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ORIGINAL ARTICLE

Long-term outcome of transobturator tape (TOT) for treatment of stress urinary incontinence in females with neuropathic bladders

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Study design: Retrospective review of prospectively collected data.
Objectives: Stress urinary incontinence (SUI) is a cause of significant distress in women with neurogenic bladder dysfunction (NBD) due to spinal cord injury (SCI). Transobturator tape (TOT) has not previously been studied in this select group for cure of SUI. We aim to determine the long-term safety and efficacy of TOT in SCI patients with NBD and SUI.
Setting: London, the United Kingdom.
Methods: All patients undergoing TOT between 2005 and 2013 were identified (27 patients). All patients had pre-operative videocystometrogram (VCMG) and all had VCMG-proven SUI. Mean follow-up was 5.2 years. Patient-reported leakage, satisfaction, change in bladder management, complications and *de novo* overactive bladder (OAB) were recorded.
Results: Mean age was 56 years (range 30–82) with complete follow-up. Twenty-two patients (81.5%) reported complete dryness from SUI post surgery. One patient (3.7%) reported SUI only when her bladder was very full but was satisfied. Twenty-three patients (85.2%) were happy. Four patients (14.8%) remained wet. Twenty-five patients (92.6%) had no change in bladder management. Two out of five patients (40%) who voided by straining prior to surgery required clean intermittent self-catheterisation (CISC) post-operatively. Two patients (7.4%) developed *de novo* OAB. No bladder or vaginal injuries, tape erosions or urethral obstruction were seen. Three patients (11.1%) had transient thigh pain.
Conclusion: In women with NBD and SUI, TOT should be considered safe and effective with very good medium/long-term outcomes. There may be an increased risk of CISC in women who void by straining pre-operatively.
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INTRODUCTION

Stress urinary incontinence (SUI) in women with neuropathic bladder dysfunction[1] (NBD) can be a major disabling feature. In the general population up to 25% of women are thought to be affected,[2] although among neuropaths the incidence remains unknown.

In women with NBD, such as after spinal cord injury (SCI), there are specific additional problems compared with the general population that require consideration. For instance, neuropathic patients may have neurogenic detrusor overactivity (NDO) in association with weakness of the external urethral sphincter or a weak sphincter with an acontractile bladder. Particularly after childbirth, this sphincteric dysfunction may be seen in association with hypermobility or prolapse, which can further complicate management.

Following Ulmsten's original description[3] in 1996 of a synthetic polypropylene tension-free vaginal tape placed at a mid-urethral level in retropubic fashion, our unit was the first to study the success of this procedure in neuropathic patients.[4,5] This showed success comparable to non-neuropaths in both short and long term with few complications. The aim of this study was to present the first series of long-term safety and efficacy outcomes of placement of mid-urethral synthetic transobturator tapes (TOT) in patients with urodynamically confirmed SUI and NBD due to SCI.

MATERIALS AND METHODS

Twenty-seven women with SCI and SUI were treated with insertion of TOT between February 2005 and May 2013 at a tertiary level referral centre for spinal injuries. The mean (range) age of the patients was 56 (30–82) years. The causes of NBD are shown in Table 1. All patients suffered SCI as a result of a traumatic or iatrogenic event. All patients underwent pre-operative videocystometrography (VCMG), which confirmed SUI in all cases. Six patients additionally were found to have NDO, which was successfully managed with botulinum toxin type A before surgery.[6]

Bladder drainage before surgery was by clean intermittent self-catheterisation (CISC) in 11 (one via a Mitrofanoff), indwelling urethral catheterisation in 4, suprapubic catheterisation in 7 and voiding by straining in 5.

The TOT surgery was performed under spinal or general anaesthesia and a single dose of intravenous antibiotic was given at induction. The operations were performed by one of two surgeons in our unit using a standard technique. The anterior vaginal wall was incised longitudinally over the urethra and the periurethral space dissected sharply to the pubic rami. A polypropylene mid-urethral mesh was placed using curved insertion needles in an inside-to-out fashion via the obturator foramen. Skin incisions (5 mm) were made over the insertion needles' exit point. The mesh was tensioned by placing a pair of Mayo scissors between the tape and urethra in order to prevent over-tensioning. However, in contrast to non-neuropathic population, the tape was tightened more snug underneath the urethra as a majority of patients were using an assisted method of bladder emptying. After confirmation of satisfactory

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Table 1 Level of neurological injury in patients with SUI undergoing TOT

Level of injury	*Number*
Above T12	2
T12 and below	22
Sacrectomy	3

Abbreviations: SUI, Stress urinary incontinence; TOT, Transobturator tape.

Table 2 Outcome post-TOT by continence status

Outcome	*Number (%)*
Number of patients	27 (100)
Dry	22 (81.5)
Improved and happy	1 (3.7)
Failed	4 (14.8)
Lost to follow-up	0 (0)

Abbreviation: TOT, Transobturator tape.

positioning, the ends of the tape were cut and buried and a stitch used to close each incision. A cystoscopy was performed to check bladder integrity. A catheter was placed overnight and removed the following morning. In patients who were voiding spontaneously, post-void residual volumes were checked to ensure adequate bladder emptying. Patients who were performing CISC were assessed to ensure ease of self-catheterisation. If there was any evidence of difficulty in performing CISC then the catheter was left in for 7 days before re-commencing CISC.

Patients were followed up at 3, 6 and 12 months, then yearly thereafter. Post-operative VCMG was performed in 19 patients. Eight patients either refused or did not attend VCMG (all such patients reported themselves as dry and did not feel that a repeat VCMG was necessary). Data were collected prospectively and analysed by chart review. Patient-reported leakage, patient satisfaction, change in bladder management, complications and the occurrence of *de novo* overactive bladder (OAB) were recorded from the patients' record and VCMG.

