# A Retrospective Study Comparing Retropubic Versus Transobturator Sling Systems for Treatment of Urodynamic Stress Incontinence in Hong Kong Chinese Women: a One-year Outcome Review

**SM WONG** MBBS, MRCOG
**WY CHAN** MBBS, MRCOG, FHKAM (O&G)
**WM TONG** APN (Urogynaecology)
**WC CHEON** MBBS, MRCOG, FHKAM (O&G)

Department of Obstetrics and Gynaecology, Queen Elizabeth Hospital, Hong Kong

*Objectives:*
To compare surgical outcomes of retropubic suburethral slings (RPS) and transobturator suburethral slings (TOS) for the treatment of urodynamic stress incontinence in local Chinese women at 1 year after operation.

*Methods:*
In this retrospective study, 402 patients with urodynamically proven stress incontinence who underwent RPS or TOS sling procedure during the period from January 1999 to July 2007 in the urogynaecology centre of Queen Elizabeth Hospital were reviewed. Immediate surgical outcome and at 1 year later in the two groups were compared.

*Results:*
In all, 281 patients had the RPS procedure and 121 had the TOS procedure during the study period. The TOS group resulted in significantly less bladder injury (0% vs 6%; p=0.004). Patients having the TOS experienced more pain than those having the RPS, as gauged by the visual analogue pain score on postoperative day 1 (scores being 4.8 vs 2.9, respectively; p=0.005). One year after the procedure in the TOS and RPS groups, there was no significant difference in tape excision due to voiding dysfunction (3% vs 6%, respectively; p=0.131), subjective success rate (87% vs 90%, respectively; p=0.322). In the TOS group, there was significantly less subjective urgency (10% vs 23%; p=0.002), poor stream voiding (3% vs 4%; p=0.004), and subjective incomplete emptying of the bladder (1% vs 5%; p=0.002). In the TOS and RPS groups, urodynamic study 1 year post-operation showed no significant difference in the objective success rate (94% vs 89%, respectively; p=0.165). There were significantly fewer patients with peak flow rate lower than 15 ml/s in the TOS group (30% vs 51%; p<0.001).

*Conclusion:*
The transobturator approach to treatment of urodynamic stress incontinence is as effective as the retropubic approach and results in less bladder injury in Chinese women.
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## Introduction

The reported prevalence of urinary incontinence in Hong Kong was around 21 to 41%, of which 40% was due to stress incontinence in women[1,2]. Tension-free vaginal tape used to treat urinary stress incontinence was first introduced by Ulmsten et al in 1995[3,4]. Widespread use of the procedure since then has resulted in success

*Correspondence to: Dr SM Wong*
*Email: assumptawong@yahoo.com.hk*

rates ranging from 84 to 95%[3,5-7]. Intra-operative bladder or urethral perforation[7], postoperative voiding difficulties and urgency[8] were well-described complications. Transobturator tape was introduced in 2001 by Delorme[9] as a new method of inserting the tape. Systematic review and meta-analysis showed bladder injury and voiding difficulty were less common in the tranobturator sling group[10]. Nonetheless there was no study performed to compare the surgical outcome between retropubic sling (RPS) and transobturator sling (TOS) in local Chinese population. Our department started to perform the RPS procedure in 1999 and TOS procedure from 2004. This study aimed to compare surgical outcomes including complication rates of the RPS and tranobturator sling procedures in Chinese women.

## Methods

This retrospective study in the urogynaecology centre of Queen Elizabeth Hospital in Hong Kong assessed procedures carried out between January 1999 and July 2007. Surgical outcomes including complication rates were reviewed. Outcomes at the 1-year follow-up were also evaluated.

All patients who underwent sling procedures underwent preoperative urodynamic study. This entailed uroflowmetry, filling / voiding cystometry, and a 1-hour pad test. All patients reviewed were confirmed to have urodynamic stress incontinence. All the patients in this study were local Chinese women who underwent RPS or TOS procedures as primary treatment of urodynamic stress incontinence during the relevant period. Patients who had had previous surgery for continence surgery (e.g. colposuspension or previous sling procedures) were excluded from the study.

Hysterectomy, whenever needed, was performed prior to the sling procedure. Blood loss and operating time was noted. At the end of the operation, operating time and blood loss associated with the sling procedure alone were subtracted from total operating time and total blood loss. Any intra-operative bladder perforations, postoperative febrile morbidity, and urinary tract infections were logged. Postoperatively, urine output was charted after every void, and twice daily the residual urine volume was measured using a bladder scan machine. If after 48 hours, the patient could not void satisfactorily with residual urine volumes repeatedly

exceeding 150 ml after removal of the foley catheter and attributed to a tight sling, downward traction was applied to the tape through the urethral wound using a uterine sound. Patients were discharged when they could void satisfactorily with residual urine volumes of less than 150 ml on two consecutive occasions.

