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Research Paper

Tension-free vaginal tape (TVT-Exact™) for stress urinary incontinence: Experience of a single surgical team performing day-case procedures in three urological wards

Michał Borowik[1], *Dorota Borowik*[2], *Marek Roslan*[1]

[1] *Department of Urology, Faculty of Medicine, University of Warmia and Mazury in Olsztyn, Poland*
[2] *Department of Physiotherapy, Faculty of Health Sciences, Vistula Academy of Finance and Business, Branch in Olsztyn and Kętrzyn, Olsztyn, Poland*

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Abstract

Introduction: Stress urinary incontinence (SUI) is common in women, but data on retropubic TVT Exact™ in regional urological units with low institutional case volumes are limited.

Aim: To assess the efficacy and safety of retropubic TVT Exact™ across three low-volume regional urological units and to describe the feasibility of a structured day-case pathway.

Material and methods: This retrospective descriptive multicentre cohort study included 52 women with SUI who underwent TVT Exact™ implantation between May 2015 and January 2025. All procedures were performed by the same two consultant urologists using a standardised technique. Eligibility for surgery was individualised. Day-case management was defined as discharge within 24 h and analysed descriptively.

Results and discussion: Twenty-eight women (53.8%) were managed within the day-case pathway. Mean hospital stay was 15.4 ± 14.0 h overall and 8.4 ± 5.0 h in this subgroup, while mean operative time was 26.2 ± 2.5 min and 25.7 ± 3.8 min, respectively. There was a mean follow-up of 42.2 months overall and 47.8 months in day-case patients. An objective cure was achieved in 80.7% and 82.1%, with improvement in 13.5% and 14.3%, respectively. No major intraoperative complications occurred. Blood loss exceeded 200 mL in one day-case patient, and two erosive complications were observed overall: one bladder erosion treated with T-LESS and one vaginal erosion managed by local excision.

Conclusions: TVT Exact™ was associated with favourable continence outcomes and low morbidity across three low-volume regional units. A structured day-case pathway appeared feasible in selected women, although the findings are descriptive and hypothesis-generating.

Corresponding author: Michał Borowik; Department of Urology, Faculty of Medicine, University of Warmia and Mazury in Olsztyn, Poland.
E-mail address: michbor@poczta.fm

1. INTRODUCTION

Stress urinary incontinence (SUI) is a common problem among women and is defined, according to the terminology of the International Continence Society and the International Urogynecological Association, as the involuntary loss of urine during physical exertion or activities that increase intra-abdominal pressure, such as coughing, sneezing or exercise.[1,2] Population-based studies suggest that any urinary incontinence affects roughly one quarter of adult women, and SUI accounts for about half of these cases.[3,4] Beyond the physical symptoms, SUI is associated with embarrassment, restrictions in social and occupational activities, a deterioration of sexual function and an overall decrease in quality of life.[5,6]

Conservative measures, including lifestyle modification, weight reduction, pelvic floor muscle training and bladder training, are recommended as first-line therapy.[7,8] However, when these approaches fail to provide satisfactory control of leakage, surgical treatment may be considered for women who desire definitive correction. Current guidelines and recent systematic reviews indicate that mid-urethral sling (MUS) procedures are safe and effective and remain the most widely used surgical treatment for female SUI.[9,10]

The introduction of the retropubic tension-free vaginal tape (TVT) in the mid-1990s, based on the integral theory of Petros and Ulmsten, represented a major breakthrough in SUI surgery.[11–13] Long-term data have confirmed the durability of retropubic TVT.[14–17] TVT Exact™ is a refinement of the classic retropubic TVT system intended to facilitate consistent tape placement while preserving the established mid-urethral sling principle.

With growing experience and advances in anaesthesia and perioperative care, MUS procedures have progressively shifted from multi-day inpatient treatment towards fast-track, short-stay or day-case pathways.[12,18,19] Contemporary series indicate that many women can be safely discharged on the day of surgery or after a single overnight stay, but most published day-case MUS data come from high-volume urogynecological or tertiary referral centres.[10,20–23]

Evidence regarding the use of TVT Exact™ within structured day-case pathways in regional urological units with low institutional case volumes remains limited. In the present study, low institutional case volume refers to units performing fewer than 20 female anti-incontinence procedures annually, not only mid-urethral sling procedures. In particular, there is little data on programmes where the same experienced operative team provides a standardised procedure across several regional hospitals. This distinction is methodologically important, because it addresses institutional volume rather than limited surgeon experience.

