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TVT-O vs. TVT-Abbrevio per il trattamento dell'incontinenza urinaria da stress nelle donne: uno studio randomizzato

Abstract

Introduzione: Confrontare l'efficacia, la sicurezza e le complicazioni della TVT-O (in-out) e della sling di lunghezza minore (TVT-Abbrevio) per il trattamento della SUI femminile.

Materiali e metodi: Centocinquantotto pazienti reclutati sono stati randomizzati nel gruppo TVT-O o TVT-Abbrevio. La valutazione preoperatoria comprendeva anamnesi e valutazione generale, analisi delle urine e coltura delle urine, esame clinico uroginecologico, valutazione urodinamica e colloquio uroginecologico di ICIQ-SF-UI, PGI-I e PISQ12. In tutti i pazienti sono stati registrati prospetticamente tempo operatorio, complicanze peri-operatori, minzione spontanea, complicanze postoperatorie e degenza ospedaliera. A 3, 6, 12, 24 e 36 mesi dopo l'intervento chirurgico, i pazienti sono stati invitati a rispondere alle interviste uroginecologiche da ICIQ-SF-UI, PGI-I e PISQ12. La valutazione urodinamica è stata eseguita a 12, 24 e 36 mesi. Il tasso di successo è stato valutato a 12, 24 e 36 mesi dopo l'intervento.

Risultati: Complessivamente, 138 su 158 pazienti (87%) sono stati curati per SUI a 36 mesi dopo l'operazione senza differenze significative tra i gruppi [69 (87%) e 69 (87%) pazienti nei gruppi TVT-O e TVT Abbrevio, rispettivamente]. I due gruppi non differivano significativamente per il tempo operatorio, perdita di sangue intraoperatoria e durata della degenza ospedaliera. Nove pazienti (11%) presentavano dolore all'inguine postoperatorio nel gruppo TVT-O e in un paziente nel gruppo TVT Abbrevio ($p = 0,02$). Al controllo triennale si è dimostrato un medesimo tasso di guarigione oggettivo in entrambi i gruppi. C'è stato un significativo miglioramento dei punteggi PISQ-12 e ICIQ-SF-UI totali in entrambi i gruppi a 36 mesi di FU.

Conclusioni: TVT-Abbrevio ha un'efficacia e una sicurezza simili alla TVT-O nelle donne affette da SUI; l'uso di una sling più corta riduce il dolore postoperatorio.



TVT-O vs. TVT-Abbrevio for stress urinary incontinence treatment in women: a randomized trial

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Abstract

Introduction To compare the efficacy, safety and complications of the trans-obturator midurethral sling from inside to outside (TVT-O) and of the shorter trans-obturator midurethral sling (TVT-Abbrevio) for treatment of female SUI.

Materials and methods One hundred fifty-eight recruited patients were randomized into either the TVT-O or TVT-Abbrevio group. Preoperative assessment included history and general assessment, urinalysis and urine culture, urogynaecological clinical examination, urodynamic evaluation and urogynaecologic interview by ICIQ-SF-UI, PGI-I and PISQ12. Operative time, perioperative complications, spontaneous voiding, postoperative complications and hospital stay were prospectively recorded in all patients. At 3, 6, 12, 24 and 36 months after surgery, patients were asked to answer urogynaecological interviews by ICIQ-SF-UI, PGI-I and PISQ12. The urodynamic assessment was performed at 12, 24 and 36 months. Success rate was assessed at 12, 24 and 36 months postoperatively.

Results Overall, 138 of 158 patients (87%) were cured of SUI 36 months after the operation with no significant differences between groups [69 (87%) and 69 (87%) patients in the TVT-O and TVT-Abbrevio groups, respectively]. The two groups did not significantly differ in operative time, intraoperative blood loss and length of hospital stay. Nine patients (11%) had postoperative groin pain in the TVT-O group and one patient in the TVT-Abbrevio group ($p = 0.02$). Three-year control demonstrated an equal objective cure rate in both groups. There was a significant improvement in total PISQ-12 and ICIQ-SF-UI scores in both groups at 36 months FU.

