



# A 10 year review of the endoscopic treatment of 125 spinal cord injured patients with vesical outlet obstruction: does bladder neck dyssynergia exist?

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The management of 125 patients with post-traumatic neuropathic bladder and vesical outlet obstruction is described and a policy of endoscopic treatment is suggested. A total of 1652 spinal cord injured patients were treated during the period of 1983–1992. About 8% had an outlet of obstruction which required endoscopic treatment. The outcome of transurethral resection of the external sphincter and/or bladder neck was retrospectively analyzed in 82 patients, and a prospective study was conducted on the other 43 patients. We have demonstrated that patients with a complete spinal cord lesion at any level, and those with a high incomplete lesion (above T-9) have benefited from external sphincterotomy combined with bladder neck resection. We emphasize that patients with a low incomplete lesion (T-9 and below) have benefited from bladder neck resection alone. Bladder neck (internal sphincter) obstruction or dyssynergia may require to be considered in the management of the neuropathic bladder.

**Keywords:** spinal cord injury; vesical outlet obstruction; endoscopic treatment; bladder neck dyssynergia; transurethral resection

## Introduction

The exact nature of the vesical outlet obstruction of the neuropathic bladder is not well known and completely understood. It is agreed that the greatest resistance to the outflow of urine is at the level of the bladder neck and the external sphincter.<sup>1,2</sup>

The aim of management by transurethral (TUR) procedures is to preserve the upper urinary tract and renal function, to avoid incontinence of urine and to render patients catheter free as soon as possible with no or the least residual urine.<sup>3,4</sup>

Our indications for TUR-bladder outlet procedure have been high residual urine (more than 80 ml) with or without vesico-ureteric reflux, poor vesical emptying and autonomic dyssynergia when drugs failed.

This study aims at demonstrating the benefit from TUR-bladder outlet procedures in the management of the spinal cord-injured patients at the reeducation phase and the stable phase.

Revival of the use of the TUR-bladder neck alone

or as an adjunct to TUR-external sphincter, according to the level and severity of the spinal injury has been considered.

## Patients and methods

By an average period of 4.5 months after the injury, the majority of 1652 spinal cord injured patients had a well established program of rehabilitation and passed urine either by tapping or by the crede technique with or without the aid of drugs. Vesical outlet obstruction had delayed the rehabilitation.

One hundred and twenty five patients who had a vesical outlet obstruction which was not relieved by drugs, were endoscopically operated upon from January 1983 through to December 1992 at the Department of Urology and Renal Transplantation, Al-Rasheed Military Hospital. These patients comprised about 8% of the total number of spinal cord-injured patients ( $n = 1652$ ).

All patients were males, their age ranged from 17 to 60 years (mean 29 years old). The follow up period ranged from 1 to 33 months (mean 7 months). They were hospitalized at general hospitals at the time of

injury and transferred later to Al-Rasheed Military Hospital for neurosurgical assessment and finally settled at Ibn Al-Knuff or Ibn Al-Mutam Spinal Centres for rehabilitation. All patients were catheterized because of urinary retention after injury.

#### Bladder evacuation

Our policy for the acute phase was as follows: (1) Indwelling urethral catheter in 119 patients (95.2%); (2) Suprapubic catheterization (Stab technique) was performed on the other 6 patients (4.8%) for accompanying urethral, peno-scrotal or perineal injuries.

Intermittent catheterization was not practised for logistic reasons.

#### Investigations

All patients had a neurological assessment to detect the level of the injury, and whether the injury was complete or incomplete. Frequent examinations for anal tone and the bulbocavernosus reflex were performed.

Patients had repeated urine specimens taken and studied for culture and sensitivity, and had frequent measurements of the blood urea and the serum creatinine. They had base-line excretory urography. Micturating cystography, ascending urethrography and cystourethroscopy were performed when specially indicated.

Bladder function was assessed by cystometry and a urethral pressure profile performed using the Dantec apparatus of 6 channels, the ice-water test and by repeated measurement of the residual urine (after bladder evacuation by tapping or crede). No specific urodynamic data are included in this study, but they will be referred to in general terms of their results.

#### Treatment policy

We aimed at obtaining a residual urine volume of less than 80 ml after tapping or manual compression. When it was more than that on repeated measurements, one of the following therapies was tried: (1)

Parasympathomimetic drug, Distigmine, when the bladder contractions were weak on cystometry. (2) Alpha-adrenergic blocking drug, Phenoxybenzamine, when there was an outlet obstruction. (3) Transurethral resection of the external sphincter and/or bladder neck when drugs failed.