Therefore, the aim of the present retrospective descriptive multicentre study was to report the intermediate-term efficacy and safety of retropubic TVT Exact™ for female SUI performed by a single experienced operative team in three regional urological units with low institutional case volumes (fewer than 20 female anti-incontinence procedures per year), and to describe the feasibility of a structured day-case pathway in this setting.

2. AIM

To assess the efficacy and safety of retropubic TVT Exact™ across three low-volume regional urological units and to describe the feasibility of a structured day-case pathway.

3. MATERIAL AND METHODS

3.1. Study design and setting

We performed a retrospective descriptive multicentre cohort study including 52 consecutive eligible women with stress urinary incontinence who underwent retropubic TVT Exact™ placement between May 2015 and January 2025 in three neighbouring regional urological units. For the purpose of this study, low institutional case volume referred to the total annual number of female anti-incontinence procedures performed in a unit, not only mid-urethral sling procedures. Each unit performed fewer than 20 such procedures per year. All procedures were performed by the same two consultant urologists using an identical technique and a standardised perioperative protocol. The numbers of patients treated at the three units were 30, 17 and 5, respectively. These figures are provided solely to characterise the organisational setting and were not used for unit-level descriptive comparison. The present study therefore addresses outcomes achieved in institutions with low procedural volumes by an experienced operative team, rather than the learning curve of surgeons who perform these procedures infrequently.

The study was conducted in accordance with the Declaration of Helsinki. Institutional Review Board approval was obtained from all participating centres and written informed consent was obtained from every patient before surgery.

3.2. Preoperative evaluation and patient selection

Preoperative evaluation included a detailed medical and urogynecological history, physical examination in the lithotomy position with assessment of urethral mobility (type of SUI), urinalysis, micturition diary, measurement of body mass index (BMI) and pelvic ultrasound. In all women, symptom severity and the impact of incontinence on quality of life were assessed using the International Consultation on Incontinence Questionnaire – Urinary Incontinence Short Form (ICIQ-UI SF).[24,25] A standardised 24-hour pad test was performed on all patients. Urodynamic investigations were reserved for women with mixed symptoms, previous pelvic surgery, or an uncertain diagnosis of SUI.

Qualification for surgery was individualised and based on the overall clinical picture rather than on SUI grade alone. Operative treatment was considered in women with grade II and III stress-predominant and clinically bothersome symptoms, relevant pad use or pad-test burden, quality-of-life impairment, physical findings consistent with SUI, and patient

preference after counselling regarding available management options.

3.3. Day-case pathway and perioperative management

TVT Exact™ was scheduled within a structured day-case pathway whenever feasible. For the purposes of this study, day-case was defined operationally as discharge within 24 hours of surgery; therefore, selected patients discharged the following morning were included in this pathway. We acknowledge that some publications use a stricter same-day discharge definition. Patients were considered suitable for day-case management if they were medically stable, able to mobilise independently, had adequate social support at home and lived within a reasonable distance of the hospital. If these criteria were not met, or when prolonged observation was considered necessary, an overnight stay was planned. Accordingly, day-case management in the present study should be interpreted as a predefined organisational and clinical pathway, not as a comparative treatment exposure.

All women received a single preoperative dose of antibiotic prophylaxis (third-generation cephalosporin or an alternative in case of allergy) and standard thromboprophylaxis according to institutional policy. Surgery was performed under general or regional anaesthesia based on anaesthesiologist assessment and patient preference. Intraoperative data included operative time, estimated blood loss, type of anaesthesia and any adverse events.

3.4. Surgical technique

All procedures were performed by the two consultant urologists, both formally trained and certified in anti-incontinence surgery at the same academic institution. A standard retropubic approach was used according to the manufacturer's instructions for the TVT Exact™ kit. After vaginal midline incision and paraurethral dissection, the tape was passed retropubically, trocar position was verified by rigid cystoscopy, and the sling was adjusted to lie tension-free beneath the mid-urethra. In uncomplicated cases, no indwelling catheter was left.