Conclusion TVT-Abbrevio has similar efficacy and safety compared with TVT-O in women with SUI; the use of a shorter sling reduces postoperative pain.

Keywords Mid-urethral sling · Quality of life · Stress urinary incontinence · TVT-O · Mini-sling

Introduction

Stress urinary incontinence (SUI) is defined as the complaint of involuntary loss of urine in effort or physical exertion, or on sneezing or coughing, by the International Urogynecological

Association (IUGA) and the International Continence Society (ICS) [1]. It has been reported that the incidence ranges from 12.8% to 46.0% and is more common among Caucasian and Hispanic women. SUI can also have a significant negative impact on economic status and quality of life [2].

Since the report by Ulmsten and Petros in 1995 [3], the tension-free vaginal tape (TVT) technique has been the most commonly used surgical treatment for SUI thanks to its advantages such as minimal surgical trauma, shorter postoperative stay and long-term high cure rate, ranging from 81% to 95% [4].

Mid-urethral slings (MUS) now represent a gold standard in the treatment of female stress urinary incontinence (SUI) [5].

Second-generation inside-out transobturator slings (TVT-O) or the later outside-in transobturator (TOT) slings have proven to be as effective as retropubic TVT with fewer intraoperative complications [6]. The main reason for the change was the higher rate of bladder perforation and major vessel

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injuries (1–5% of patients) using the retropubic route, whereas TVT-O passage is related to vaginal damage and neurological impairment, leading to long-term thigh pain and upper-leg weakness (4% of patients) [7].

A third generation of the MUS inserted through a single vaginal incision (SIS) or constructed with less material (12 cm polypropylene), TVT Abbrevio, has become a means of overcoming significant postoperative thigh and groin pain [8].

This randomized trial compared use of the trans-obturator midurethral sling from inside to outside (TVT-O) and of the shorter trans-obturator midurethral sling (TVT-Abbrevio) for surgical treatment of SUI in terms of complications (primary end point) and medium-term success rate (secondary end point).

Materials and methods

From January 2013 to July 2016, consecutive patients affected by SUI were included in the study. The institutional review board (IRB) approved the study protocol no. L002–1511/2013.

Inclusion criteria included SUI with no contraindications to vaginal surgery and signed informed consent. SUI was defined as the complaint of any involuntary loss of urine on effort or physical exertion (e.g., sporting activities) or on sneezing or coughing.

Exclusion criteria included: urogenital prolapse > stage 1, symptoms of overactive bladder (OAB), planned or present pregnancy, intrinsic urethral sphincter deficiency, previous anti-incontinence surgery, residual urine volume > 100 ml, previous pelvic irradiation, recurrent urinary tract infections (> 4 during last year), neurological conditions such as multiple sclerosis, current treatment with corticoids, inability to understand the protocol and a history of genital or abdominal cancer or a pelvic mass.

Preoperative assessment included history and general assessment, urinalysis and urine culture, urogynaecological clinical examination and urodynamic evaluation.

During the urogynaecological interview the International Consultation on Incontinence Questionnaire (ICIQ-SF-UI) [9], and, if sexually active, the Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ12) [10] were used to evaluate the influence of surgery on incontinence, quality of life and the woman's perception of improvement. Only sexually active women were asked to complete the PISQ-12.

During the urogynaecological examination, the degree of vaginal defects was evaluated using the pelvic organ prolapse quantification (POP-Q) system [11]. All patients underwent cough stress testing in the supine and standing positions at 300 ml bladder filling. Urodynamic evaluations were performed in accordance with criteria established by the International Continence Society (ICS) [12]. In the present study, patients were not masked but examinations were performed by physicians not involved in the study protocol. Maximum urethral closure pressure < 20 cmH₂O and Valsalva

leak-point pressure < 60 cmH₂O was considered an indicator of intrinsic sphincter deficiency.

