putting the operation off if they get an erection. I congratulate them, though. I say "you lucky old man" you know.

Avanoğlu: What is your retrograde ejaculation rate?

Blandy: I don't know, because I don't ask all my patients. I warn everyone. We now write it down in the consent form, because they are now suing doctors for causing retrograde ejaculation. They don't all have it and I don't understand why.