Patients were asked to complete a visual analogue scale (VAS) of pain on day 1, 2 weeks, and 3 months after the operation. All patients were followed up routinely at 3 months, 6 months, and 1 year after the operation.

Outcome measures included operating time, operative blood loss, complications, postoperative pain score, duration of hospital stay, as well as subjective and objective changes in the severity of incontinence. Subjective outcomes were defined according to the description of symptoms (present or absent) in the standard follow-up forms. Objective outcomes were assessed by urodynamic testing, performed 1 year after operation. The operation was considered successful if the patient was dry during six consecutive severe coughs during urodynamic testing.

### *Operative Techniques*

Retropubic slings were mainly used from 1999 to 2005 as this was mostly available during that period. All patients underwent spinal or general anaesthesia, depending on the patient's and anaesthetist's preference. We used the Gynecare TVT system (Ethicon, Inc., Somerville [NJ], US) in the retropublic sling group. The procedure was performed as reported in previous studies[11,12]. A 1-cm incision was made at midline of the suburethral vaginal wall, starting 1 cm below the urethral meatus. Bilateral paraurethral dissection with scissors of around 1 cm was carried out to allow insertion of a trocar in the later part of the procedure. Two 1-cm transverse abdominal skin incisions were made close to superior rim of pubic bone where the trocar exits. The trocar and tape were inserted into the suburethral incision and pushed with the handle attached, towards both sides of the urethra and the urogenital diaphragm, into the retropubic space. The tip of the trocar was brought up to the abdominal incision. The proximal end of the trocar was disconnected and brought into position by pulling the needle upwards with the tape attached. Cystoscopy was performed after the procedure to exclude bladder perforation. The tape was placed under the mid-urethra

without tension and the plastic sheath was withdrawn.

Transobturator tapes were mainly from 2005 to 2007 as they became available to us later and the relevant instrument costs were lower. The type of sling used for the transobturator operation (Gynecare TVT Obturator system or Monarc Subfascial hammock system) depended on availability. The procedure was performed under spinal or general anaesthesia, according to the technique described in the instruction guideline[13], with the bladder catheterized. A 1-cm incision was made at the exit points, located 2 cm above the urethral meatus and 2 cm lateral to the folds of each thigh. A 1-cm incision was made in the midline of the vaginal mucosa starting 1 cm below the urethral meatus. Bilateral paraurethral dissection oriented at a 45º angle from the midline was performed until the junction between the body of the pubic bones and the inferior pubic ramus was reached. The obturator membrane was perforated. The winged guide was inserted into the dissected tract until it passed the inferior pubic ramus and entered the opening previously made in the obturator membrane. The helical passer was inserted into the dissected tract following the channel of the winged guide until the tip traversed the obturator membrane. The winged guide was removed and the handle of the helical passer rotated until it exited the previously made skin incision. The pointed tip of the plastic tube was grasped with a clamp and the helical passer was removed by a reverse rotation of the handle. The plastic tube was pulled through the skin until the tape appeared. The same procedure was repeated on the other side. When both plastic tubes had been extracted, they were cut from the tape and plastic sheaths. The tapes were adjusted and positioned loosely and flat under the midurethra. The plastic sheath that covered the tape was then removed. The tape was cut at its exit points just below the skin of the inner thigh. The skin incision was closed with sutures. Cystoscopy was performed after the procedure to ensure no bladder perforation had occurred. The procedure was similar in patients who had Monarc subfascial hammock system (American medical Systems, Inc., Minnetonka [MN], US) except that the tape was inserted by an outside-in approach from the groin into the vagina. The procedure was carried out using the technique described by the manufacturer[14].

A Foley catheter was routinely inserted after each operation, and removed when the patient was fully mobile on the next day.

### Data Collection and Recording

The urogynaecology team in our department used pre-designed standard forms and data sheets to record data. Clinical data of all urogynaecology patients were entered into these data sheets. Such data included: demographic data, symptoms, and physical findings, preoperative urogynaecological symptoms and the urodynamic diagnosis, perioperative data (operating time, blood loss, postoperative febrile mobidity, urinary tract infections, postoperative pain scores), duration of hospital stay, postoperative urodynamic diagnosis, follow-up symptoms, and physical findings.