After preoperative assessment, patients, who had signed informed consents, were randomly allocated to undergo a TVT-O (Gynecare, Ethicon) or TVT-Abbrevio (Gynecare, Ethicon) procedure using a computer-generated list in a 1:1 ratio. Surgical procedures were performed by the same experienced surgeon (M.A.Z.) according to the original techniques by De Leval [13, 14].

A short-term antibiotic prophylaxis was given 30 min prior to surgery (cefazolin 2 g). If the postoperative postvoid residual was > 100 ml, the patient carried out intermittent self-catheterisation at home until a postvoid residual < 50 ml on two consecutive measurements was obtained.

Operative time, perioperative complications, spontaneous voiding, postoperative complications and hospital stay were prospectively recorded in all patients. At 3, 6, 12, 24 and 36 months after surgery, patients were asked to answer urogynaecological interviews using the ICIQ-SF-UI [9], Patient Global Impression of Improvement (PGI-I) [15] and PISQ12 [10]; in addition, physical examination was performed. Urodynamic assessment was performed at 12, 24 and 36 months. Classification of surgical complications was performed using the IUGA/ICS classification of complications of prosthesis and graft insertion [16]. Success rate was assessed at 12, 24 and 36 months postoperatively. Objective cure for SUI was defined as no leakage of urine while performing the cough stress test with 300 ml of saline solution in the bladder and at a mean pressure transmission ratio (PTR) > 90% for the proximal three-fourths of the urethra. Subjective cure is related to the symptoms the patient reports and was defined as no stress urinary incontinence after surgery.

Urinary frequency was defined as a repeated voiding of a small volume of urine (> 8 times/day) in short intervals. Urgency was defined as a strong desire to void accompanied by fear of leakage or fear of pain; nocturia was defined as the need to awake more than twice a night to void. Bladder outlet obstruction was measured with a pressure-flow study according to the Blaivas and Groutz nomogram [17]. Severe pain was defined as presence of pain requiring analgesic therapy still 6 weeks after surgery.

The sample size calculation was performed assuming that the original TVT-O procedure would be associated with a 23% incidence of intra- and postoperative complications at 1-year follow-up and that a 16% decrease in intra- and postoperative complications would be clinically important. With an 80% statistical power (1- β) to show this 16% difference at $\alpha = 0.05$, it was determined that the sample size should be 150 patients, 75 patients in each group. To compensate for patients lost to follow-up postoperatively (estimated rate of 5%), 79 patients per group needed to be enrolled.

For analysis of continuous and nominal variables, Mann-Whitney and chi-squared tests, respectively, were

used to calculate statistical differences between study groups. The patients lost at the 36-month follow-up (8 patients in both groups) were considered as a failure in the statistical analysis for the objective cure calculation. The Wilcoxon signed rank-sum test was used for comparison within groups. A p value < 0.05 was considered statistically significant.

Results

A total of 185 patients affected by SUI were assessed for eligibility. One hundred fifty-eight patients who met the inclusion and exclusion criteria and signed informed consent were enrolled. All 158 patients were treated on an intention-to-treat basis; 79 had the TVT-O procedure (TVT-O group) and 79