RESULTS

All 27 patients were followed up. The mean follow-up period was 5.2 years (median 5.6 years), range 1–9 years. Table 2 shows the results. Patients were considered dry if they reported complete correction of stress incontinence after TOT without the need to wear incontinence pads post-operatively. The one patient who reported stress incontinence only when her bladder was very full was happy with this and increased her frequency of CISC. Twenty-three patients (85.2%) were therefore satisfied with their outcome. No patient complained of worsening incontinence during the follow-up period.

Four patients (14.8%) remained wet. Two had residual SUI on VCMG: one responded to peri-urethral injection of a bulking agent and the other went on to have a rectus fascia retropubic sling. One woman had *de novo* OAB that responded to botulinum toxin type A. The final woman had pre-existing acontractile bladder and was voiding by straining and despite her TOT the incontinence persisted. It resolved with the commencement of CISC.

Twenty-five patients (92.6%) had no change in bladder management and continued to empty in the same manner as before surgery. Two out of five patients (40%) who were voiding by straining before surgery required CISC post-operatively.

Two patients (7.4%) developed *de novo* OAB, one was wet (as mentioned above) and the other was dry, both confirmed at VCMG. Both responded to botulinum toxin type A.

No bladder injuries, vaginal injuries or tape erosions were seen over the follow-up period. No patient suffered post-operative urethral obstruction. Three patients (11.1%) had transient thigh pain, two bilateral and one unilateral, that were self-limiting. Two resolved within 3 days, one woman with a history of multifactorial chronic pain resolved within 6 months.

DISCUSSION

The paradigm of treatment in women with neurogenic bladders differs from that in non-neurogenic bladders. Bladder dysfunction, such as NDO and decreased bladder sensation with filling is often the underlying cause of incontinence in these patients, rather than purely sphincteric issues. The main principle of bladder management is protection of the upper tracts.[7] Hence, if NDO is present, it is treated with anticholinergic medication and increasingly with intravesicular botulinum toxin type A injections. This in turn may lead to a dependence on CISC. Conversely, in patients with acontractile bladders, CISC may be required for effective bladder emptying. Hence, the need to perform CISC after an incontinence procedure is usually considered an acceptable outcome in neuropathic patients, whereas in the general population such an outcome would not be satisfactory.

Treatment options for SUI include periurethal bulking agents, synthetic mid-urethral slings (either retro-pubic or transobturator), autologous slings and artificial urinary sphincters. Phamacological agents are now rarely used.[8] Bulking agents have been found to have poor long-term success.[9] The artificial urinary sphincter is effective; however, its limited mechanical life and high costs bring disadvantages.[10,11] As the initial use of autologous slings showed excellent continence improvement,[12] the operative morbidity and complications of harvest site pain and infection has seen synthetic sling usage increase.[13]

The treatment options for female SUI continues to improve, and increasingly more options available to the general population are being shown to be successful in the neuropathic population—such as the tension-free vaginal tape placed in a retro-pubic manner. Our series is the first to evaluate the long-term effectiveness of TOT in women with SUI due to SCI. We present a homogenous group of patients with pure SCI and complete follow-up. We have shown a very good long-term outcome with a high success rate of 82% in correction of SUI with a patient satisfaction rate of 85%. No major complications were seen, with only two patients requiring a change in bladder management and a further two developing *de novo* OAB—although only one patient suffered incontinence due to this. Rates of *de novo* OAB in the general population after mid-urethral sling surgery are reported as up to 15%,[14] so the results are within acceptable limits.

Our results also compare favourably to previously reported success rates with tension-free vaginal tape,[4,5,15,16] with success rates at least as great with longer follow-up in our study. Furthermore, our results are comparable to those achieved in the general population undergoing TOT surgery.[17–20] The reason for these good results is not clear—it may be that in our homogenous population of women with neuropathic bladders, bladder and outlet pathology is better understood. It may be also that these women are inherently less mobile and less active—both in the immediate post-operative period (hence putting their TOT under less stress) and in the long term (hence not subjecting their TOT to the same degree of strain as in a neurologically intact woman).

Limitations of our study are its retrospective nature and the relatively small number of patients involved. However, as all our patients are known to our spinal injury service, they remain under

life-long surveillance and therefore we were able to achieve complete follow-up of all patients. Although we did not have post-operative VCMG data on all patients, VCMG was available on all women who did not have a satisfactory outcome.

It is useful to be aware that insertion of TOT in neuropathic patients may worsen bladder dysfunction for several reasons. NDO may be worsened or occur as *de novo* OAB, possibly due to the activation of the voiding reflex by stimulation of the afferent receptors in the proximal urethra. Furthermore, patients who void spontaneously pre-operatively may need to perform CISC post-operatively. Two such women required a change in bladder management in our study. Finally, excessive tape tensioning may prohibit the continued successful performance of CISC post-operatively requiring tape incision to relieve bladder outlet resistance. Fortunately, this did not occur in our group. We believe that it is especially important in this group to tension the tape judiciously, in order to minimise a disturbance in post-operative voiding function. It is important to counsel women who pre-operatively void by straining that there is an increased likelihood of dependence on CISC after TOT insertion.

In women with neurogenic bladder dysfunction who have SUI, which requires surgical intervention, TOT should be considered a safe and effective treatment with very good long-term outcomes. There may be an increased risk of CISC in women who void by straining pre-operatively.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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