3.5. Follow-up and outcome measures

Postoperative visits were scheduled approximately 2 and 6 weeks after surgery and subsequently at 3–6-month intervals. For the present analysis, outcomes were assessed at the last available follow-up. All included women had at least 14 months of observation; therefore, all 52 patients were available for the long-term outcome analysis and none were lost before the 14-month threshold.

The primary outcome measures were objective cure and overall success. Objective cure was defined as complete absence of stress leakage during physical activity and a negative 24-hour pad test without the need for protective pads. Improvement was defined as a clinically relevant reduction in leakage episodes and pad use together with a substantial decrease in ICIQ-UI SF score, but not complete dryness. Failure was defined as persistent bothersome SUI or the need for additional anti-incontinence surgery. Secondary outcomes included peri- and postoperative complications, de novo urgency or overactive bladder (OAB), voiding dysfunction, urinary retention requiring catheterisation, and feasibility of the structured day-case pathway.

3.6. Statistical analysis

Because of the exploratory descriptive character of the study, the small overall cohort, and the very small unit-level subgroups, the revised analysis emphasises descriptive statistics. No formal sample size or power calculation was performed, because this was a retrospective cohort including all consecutive eligible patients treated during the study period. Continuous variables are presented as mean ± standard deviation (SD) or mean [range], as appropriate, and categorical variables as counts and percentages. No formal comparative inference was prespecified for day-case versus overnight management, because discharge strategy was determined by predefined clinical and organisational criteria rather than by a comparative study design. Similarly, no formal unit-level descriptive comparison was performed, because all procedures were delivered by the same operative team and site-specific numbers were small.

4. RESULTS

Fifty-two women with SUI underwent TVT Exact™ implantation. Mean age was 62.3 ± 11.9 years and mean BMI was 27.7 ± 4.1 kg/m^2. Patients used a mean of 4.2 ± 1.9 pads per day, with a 24-hour pad test result of 60.6 ± 40.6 g and a mean preoperative ICIQ-UI SF score of 17.8 ± 2.1. Prior hysterectomy and previous anti-incontinence surgery were recorded in 8 (15.4%) and 10 women (19.2%), respectively. Baseline characteristics of the overall cohort are summarised in Table 1.

All 52 women were available for the long-term outcome analysis, and no patient was lost before 14 months of follow-up.

Table 1. Baseline demographic and clinical characteristics of the overall cohort.

Variable	Overall cohort (n = 52)
Age (years), mean ± SD [range]	62.3 ± 11.9 [40–89]
BMI (kg/m^2), mean ± SD [range]	27.7 ± 4.1 [18.9–39.0]
Pads used per day, mean ± SD [range]	4.2 ± 1.9 [2–10]
24-h pad test (g), mean ± SD [range]	60.6 ± 40.6 [8–180]
ICIQ-UI SF score (pre-op), mean ± SD [range]	17.8 ± 2.1 [13–21]
Follow-up duration (months), mean [range]	42.2 [14–72]
Prior hysterectomy, n (%)	8 (15.4%)
Previous anti-incontinence surgery, n (%)	10 (19.2%)
History of urinary tract infection, n (%)	6 (11.5%)

Abbreviations: BMI = body mass index; ICIQ-UI SF = International Consultation on Incontinence Questionnaire – Urinary Incontinence Short Form.

Follow-up at the last available visit ranged from 14 to 72 months (mean 42.2 months). At the last available follow-up, 42 of 52 women (80.7%) were objectively dry and a further 7 (13.5%) reported marked improvement, giving an overall success rate of 94.2%. Three women (5.8%) were classified as failures. Mean ICIQ-UI SF score improved from 17.8 preoperatively to 4.1 at final follow-up.

Overall, 28 women (53.8%) were discharged within 24 hours and were considered successfully managed within the day-case pathway. Mean postoperative hospital stay was 15.4 ± 14.0 hours in the total cohort and 8.4 ± 5.0 hours in the day-case subgroup. In this subgroup, objective cure was observed in 23/28 women (82.1%), improvement in 4/28 (14.3%), and failure in 1/28 (3.6%), yielding an overall success rate of 96.4%. Mean postoperative ICIQ-UI SF score in day-case patients was 3.7 ± 3.3. Because discharge strategy was predetermined, these subgroup data are presented descriptively only.