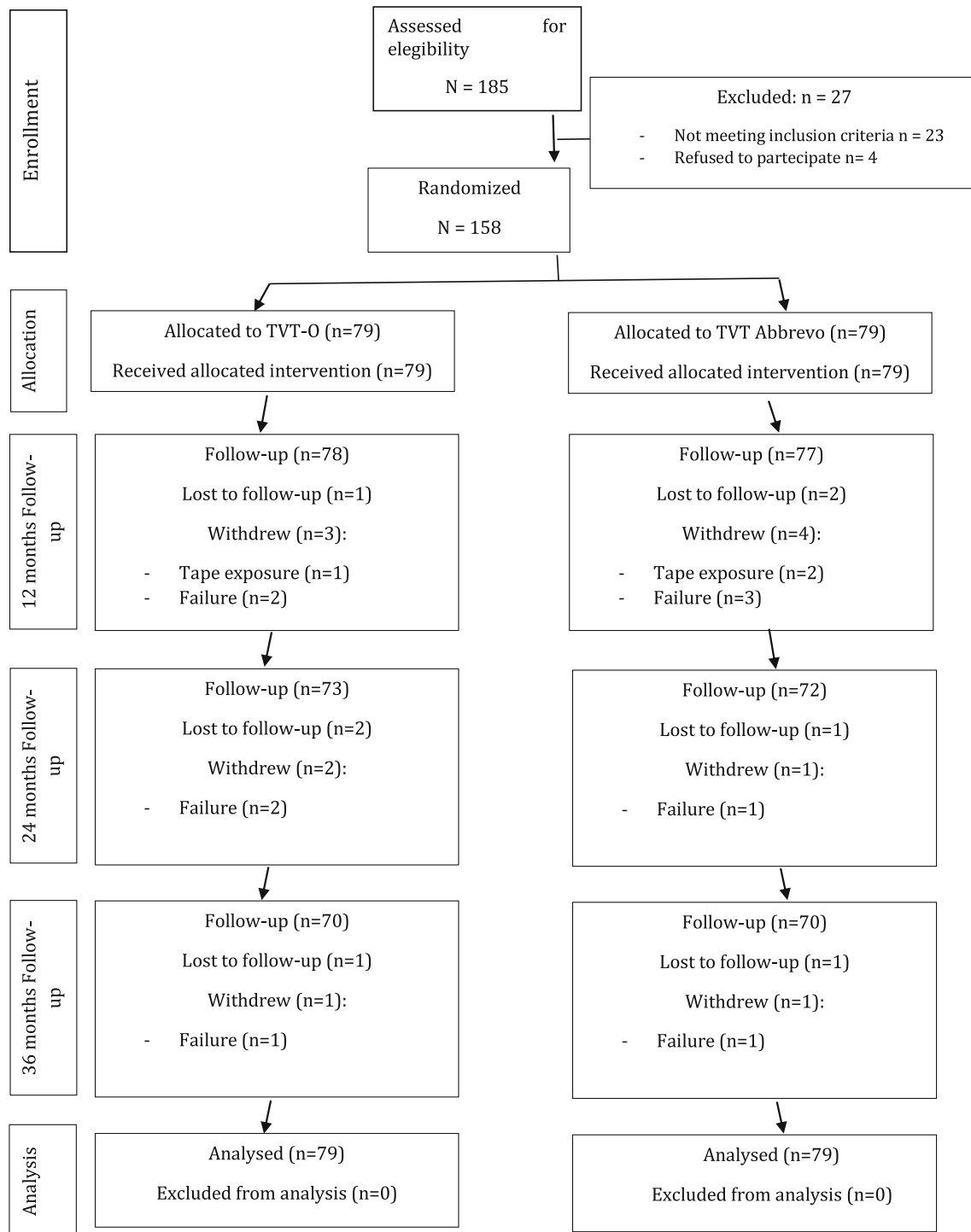


Fig. 1 CONSORT flow diagram for patients who were brought into the trial

Table 1 Patient characteristics

Variables	TVT-O group (79 patients)	TVT Abbrevio group (79 patients)	<i>p</i>
Age, years	55.8 + 11.2	56.8 + 8.9	ns
Body mass index, kg/m ²	26.9 + 3.4	26.2 + 5.8	ns
Parity, <i>n</i>	2.3 + 0.8	2.1 + 1.4	ns
Menopausal status, <i>n</i>	21 (27%)	24 (30%)	ns
Hormone replacement therapy, <i>n</i>	8/21 (36%)	9/24 (37%)	ns
Previous hysterectomy, <i>n</i>	9 (11%)	7 (9%)	ns
POPQ system			
Stage 0	59 (75%)	54 (68%)	ns
Stage 1	20 (25%)	25 (32%)	ns

Values are given as mean + standard deviation (SD); ns = not significant

had the TVT-Abbrevio procedure (TVT Abbrevio group). Their progress through the trial is shown in Fig. 1. One hundred fifty-five were examined at 12-month follow-up, while 18 patients did not return for the 3-year follow-up, 8 patients were lost (4 in the TVT-O group and 4 in the TVT Abbrevio group), and 10 patients withdrew (5 in the TVT-O group and 5 in the TVT Abbrevio group). At 36-month follow-up two patients withdrew (one in the TVT-O group and one in the TVT Abbrevio group). Median follow-up was 39.7 months (range: 36–51).