Student's $t$ test and Chi-square test were used for statistical analysis and a p value of less than 0.05 was considered statistically significant. Statistical analyses were performed using the Statistical Package for Social Sciences (Windows version 13.0).

## Results

A total of 402 patients underwent sling procedures for treatment of urodynamic stress incontinence during the study period—281 in the RPS and 121 in the TOS groups.

The mean age, parity, number of vaginal deliveries, body weight, prevalence of uterovaginal prolapse in the two patient groups were similar (Table 1). Moreover, urodynamic study revealed no significant differences with respect to preoperative pad test results, peak flow rates or the proportion of patients who had detrusor overactivity (Table 1).

### Perioperative Details

In this study, 134 (48%) patients in RPS group and 45 (37%) in the TOS group had hysterectomies performed at the same time for prolapse symptoms. Data pertaining to operating time, blood loss, bladder injury, other related procedures, and postoperative complications in the two groups are summarised in Table 2. One patient in the RPS group had a 5-cm retropubic haematoma, which resolved after conservative management.

For postoperative wound pain, although the average number of prescriptions for oral analgesics

**Table 1. Patients' characteristics of the retropubic sling (RPS) and transobturator sling (TOS) groups**[*]

| Characteristic | RPS (n=281) | TOS (n=121) | p Value |
|---|---|---|---|
| Age (years) | 59 ± 11 | 56 ± 10 | 0.060 |
| No. of parity | 3.3 ± 2.1 | 2.9 ± 1.5 | 0.129 |
| No. of vaginal delivery | 3.3 ± 2.2 | 2.8 ± 1.5 | 0.098 |
| Body weight (kg) | 54 ± 6 | 54 ± 3 | 0.260 |
| Patients with uterovaginal prolapse | 139 (49%) | 50 (41%) | 0.133 |
| Preoperative pad test (g) | 35 ± 16 | 34 ± 13 | 0.551 |
| Peak flow rate (ml/s) | 21 ± 9 | 22 ± 9 | 0.272 |
| Patients with pre-existing detrusor overactivity | 49 (17%) | 25 (21%) | 0.543 |

[*] Data are shown as mean ± standard deviation or No. (%)

**Table 3. Postoperative visual analogue scale (VAS) pain score of the retropubic sling (RPS) and transobturator sling (TOS) groups**[*]

| Time | RPS (n=281) | TOS (n=121) | p Value |
|---|---|---|---|
| Day 1 | 2.9 ± 2.3 | 4.8 ± 2.5 | 0.005 |
| 2 weeks | 1.3 ± 1.9 | 1.2 ± 2.1 | 0.781 |
| 3 months | 0.3 ± 1.0 | 0.6 ± 1.7 | 0.503 |

[*] Data are shown as mean ± standard deviation

tape manipulation for persistent residual urine volumes exceeding 150 ml 48 hours after foley catheter removal, there was no significant difference between the two groups (Table 2).

*First-year Assessment*

A total of 392 patients, including 272 (97%) patients in the RPS group and 120 (99%) patients in TOS group, were assessed at 1 year after their operation. We attempted to contact the remaining 10 patients who did not come back for follow-up via phone or mail but they did not turn up for examination.

Over 95% of patients in both groups were satisfied after their operation. There were no statistically significant differences between the RPS and TOS groups with respect to subjective success rates (90% vs 87% respectively; p=0.322), urge incontinence rates (33% vs 33%, respectively; p=0.912). However, there were

during hospitalisation was similar in both groups (3.9 in the RPS group vs 3.2 in the TOS group, p=0.392), on day 1, TOS group patients endured more pain as gauged by the mean VAS pain scores (4.8 vs 2.9). In both groups, the mean VAS score for pain decreased to around 1 in 2 weeks' time and even lower 3 months after operation (Table 3).