All procedures in this group were completed without conversion or intra-abdominal organ injury. The mean operative time was 25.7 ± 3.8 minutes. Estimated blood loss exceeded 200 mL in one patient (3.6%). No transfusions, bowel injuries, or major vascular injuries were recorded. Late mesh-related complications were observed in two women: one vaginal exposure and one intravesical erosion with calculus formation; both were treated surgically. Two patients (7.1%) reported de novo urgency/OAB, and two (7.1%) developed postoperative urinary tract infection. Operative and follow-up outcomes are presented in Table 2.

5. DISCUSSION

The management of women with stress urinary incontinence (SUI) has become an established component of routine urological and urogynecological care. Mid-urethral slings are widely regarded as the preferred minimally invasive surgical option for women who do not respond to conservative treatment and remain the current reference standard in major guidelines and systematic reviews.[9,26,27] In everyday practice, however, only a limited proportion of urological units perform anti-incontinence procedures for women on a regular basis, meaning that many units maintain relatively low annual case volumes.

Against this background, the present study was designed to describe the outcomes of a standardised retropubic TVT Exact™ programme delivered by the same operative team across three regional urological units with low institutional case volumes, with particular attention to the feasibility of a structured day-case pathway. To the best of our knowledge, this is the first study to assess retropubic TVT Exact™ procedures performed by a single operative team across several regional urological units with this specific organisational focus. A uniform, well-validated surgical technique was used in all cases, and both surgeons had completed formal training and certification in the TVT procedure. The present study should therefore be interpreted as a small retrospective descriptive multicentre cohort rather than as a formal comparative outcomes study. Its purpose was not to compare

Table 2. Descriptive operative, follow-up, and complication outcomes.

Variable	Overall cohort (n = 52)	Day-case subgroup (n = 28)
Objective cure, n (%)	42 (80.7%)	23 (82.1%)
Improved, n (%)	7 (13.5%)	4 (14.3%)
Failure, n (%)	3 (5.8%)	1 (3.6%)
Overall success, n (%)	49 (94.2%)	27 (96.4%)
Operating time (minutes), mean ± SD	26.2 ± 2.5	25.7 ± 3.8
Postoperative hospital stay (hours), mean ± SD	15.4 ± 14.0	8.4 ± 5.0
General anaesthesia, n (%)	39 (75.0%)	28 (100%)
Spinal/epidural anaesthesia, n (%)	13 (25.0%)	0 (0%)
Blood loss >200 mL, n (%)	2 (3.8%)	1 (3.6%)
Bladder perforation, n (%)	4 (7.7%)	0 (0%)
Late mesh-related complications, n (%)	2 (3.8%)	2 (7.1%)
Acute urinary retention, n (%)	1 (1.9%)	0 (0%)
De novo urgency/OAB, n (%)	3 (5.8%)	2 (7.1%)
Postoperative UTI, n (%)	3 (5.8%)	2 (7.1%)
ICIQ-UI SF at last follow-up, mean ± SD	4.1 ± 4.0	3.7 ± 3.3
Follow-up duration (months), mean [range]	42.2 [14–72]	47.8 [14–72]

Day-case was defined as discharge within 24 h and therefore included selected patients discharged the following morning. All 52 women were available for long-term outcome analysis, and none were lost before 14 months. Late mesh-related complications comprised one vaginal exposure and one intravesical erosion with calculus. OAB = overactive bladder; UTI = urinary tract infection; ICIQ-UI SF = International Consultation on Incontinence Questionnaire – Urinary Incontinence Short Form.

discharge strategies or to test equivalence between units, but to examine whether acceptable and reproducible results could be achieved when a standardised technique and perioperative protocol were applied by an experienced team under different institutional conditions.