Patient characteristics are shown in Table 1 and appear well balanced between the treatment groups after randomization.

The two groups did not differ significantly in operative time (minutes) (17.5 + 4.6 in the TVT-O group and 15.8 + 5.8 in the TVT Abbrevio, respectively), intraoperative blood loss (ml) (32.5 + 15.6 in the TVT-O group and 26.8 + 18.8 in the TVT Abbrevio, respectively), length of hospital stay (days) (1.9 + 0.6 in the TVT-O group and 1.8 + 0.9 in the TVT

Abbrevio, respectively) and time to return to normal activities (days) (2.9 + 2.6 in the TVT-O group and 2.4 + 2.8 in the TVT Abbrevio, respectively). None of the patients had intraoperative complications.

The postoperative complications are shown in Table 2. Nine patients (11%) had postoperative groin pain in the TVT-O group and one patient in the TVT Abbrevio group (*p* = 0.02). Groin pain resolved in all patients within 12 weeks with analgesic therapy.

Overall, 138 of 158 patients (87%) were objectively cured of SUI 36 months after the operation with no significant differences found between groups [69 (87%) and 69 (87%) patients for the TVT-O and TVT Abbrevio groups, respectively]. Urodynamic studies 3 years postoperatively demonstrated an equal objective cure rate in both groups (Table 3), although they were lower compared with the subjective cure rate (ICIQ-SF-UI). The ICIQ-SF-UI score was reduced equally in both groups compared with baseline values (preoperative value

Table 2 Postoperative complications in 158 patients

Variables	TVT-O group (79 patients)	TVT Abbrevio group (79 patients)	<i>p</i>
Fever, <i>n</i>	1 (1%)	0	ns
Urinary tract infection, <i>n</i>	2 (2%)	3 (4%)	ns
Deep vein thrombosis, <i>n</i>	0	0	ns
Urinary retention for up to 7 days, <i>n</i>	1 (1%)	0	ns
Tape exposure, <i>n</i>	1 (1%)	2 (2%)	ns
Dyspareunia, <i>n</i> *	2 (3%)	1 (2%)	ns
De novo urgency	2 (2%)	2 (2%)	ns
De novo SUI	4 (5%)	4 (5%)	ns
Groin pain, <i>n</i>	9 (11%)	1 (1%)	0.02
Chronic pain**	1 (1%)	0	ns

SUI = stress urinary incontinence; ns: not significant

*Dyspareunia “de novo” evaluated in sexually active patients after surgery

59 patients in the TVT-O group; 56 patients in the TVT Abbrevio group

The analyzed patients did not have dyspareunia before surgery

**Chronic pain: was defined as presence of pain requiring analgesic therapy still 6 weeks after surgery

Table 3 Results at 36-month follow-up

TVT-O group	<i>n</i>	<i>p</i>	TVT Abbrevio group	<i>n</i>	<i>p</i>
Objective cure, <i>n</i> *	69 (87%)	ns	Objective cure, <i>n</i> *	69 (87%)	ns
Subjective cure (ICIQ-UI-SF), <i>n</i> **			Subjective cure (ICIQ-UI-SF), <i>n</i> **		
Question 3: "How often do you leak urine?"			Question 3: "How often do you leak urine?"		
Never, <i>n</i>	66 (94%)	ns	Never, <i>n</i>	66 (94%)	ns
About once a week or less often, <i>n</i>	2 (3%)	ns	About once a week or less often, <i>n</i>	2 (3%)	ns
Two or three times a week, <i>n</i>	2 (3%)	ns	Two or three times a week, <i>n</i>	1 (1%)	ns
Once daily, <i>n</i>	1 (1%)	ns	Once daily, <i>n</i>	2 (3%)	ns
Several times a day, <i>n</i>	0	ns	Several times a day, <i>n</i>	0	ns
All the time, <i>n</i>	0	ns	All the time, <i>n</i>	0	ns
TOT patients	71		TOT patients	71	
ICIQ score sum (questions 3–5), mean + SD	2.4 + 1.6	ns	ICIQ score sum (questions 3–5), mean + SD	2.7 + 1.8	ns