Medical nerve blocks, and surgical neurectomies and rhizotomies were not practised on our patients. Nor have we used urethral stents.

One hundred and sixty one operations were performed on 125 patients during the period of the study. Patients were divided into two groups (A and B) representing two eras. The first extended from January 1983 through to December 1987, and the second from January 1988 through to December 1992.

Patients of group A ( $n=82$ ) were randomly treated according to various policies of other workers<sup>5-9</sup> due to lack of personal experience and were retrospectively analyzed (Table 1). Thirty seven patients were treated by TUR-bladder neck only, which was repeated on two of them. Sixteen patients were treated by TUR-bladder neck followed by TUR-external sphincter because of the results of bladder neck resection failed to achieve an acceptable amount of residue urine. In 29 patients TUR-external sphincter was primarily chosen, combined with TUR-bladder neck in 23 patients.

A preliminary analysis of 60 patients from group A, which was conducted in a previous study<sup>10</sup> showed that the severity of the neural injury (whether complete or incomplete) and level (whether above or below T-9) of the injury were crucial for the indication of either procedure.

Accordingly, a prospective study on 43 patients (group B) was carried out in the second era. Patients were treated with a selective policy according to the level and severity of the condition (Table 2). Patients who had a complete lesion at any level and those with incomplete lesion above T-9, underwent external sphincterotomy and bladder neck resection. Those with an incomplete lesion at or below T-9 had only TUR-bladder neck, while TUR-external sphincter was reserved for patients in whom bladder neck resection did not achieve an acceptable residual urine.

**Table 1** Number of patients and the types of TUR-procedures in relation to the level and severity of the injury in group A ( $n=82$ )

	Complete lesion (no. of pat.)		Incomplete lesion (no. of pat.)	
	Above T-9	T-9 and below	Above T-9	T-9 and below
TUR-bladder neck	10	12	2	13
TUR-bladder neck followed by TUR-external sphincter	6	3	3	4
TUR-external sphincter	2	2	1	1
TUR-external sphincter and bladder neck	13	5	3	2

*Surgical procedure*

TUR-bladder neck involved complete removal of all tissue from around the internal meatus to the verumontanum (about 5–8 gm of tissue). TUR-external sphincter was done by making two posterolateral cuts just distal to the verumontanum extending downwards for about 3 cm. Both procedures were done with a hot loop resectoscope which achieved better hemostasis necessary for the external sphincterotomy.<sup>10</sup> None of the patients had an anatomical obstruction to the outflow (BPH or otherwise). Post surgery emptying was by tapping or crede after 5 days of catheterization.

*Antibiotic policy:*

Until the bladder is rehabilitated, urinary tract infection was avoided by proper positioning of the catheter and the intake of plenty of fluids (4–5 L/day). The bladder was washed out with Rifocin diluted in normal saline (50 mg/100 ml)<sup>11</sup> for frank pyuria and haemorrhagic cystitis. No prophylactic antibiotics were given to catheterized patients unless systemic effects arose, or renal function declined as a result of infection.

In patients who are catheter free, the appropriate antibiotic was given according to bacteriological testing of mid-stream urine. Some patients were placed on a long term prophylactic dose of Co-trimoxazole (2 tablets a night) for rapidly recurring urinary tract infection caused by microorganisms sensitive to it.

**Results**

On a retrospective analysis of group A patients (January 1983 through to December 1987), we found that TUR-bladder neck was done more in low (T-9 and below) incomplete lesions (13 of 20 patients – 65%). External sphincterotomy (performed either per primam or after bladder neck resection) was done more in high (above T-9) lesions (31 of 53 patients – 59%) as shown in Table 1. The mean pre-operative residual urine in this group of patients was 360 ml (range 100–1000 ml) dropped to 40 ml (range 0–200 ml) post-operatively.

Accordingly, group B patients (January 1988 through to December 1992), underwent bladder neck

resection when their lesions were incomplete at or below T-9 (8 patients), while external sphincterotomy combined with bladder neck resection was performed on all patients with a complete lesion at any level (31 patients) and on patients with an incomplete lesion above T-9 (4 patients) as shown in Table 2. No patient of the TUR-bladder neck group required an external sphincterotomy. Neither procedure had to be repeated. In this group of patients the average pre-operative residual urine was 320 ml (range 50–750 ml) dropped to 30 ml (range 0–150 ml) post-operatively.

Residual urine measurements were taken at the last visit to the clinic, which marked the end of the observation period.

Pre-operatively, in group A, the urine was infected in 71 of the 82 patients (86%) dropped to 45 (55%) post-operatively, while on group B the urine was infected in 30 of the 43 patients (70%) pre-operatively, dropped to 10 (23%) post-operatively.