The RPS group patients had significantly longer mean hospital stays than the TOS group (8 days vs 4 days; p<0.001). Among those not having a concomitant hysterectomy, RPS patients still had significantly longer hospital stays (7 days vs 4 days; p<0.001). Regarding

**Table 2. Comparison of perioperative details in the retropubic sling (RPS) and transobturator sling (TOS) groups**[*]

| Perioperative data | RPS (n=281) | TOS (n=121) | p Value |
|---|---|---|---|
| Duration of operation (mins) | 33 ± 24 | 29 ± 26 | 0.250 |
| Blood loss (ml) | 84 ± 42 | 68 ± 20 | 0.471 |
| Bladder injury | 16 (6%) | 0 (0%) | 0.004 |
| Postoperative urinary tract infection | 11 (4%) | 5 (4%) | 0.461 |
| Postoperative fever | 25 (9%) | 18 (15%) | 0.075 |
| No. of oral analgesic prescription (each prescription = 1 tab dologesics) | 3.9 | 3.2 | 0.392 |
| Length of hospital stay (days) | 8 ± 7 | 4 ± 4 | <0.001 |
| Patients with concomitant hysterectomy performed | 134 (48%) | 45 (37%) | 0.149 |
| Length of hospital stay of patients without hysterectomy (days) | 7 ± 4 | 4 ± 3 | <0.001 |
| Postoperative tape manipulation | 12 (4%) | 4 (3%) | 0.783 |
| Retropubic haematoma formation | 1 (0.4%) | 0 (0%) | 0.471 |

[*] Data are shown as mean ± standard deviation or No. (%)

statistically significant differences in the rates of urinary urgency (23% vs 10%, respectively; p=0.002), subjective sensation of poor stream (4% vs 3%, respectively; p=0.004), and incomplete bladder emptying (5% vs 1%; p=0.002), all in favour of the TOS group (Table 4).

Regarding objective assessments, there were no statistically significant differences in objective success rates (i.e. being dry after six consecutive severe coughs during urodynamic testing) between the RPS and TOS groups (89% vs 94%, respectively; p=0.165), detrusor overactivity (30% vs 31%, respectively; p=0.852), and the pad test results (7 vs 5, respectively; p=0.781). However, there were significantly fewer patients with urinary peak flow rates <15 ml/s during urodynamic testing in the TOS group (51% in RPS group vs 30% in the TOS group; p<0.001). One (0.4%) of the patients had tape erosion in the RPS group but none in the TOS group. Moreover, 17 (6%) of the patients in RPS group and 3 (3%) in the TOS group underwent tape excision within 1 year due to urine voiding dysfunction (p=0.131) [Table 5].

There were two types of sling used in the TOS group. Further statistical analysis showed no significant difference in subjective success rates between the two types of tranobturator slings: 70/82 (85%) in the Gynaecare TVT-O group vs 34/38 (89%) in Monarc group (p=0.538). Similarly, there was no statistically significant difference in objective success rate between the two types of TOS slings (77/82 [94%] vs 36/38 [95%] respectively; p=0.856).

## Discussion

In our study, there was no bladder injury in the TOS group, but a bladder perforation rate of 6% in the RPS group, which was consistent with previously published studies[15]. Bladder perforation is more common in RPS procedures as it involves blind passage of sling through the retropubic space in close proximity to the bladder. The TOS entails passage of the sling laterally and through the obturator foramen, thus sparing trauma to the bladder.

De Tayrac et al[8] reported that mean operating times for RPS procedures were nearly twice as long as those for TOS procedures; cystoscopy not being performed in the latter. Yet in our series, operating times were similar

**Table 4. Comparison of subjective outcomes at 1 year of the retropubic sling (RPS) and transobturator sling (TOS) groups***

| Parameter | RPS (n=272) | TOS (n=120) | p Value |
|---|---|---|---|
| Satisfaction | | | |
| Not satisfied | 13 (5%) | 3 (3%) | <0.001 |
| Satisfied | 259 (95%) | 117 (98%) | - |
| Success rate | 245 (90%) | 104 (87%) | 0.322 |
| Stress incontinence (mild-to-severe) | 27 (10%) | 16 (13%) | - |
| Urge incontinence | 89 (33%) | 40 (33%) | 0.912 |
| Subjective urinary urgency | 63 (23%) | 12 (10%) | 0.002 |
| Sensation of poor stream | 11 (4%) | 3 (3%) | 0.004 |
| Incomplete bladder emptying | 14 (5%) | 1 (1%) | 0.002 |
| Retention of urine | 15 (6%) | 4 (3%) | 0.351 |
| Straining to void | 28 (10%) | 5 (4%) | 0.044 |

**Table 5. Comparison of objective outcomes at 1 year of the retropubic sling (RPS) and transobturator sling (TOS) groups***

| Parameter | RPS (n=272) | TOS (n=120) | p Value |
|---|---|---|---|
| Detrusor overactivity | 81 (30%) | 37 (31%) | 0.852 |
| Peak flow rate <15 ml/s | 139 (51%) | 36 (30%) | <0.001 |
| Success rate | 242 (89%) | 113 (94%) | 0.165 |
| Mean (SD) pad test (g) | 7 (6) | 5 (5) | 0.781 |
| No. having tape excision | 17 (6%) | 3 (3%) | 0.131 |
| No. having tape erosion | 1 (0.4%) | 0 (0%) | 0.471 |