ns: not significant

*Patients lost to 36-month follow-up (8 patients) were evaluated as failure

**71 patients for both groups

7.8 + 4.8 vs. 3-year value 2.4 + 1.6 in the TVT-O group, $p < 0.01$; preoperative value 7.7 + 3.9 vs. 3-year value 2.7 + 1.8 in the TVT Abbrevio group, $p < 0.01$ (Table 3).

There was no significant difference in OAB symptoms between groups at the 36-month follow-up visit [5 (7%) and 3 (4%) patients for TVT-O and TVT Abbrevio groups, respectively] and for the urodynamic data between groups and within groups from baseline to the 36-month follow-up. No sling erosion was observed, and one patient in the TVT-O and two patients in the TVT Abbrevio group, respectively, experienced a tape exposure.

The PGI-I declined similarly in both groups without any difference between the groups at the 3-year follow-up (Table 4).

One hundred fifteen patients (73%) were sexually active at the time of enrolment and 99 (total 142 patients, 70%) were sexually active at the 3-year postoperative visit. Five of the seven women who ceased sexual intercourse after the procedure did so because of partner-related issues. Three patients

who were not sexually active before surgery became sexually active postoperatively. Table 5 summarizes the data in both groups. There was a significant improvement in total PISQ-12 scores in both groups. There were no differences between the two groups at baseline or 3 years after surgery, so we combined both groups for further comparisons. The analysis of the dichotomized responses to individual questions in the physical domain shows some interesting trends, which in some cases reached statistical significance (Table 5).

A sensitivity analysis was performed to explore the effect of different assumptions about withdrawals and lost patients: no differences were found.

Discussion

This randomized trial seems to indicate that TVT-Abbrevio was as effective as TVT-O.

Table 4 Comparisons of scores obtained from the PGI-I questionnaire at 12, 24 and 36-month follow-up

Variables	TVT-O group			TVT Abbrevio group			<i>p</i>
	12 months (78 pts)	24 months (73 pts)	36 months (70 pts)	12 months (77 pts)	24 months (72 pts)	36 months (70 pts)	
Significantly improved, <i>n</i>	75 (96%)	71 (97%)	69 (99%)	73 (95%)	71 (90%)	69 (87%)	ns
Much improved, <i>n</i>	2 (3%)	1 (1.5%)	0	1 (1%)	1 (1%)	1 (1%)	ns
Some improvement, <i>n</i>	1(1%)	1 (1.5%)	1 (1%)	2 (3%)	0	0	ns
Unchanged, <i>n</i>	0	0	0	1 (1%)	0	0	ns
Slightly worse, <i>n</i>	0	0	0	0	0	0	ns
Worse, <i>n</i>	0	0	0	0	0	0	ns
Much worse, <i>n</i>	0	0	0	0	0	0	ns

ns: not significant

Table 5 Sexual function before and 3 years after surgery in both groups among sexually active women (PISQ-12)