This distinction is methodologically important because low institutional case volume and surgeon experience are not synonymous. Although each participating hospital performed relatively few female anti-incontinence procedures annually, all operations in the present cohort were performed or closely supervised by the same two trained and experienced urologists. Accordingly, these data should not be interpreted as evidence regarding the learning curve of inexperienced operators or of surgical teams that perform these procedures infrequently. Rather, they suggest that favourable outcomes may be achievable in institutions with low procedural volumes when surgery is concentrated in the hands of an experienced team working according to a standardised protocol.[23,28–30] At the same time, this feature limits generalisability, because results obtained by one experienced travelling team may not automatically translate to other units staffed by different or less experienced surgeons.

At a mean follow-up of 42.2 months, objective cure in the overall cohort was 80.7% and overall success (cure plus marked improvement) reached 94.2%. These results fall within the range reported for retropubic mid-urethral slings in published series and randomised comparisons.[14,15,17,31–35] Porena et al. reported objective cure rates of 71%–77% for retropubic versus transobturator slings, rising to around 90% when improved cases were included.[34] Aniulienė et al. found a 94%–95% cure rate at 12 months specifically for TVT Exact, which mirrors the short-term results of our programme.[33] Long-term series by Broś-Konopielko et al. and Nilsson et al. documented objective continence rates of approximately 72%–90% and high patient satisfaction 10–20 years after surgery.[15,17] Taken together, these studies suggest that the cure rate observed in our cohort is consistent with the expected performance of retropubic mid-urethral slings, particularly given that nearly one fifth of the patients had undergone previous anti-incontinence surgery.

Patient-reported outcomes were consistent with the clinical findings. The mean ICIQ-UI SF score in the overall cohort improved from 17.8 preoperatively to 4.1 at last follow-up, indicating a substantial reduction in symptom burden. Lebar et al. reported a median postoperative ICIQ-UI SF score of 7 after 20–25 years of follow-up, which still falls within the range associated with patient-perceived treatment success according to the threshold analyses of Karmakar et al.[14,24] These findings support the clinical relevance of our continence outcomes from the patient perspective.

More than half of the women were managed within the structured day-case pathway, and mean postoperative stay in this subgroup was 8.4 hours. This supports the practical feasibility of fast-track management in selected patients, even in regional units with low institutional caseloads. Earlier TVT series, particularly from the first decade after the introduction of the procedure, typically reported hospitalisations of 2–4 days, reflecting a more conservative postoperative policy.[11,18] Ulmsten and Petros had already demonstrated the feasibility of ambulatory sling surgery in the 1990s, and more recent work by McAchran and Goldman, as well as Lin et al., has confirmed that fast-track or pure day-surgery models can be safe and efficient in higher-volume settings.[12,19,22] Our findings extend these observations to a regional setting with low institutional case volumes, but they must be interpreted with caution. Eligibility for day-case management was determined a priori on the basis of clinical stability, mobility, home support, and logistical considerations rather than through any comparative allocation process. The day-case subgroup therefore represents a selected pathway cohort rather than a controlled comparison with planned overnight admission. For this reason, the favourable outcomes observed in this subgroup should be interpreted descriptively only and should not be used to infer equivalence between discharge strategies.

The safety profile of TVT Exact™ in the present series was favourable. Perioperative morbidity was low: only two women (3.8%) had an estimated blood loss >200 mL, no transfusions were required, and no bowel or major vascular injuries occurred. Four intraoperative bladder perforations (7.7%) were recognised on cystoscopy and managed conservatively, with no long-term sequelae. In a nationwide Finnish analysis of TVT, Kuuva and Nilsson reported significant haemorrhage in about 2% of cases and bladder perforation in 3%–9% of cases, so our rates lie within these reported ranges.[28] Similar figures have been described by Teo et al. and by other groups evaluating retropubic slings.[35]

Late mesh-related complications were uncommon. One woman developed a small intravesical erosion with calculus formation that was successfully managed using T-LESS, in line with the minimally invasive techniques described by Ingber et al. and Przudzik et al.[36,37] Another patient had a limited vaginal exposure treated by local excision. The overall erosion rate of 3.8% is similar to the 2%–6% range reported for retropubic TVT in long-term series and systematic reviews.[14,15,17,34]

Lower urinary tract morbidity was modest. Acute urinary retention occurred in 1.9% of patients and resolved with short-term catheterisation. De novo overactive bladder symptoms were uncommon and were controlled conservatively. Meta-analyses and health technology assessments suggest that de novo urgency after MUS occurs in 8%–20% of women.[20,34] Our rate therefore falls at the lower end of this spectrum, which is reassuring given the impact of urgency on patient satisfaction.