Twenty one patients from both groups (16.8%) had hydroureteronephrosis pre-operatively which remained stable ( $n=13$ ) or improved ( $n=8$ ) post-operatively. In five patients who had vesico-ureteric reflux on micturating cystography, the reflux either disappeared ( $n=2$ ) or improved ( $n=3$ ). The pre-operative blood urea and serum creatinine were normal in all the patients except three who were in renal failure, which stabilized post-operatively. By the end of the study period, 30 patients (24%) required re-insertion of the suprapubic or urethral catheter permanently for severe bladder contraction and/or severely damaged urethra (11 patients) and for patients who were less motivated and non-compliant who presented with overflow incontinence (19 patients).

*Complications*

No mortality was attributed to any of the procedures. One patient died because of septicemia from a liver abscess. Two patients showed abnormal levels of blood urea and serum creatinine post-operatively. The other significant operative complication noticed was secondary hematuria which occurred in patients who had a severe uncontrollable infection prior to external sphincterotomy (10 patients – 8%). None of the patients had incontinence at the end of the study period, apart from the 19 patients who were non-compliant and had to be re-catheterized because of retention overflow.

**Table 2** Number of patients and the types of TUR-procedures in relation to the level and severity of the injury in group B ( $n=43$ )

	Complete lesion (no. of pat.)		Incomplete lesion (no. of pat.)	
	Above T-9	T-9 and below	Above T-9	T-9 and below
TUR-bladder neck	–	–	–	8
TUR-external sphincter and bladder neck	17	14	4	–

## Discussion and conclusion

Sham Sunder and his co-workers stated that for voiding to take place in patients with spinal cord injury two conditions must apply; first, the bladder neck must be open either by detrusor contraction, albeit reflex or uninhibited, as in upper motor neurone lesions, or by abdominal straining augmented by bladder neck resection as in lower motor neurone lesion. Second, the resistance in the membranous urethra (external sphincter) must remain below the intra-vesical pressure<sup>12</sup>.

Trans-urethral resection of the bladder neck was first introduced by Emmett in 1940<sup>13</sup> and external sphincterotomy by Ross in 1956.<sup>14</sup>

Currie and his associates stated that the indications for external sphincterotomy in patients with an upper or lower motor neurone bladder are; the requirement of urethral catheter drainage due to an inability void, a high residual urine and/or early vesico-ureteric reflux.<sup>5</sup>

Gibbon performed bladder neck resection on patients with a lower motor neurone bladder in whom there were no detrusor contractions to pull open the bladder neck and sometimes it needed to be followed by an external sphincter division. He had also indicated that in the upper motor-neurone bladder with detrusor contractions there was normally no indication for a bladder neck resection and, when necessary external sphincterotomy can confidently be carried out as a primary procedure.<sup>6</sup>

Ross and his co-workers performed external sphincterotomy on all patients whether with an upper or a lower motor neurone bladder,<sup>7</sup> while O'Flynn performed bladder neck resection as the primary operation irrespective of the type of bladder dysfunction, and if that failed an external sphincterotomy was performed.<sup>8</sup> Combined bladder neck resection and external sphincterotomy has been in practice at Meath Hospital, Dublin since 1971.<sup>9</sup>

Our policy in the first era (group A) was a mixture of policies of other centres,<sup>5,9</sup> and analysis showed that the patients with high incomplete lesions (above T-9) and those with complete lesion at any level had undergone external sphincterotomy more frequently (38 of 62 patients – 61%) as final treatment, preceded by ineffective TUR-bladder neck in 12 of them, while patients with low incomplete lesions (at or below T-9) had undergone bladder neck resection more frequently (13 of 20 patients – 65%) as final treatment.

In the second era, (group B), the policy was modified according to a previously published retrospective analysis of all the patients in the first era,<sup>10</sup> so that all the patients with complete lesions at any level ( $n=31$ ) and those with incomplete lesions above T-9 ( $n=4$ ) underwent primary sphincterotomy combined with bladder neck resection, while all patients ( $n=8$ ) with incomplete low lesions (at or below T-9) underwent primary bladder neck resection which agrees with Gibbon.<sup>6</sup> We differed in that the selection of either procedure has depended on the level of the

injury (whether it was at or below T-9 or above this level) and on the severity of cord injury (whether it had resulted in a complete or in an incomplete lesion). We differed also in that we combined bladder neck resection with external sphincterotomy on patients who required the latter.