* SD denotes standard deviation

for both procedures because we performed routine cystoscopy in both patient groups. Although we did not encounter bladder perforation in the TOS group, we still advocate post-procedure cystoscopy, as isolated cases of bladder perforation have been reported[16]. Bladder or urethral perforation, which is a serious complication that could lead to litigation, could be easily detected by simple cystoscopy following TOS operations.

In our study, significantly more pain (mainly

in the groin) was encountered on postoperative day 1 by patients in the TOS group, although there was no complaint of prolonged pain after either type of sling procedure. Laurikainen et al[17] also found significantly more pain in those having TOS group, who also received significantly more opiates. We did not found any significant difference in dosage of analgesics taken by the two groups, which could be due to difference in pain tolerance between different ethnic patients. Other studies reported a low prevalence of groin pain, which almost always resolved spontaneously and without intervention[18]. Persistent groin pain after RPS and TOS procedures is uncommon. The differential diagnosis of persistent groin pain after TOS procedures include: adductor muscle strain, osteitis pubis, obturator or groin abscess, adhesions and oedema or nerve entrapment of the anterior branch of the obturator nerve. Obturator abscess is a unique complication of TOS procedures, typically accompanied by vaginal erosions or exposure of the mesh[19].

Laurikainen et al[17] carried out a randomised controlled trial comparing RPS and TOS. In that study, both patient groups stayed in hospital for less than 1 day (14 hours in the RPS group and 17 hours in the TOS group). In our study, both groups had longer hospital stays than described in other studies[8,17]. This could be due to the procedures being performed as an in-hospital rather than day surgery procedure. In Hong Kong, hospitalisation is largely subsidised by the government, and patients like to stay in hospital for longer periods to receive professional nursing care during the postoperative period and receive advice on bladder training.

The RPS group had significantly longer hospital stays than those who had TOS. This was true even in the subgroup of patients not having a hysterectomy. Over the years 2004 to 2006, there was change in department policy in handling admissions of patients undergoing sling procedures. Before 2004, they were admitted 1 day before the operation for anaesthetist consultation and preoperative preparation. After 2005 the practice changed such that patients were assessed in a pre-anaesthetic clinic and admitted on the day of the operation. Moreover, in the first few years of performing sling operations, surgeons had less experience of the postoperative outcomes of such patients, and

kept patients in the hospital to observe their voiding performance, which also resulted in longer hospital stays. As day surgery has become more and more common in recent years, both clinicians and patients expect shorter hospital stays. In this retrospective study, most of the RPS procedures were performed in early years (from 1999 to 2005) and TOS procedures ensued in latter years (mainly after 2005). Therefore shorter hospital stay in the TOS group could be due to changes in departmental policy and clinical practice. This is one of the drawbacks of retrospective analysis, where there could well be a degree of observation bias.

In our study, the TOS approach to treat urodynamic stress incontinence was both subjectively and objectively as effective as RPS approach. Voiding dysfunction may be more common in RPS patients at the 1-year follow-up, as reflected by the patient's questionnaire and objective urodynamic studies. Systematic review and meta-analysis of transobturator and retropubic tape procedures suggest less voiding difficulty in the former group[10]. Reduced risk of voiding difficulty appears to make TOS preferable in women with borderline flow rates[10]. On the other hand, the retropubic approach may be more suitable for patients with intrinsic sphincter deficiency. A randomised controlled trial by Schierlitz et al[20] compared the effectiveness of a tension-free vaginal tape with the transobturator tape in women with stress urinary incontinence and intrinsic sphincter deficiency, and showed that the former was more effective. One possible explanation for this may be the difference in sling axis of these two approaches. The sling axis of the RPS is more perpendicular to the urethral axis, creating more circumferential compression of the urethra. The less acute axis of the transobturator tape mimics the subfascial hammock support of the urethra, and thus, may not provide adequate support in patients with intrinsic sphincter deficiency.

## Conclusion

This study showed that in our study population, the efficacy of the TOS procedure was clinically comparable to the RPS approach. It was also superior to RPS approach in terms of liability to bladder injury. Further prospective randomised controlled trials study may establish additional differences between the TOS and RPS procedures.

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