The question of whether MUS procedures should be centralised in high-volume specialised units remains debated. Brennand and Quan, for example, found that revision after mesh slings was more strongly associated with individual surgeon volume and specialty than with hospital type.[23] On the other hand, large registries from Finland and Norway indicate that, with standardised technique and adequate training, community hospitals can achieve outcomes comparable to those in tertiary centres.[28–30] Our findings align more closely with this latter view, although they should be interpreted cautiously given the modest sample size. They

suggest that institutional volume alone may be less important than the combination of surgeon experience, protocol standardisation, and organisational consistency. In this respect, our results resemble those reported from high-volume urogynecological units by Nilsson, Dyrkorn, and others,[15,27,30] while also reflecting the practical realities of regional service delivery.

Several limitations must be acknowledged. First, the study is retrospective and observational, which introduces the usual risks of selection and information bias. Second, the sample size is modest, particularly in the subgroup analyses, and there was no contemporaneous control group undergoing alternative procedures or conventional multiday care. Third, qualification for surgery was individualised and based on the overall clinical picture rather than on SUI grade alone, resulting in a heterogeneous cohort with respect to symptom burden and previous surgical history. Although this reflects real-world practice, it limits internal validity and precludes robust subgroup inference. In addition, follow-up duration varied between units, and unit-specific numbers were too small to support meaningful institutional-level comparisons. Finally, although use of the same experienced operative team improved technical consistency, it also limits generalisability to settings in which procedures are performed by different teams or by surgeons with less experience. Follow-up of approximately 4 years is longer than in many day-case series but remains shorter than the 10–20-year observations reported for classic TVT by Lebar et al., Broś-Konopielko et al., and Nilsson et al.[14,15,17] Although all included women had at least 14 months of follow-up and were available for the long-term descriptive analysis, some did not attend additional visits beyond their last recorded assessment, and the reasons for this were not consistently documented. Very late failures or mesh-related complications may therefore have been missed.

The study also has several important strengths. It reflects consecutive real-world practice across three regional urological units, uses a single type of retropubic sling, and applies a standardised perioperative pathway delivered by the same experienced operative team. This reduces procedural heterogeneity and highlights the reproducibility of the technique under different institutional conditions. In addition, the inclusion of a validated patient-reported outcome measure and detailed complication reporting increases the clinical relevance of the findings.

The current article also differs from our previous report by focusing specifically on the structured day-case pathway and by explicitly framing the data as descriptive rather than comparative. Where both papers are cited together, partial patient overlap should be acknowledged.[16]

6. CONCLUSIONS

Retropubic TVT Exact™ implantation, performed by the same experienced surgical team across three regional urological units with relatively low annual institutional volumes of such procedures, was associated with favourable continence outcomes and a low complication rate in this small retrospective descriptive cohort. A structured day-case pathway appeared feasible in appropriately selected women. These results, however, should be interpreted with caution because of the retrospective study design, limited sample size, selection of patients for day-case management, and the lack of a randomised or comparative group. Further prospective studies involving larger patient cohorts are needed to confirm these observations.

LIST OF ABBREVIATIONS

BMI – body mass index
ICIQ-UI SF – International Consultation on Incontinence Questionnaire – Urinary Incontinence Short Form
MUS – mid-urethral sling
OAB – overactive bladder
SD – standard deviation
SUI – stress urinary incontinence
T-LESS – Transvesical Laparoendoscopic Single-Site Surgery
TVT – tension-free vaginal tape
UTI – urinary tract infection

Data availability
The datasets supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethics approval and informed consent
This retrospective study was approved by the institutional review boards of all three participating centres. All patients provided informed consent for the procedure and for the use of anonymised data for research purposes.

Conflict of interest
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Author contributions
Study design: MB, MR
Data collection: MB, DB
Statistical analysis: MB, DB
Data interpretation: MB, MR
Manuscript preparation: MB
Literature search: MB, DB

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