The importance of this particular level of spinal injury had been noted by Parlow and Diokno,<sup>15</sup> although they used the vertebral level T-7 as the line of demarcation, which coincides with the T-9 cord level observed in our study. A sub-group of those patients represented the grey-zone patients who are upper motor neurone spinal patients, but with lower motor neurone sacral bladder neuropathy due to extension of the inflammation, haemorrhage or scarring.

The pre-operative residual urine of the eight patients with low incomplete lesions (at T-9 or below) ranged between 175 ml and 600 ml (average 293 ml). It had dropped post-operatively after doing only bladder neck resection to an average of 17 ml (range 10–22 ml). The pre-operative urodynamic study showed that their external sphincter was either lax in six patients or normal in the remaining two. The explanation is perhaps that the cause of the outlet obstruction is a bladder neck dysfunction. A particular shortcoming of urethral pressure profile studies is that bladder neck function and dysfunction are poorly recorded.<sup>16</sup> A simultaneous cystourethrography would have been useful to demonstrate the adequacy of bladder neck function, but it was unavailable. It is hardly possible to speak of dyssynergia, but more of non-relaxing or functionally obstructive bladder neck, because seven of the eight patients had an areflexic bladder, and the remaining one had weak detrusor activity. In fact, the patient with weak detrusor activity has spastic paraplegia (upper motor neurone) and represents the grey-zone patients described by Perlow and Diokno.

Krane and Olsson hypothesized that some outlet obstruction is the result of inadequate opening of the bladder neck and/or of inadequate decrease in the resistance in the area.<sup>17,18</sup>

Lockhart and his co-workers noticed two bladder neck obstruction cases in a group of 15 external sphincterotomies that failed to achieve acceptable vesical emptying. They suggested bladder neck resection to be performed with external sphincterotomy.<sup>19</sup> Although none of our patients of group A required TUR-bladder neck after TUR-external sphincterotomy, yet we planned TUR-bladder neck simultaneously with external sphincterotomy for group B patients to avoid a possible cause of failure of the sphincterotomy, ie, bladder neck dysfunction or dyssynergia.<sup>19,20</sup>

Our evidence such as it is, may not support the hypothesis of bladder neck dyssynergia, as seven patients (88%) were areflexic, but more work is perhaps needed before firm conclusions can be drawn, but definitely there is a dysfunction in the form of non-relaxation or functional obstruction.

Our policy has spared patients with incomplete low lesion from undergoing external sphincterotomy and were given the advantage of TUR-bladder neck alone which, in itself, is an inadequate treatment for all types of neuropathic bladder.

We managed to render 95 out of 125 patients (76%) catheter free after external sphincterotomy and/or bladder neck resection, and both procedures were effective in reducing the amount of residual urine, and decreasing the rate of urinary tract infection. Patients with hydro-ureteronephrosis or reflux pre-operatively have either improved or remained stable, without further deterioration.

The residual urine volume remains a good indicator of the ability to evacuate the urine by tapping or crede especially if it is repeated and consistent. It is the resultant of all factors and forces affecting urine evacuation that are measured by flow studies and neurophysiological techniques. Such investigations are useful for diagnosis but are perhaps not mandatory for follow-up. What matters in the long run is the state of the upper urinary tract, which is not directly related to the residual urine but depends on the bladder neuropathy. Patients with an areflexic bladder are at lower risk than those with a hyper-reflexic bladder.<sup>21</sup>

Medical nerve blocks, and surgical neurectomies and rhizotomies, according to the experience of others, were not useful and carry the risk of complications.<sup>4,7</sup> They were not practised at our centre. Urethral stents are not yet being used for our patients,<sup>22</sup> due to unavailability.

We have not specially investigated the effect of postero-lateral cuts of the sphincter on the sexual potency of patients. Jameson pointed out that impotence is not a problem if bilateral incisions are made.<sup>23</sup> Neither have we investigated the effect of bladder neck resection on ejaculation. However, it has been shown by others that 85% of patients who underwent bladder neck resection are left with undisturbed ejaculation.<sup>24</sup>

In conclusion, it is essential to relieve the vesical outlet obstruction of the neuropathic bladder. This is done by drugs. If drugs fail to achieve acceptable evacuation, TUR-outlet procedures are performed.

Patients with a high incomplete lesion (above T-9), and all those with complete lesions have benefited from TUR-external sphincter, preferably combined with TUR-bladder neck to relieve the outlet obstruction.

Patients with an incomplete lesion at or below T-9 have benefited from TUR-bladder neck performed per primam, while TUR-external sphincter is reserved in this category of patients for those who fail to achieve optimum emptying of the bladder, although this was not required in any of our patients.

This policy might provide a rough guide to the endoscopic treatment of vesical outlet obstruction where and when urodynamic studies are unavailable.

Urodynamic measurements and neuro-physiological techniques are useful for the diagnosis of bladder dysfunction, but perhaps are not necessary for the follow-up of patients.

## References

- Emmett J.L. and Dunn J.H.: Transurethral resection in the surgical management of cord bladder. *Surg. Gynec. and Obst* 1946; **83**: 597.
- O'Flynn J.D.: Early management of neuropathic bladder in spinal cord injury. *Paraplegia* 1974; **12**: 83.
- Castro, J.: Surgical Aspects: 2 Urological. In, *Progress in Rehabilitation of Paraplegia* 1984; Eds. Capiladeo R. and Maxwell A., McMillan Press, London; 31–48.
- Guttman L.: Spinal Cord Injuries: Disturbances of the bladder and upper urinary tract. Blackwell Publication, London; 331 1976.
- Currie R. J., Bilbisi A. A., Schiebler J.C. and Bunts R.C.: External sphincterotomy in paraplegics: Technique and results. *J. Urol* 1970; **103**: 64–68.
- Gibbon N.O.K.: Division of the external sphincter, *Br. J. Urol* 1973; **45**: 110–115.
- Ross J.C., Gibbon N.O.K. and Sham Sunder G.: Division of the external urethral sphincter in the neuropathic bladder: a twenty years review. *Br Urol* 1976; **48**: 649–656.
- O'Flynn J.D.: Early and late management of the neuropathic bladder in spinal cord injury patients. *J. Urol* 1978; **120**: 726–728.
- Webb D.R., Fitzpatrick J.M. and O'Flynn J.D.: A 15 Years follow up of 406 consecutive spinal cord injuries. *Br. J. Urol* 1984; **56**: 614–617.
- Al-Ali M. and Al-Chalabi K.M. Bladder rehabilitation in patients with spinal cord injury. *Egyptian Rheumatology and Rehabilitation* 1988; **15**: 83–89.
- Salman G.T., Al-Zahawi H., Al-Chalabi K.M. and Salih T.A.: Bladder irrigation in paraplegics. *Egyptian Rheumatology and Rehabilitation* 1988; **15**: 279–290.
- Sham Sunder G., Parson K.F. and Gibbon N.O.K.: Outflow obstruction in neuropathic bladder dysfunction: The neuropathic urethra. *Br. J. Urol* 1978; **50**: 190–199.
- Emmett J.L.: Urinary retention from imbalance of detrusor and vesical neck: Treatment by transurethral resection. *J. Urol* 1940; **47**: 657–662.
- Ross J.C.: Treatment of the bladder in paraplegia. *Br. J. Urol* 1956; **28**: 14–23.
- Perlow D.L. and Diokno A.C.: Predicting lower urinary tract dysfunction in patients with spinal cord injury. *Urology* 1981; **18**: 531–535.
- Turner - Warwick R.T. and Whiteside C.G.: Urodynamic studies and their effect upon management. In *Scientific Foundations of Urology* 1982; Ed. Chisholm D.G. and Williams D.I., 2nd ed., William Heinmann Medical Books, London; 442.
- Krane R. and Olsson C.: Phenoxybenzamine in neurogenic bladder dysfunction. I. A theory of micturition. *J. Urol* 1973; **110**: 650–652.
- Krane R. and Olsson C.: Phenoxybenzamine in neurogenic bladder dysfunction. II. Clinical considerations. *J. Urol* 1973; **110**: 653–656.
- Lockhart J.L., Vorstman B., Weinstein D., and Politano V.A.: Sphincterotomy failure in neurogenic bladder disease. *J. Urol* 1986; **135**: 86–89.
- Steers W.: Comment, voiding dysfunction. *Year Book of Urology* 1992; Mosby Year Book Inc., Chicago: 96–97.
- Yalla S.V.: Editorial Comment, *J. Urol* 1986; **135**: 89.
- McInery P. D., Vanner T.F., Harris S.A.B. and Stephenson T.P.: Permanent urethral stents for detrusor-sphincter dyssynergia. *Br. J. Urol* 1991; **67**: 291–294.
- Jameson M., Division of the external urethral sphincter in spinal cord injured patients. *J. Urol* 1983; **130**: 86–87.
- Pengelly A.W.: Lower Urinary Tract: Bladder neck dyssynergia. In, *Textbook of Genitourinary Surgery* 1985; Ed. Whitfield H.N. and Hendry W.F., Churchill Livingstone, London; 423–428.