TVT-O group	Baseline	36 months	<i>p</i>	TVT Abbrevio group	Baseline	36 months	<i>p</i>
PISQ-12 total score, mean +SD Baseline-59 pts	31.5 + 6.3	38.4 + 4.2	< 0.01	PISQ-12 total score, mean +SD Baseline-56 pts	32.6 + 7.3	40.5.4 + 5.5	< 0.01
36 months FU-51 pts				36 months FU-48 pts			
Pain during intercourse-PISQ12-question #5 Baseline-59 pts	13 (22%)	13 (25%)	ns	Pain during intercourse-PISQ12-question #5 Baseline-56 pts	13 (23%)	12 (24%)	ns
36 months FU-51 pts				36 months FU-48 pts			
Urine incontinence during sex PISQ12-question #6	51 (86%)	3 (6%)	< 0.01	Urine incontinence during sex PISQ12-question #6	47 (84%)	3 (7%)	< 0.01
Baseline-59 pts				Baseline-56 pts			
36 months FU-51 pts				36 months FU-48 pts			
Fear of incontinence restrict sexual activity PISQ12-question #7	41 (69%)	2 (4%)	<0.01	Fear of incontinence restrict sexual activity PISQ12-question #7	40 (71%)	1 (3%)	< 0.01
Baseline-59 pts				Baseline-56 pts			
36 months FU-51 pts				36 months FU-48 pts			

PISQ responses were considered negative for “seldom” or “never”. Only positive responses are in the table; ns: not significant

The most appropriate technique for the surgical treatment of SUI depends on both the degree and type of incontinence and the characteristics of the treated patients [18–22].

To improve the quality of life and sexual function of patients we must try to use the ~~less~~ least invasive techniques. However, it is also important to achieve the desired effectiveness and improve the symptomatology [23]. In fact, some minislings have been withdrawn from the market because of the lack of proven effectiveness compared with the classic sling [5]. Therefore, finding the right compromise between length and effectiveness is the way forward to improve the quality of life of patients. TVT-Abbrevio is an inside-out transobturator tape only 12 cm long, significantly shorter than the traditional TVT-O (19 cm of tape left in the patient’s body) [24, 25].

This tape was created to eliminate the amount of foreign material and finally deal with the problem of groin pain. The groin pain may depend on possible neuro-muscular injuries, and the presence of the tape is believed to be one of the reasons for this pain. However, no contact with the obturator nerve or its branches was noted in any case reported in the literature. Furthermore, no injury to the urinary bladder or major vessels was noted in the series of patients that underwent TVT-Abbrevio [26].

Other authors compared the classic TVT-O with the new TVT-A reporting similar success rates and no intraoperative complications [26]. In our study, however, there was also a long-term analysis of sexual function and satisfaction of treated patients.

The present study confirms the high continence rates achieved by these procedures at a medium-term follow-up (objective cure: 87% TVT Abbrevio vs. 87% TVT-O). Furthermore, our data confirm that the mean operative time, intraoperative blood loss, length of hospital stay and time to return to normal activities were equivalent in both groups with no intraoperative complications. This randomized trial seems to indicate that TVT-Abbrevio was as effective as TVT-O, both objectively and subjectively, in patients with primary SUI due to urethral hypermobility and not for pure sphincter deficiency.

This study showed that TVT-Abbrevio is also a safe procedure, with no significant intra- and postoperative complications. In particular, no vaginal erosions were observed, but only one and two patients respectively experienced a tape exposure. De novo OAB symptom rate was limited in accordance with previous studies on TVT-O [27, 28]. Overweight does not seem to be a risk factor for intraoperative and short-term complications. Persistence of groin pain beyond the immediate postoperative period is a concern in TVT-O. In a retrospective study on TVT-O, groin pain was found to have persisted for up to 6 months in 3.6% of patients [20]. In contrast,

randomized clinical trials with TVT-Abbrevio have reported low rates of groin pain [14].

In our study, postoperative groin or thigh pain was 0% at 6 months at 2 and 3 years of follow-up, while 1.9% at 1 year. The positive impact that the anti-incontinence surgery has on the patients' sexual life is already known as it reduces the fear of coital incontinence [29, 30]. The last meta-analysis showed no difference between the TOT and TVT for sexual function after surgery, because there was insufficient evidence to state the difference [5, 29]. Our data demonstrate a significant improvement in sexual function and quality of life measured by the ICIQ-UI-SF and PISQ-12 questionnaires in patients who underwent both techniques without differences between them. This could demonstrate that the impact of different surgical techniques does not affect the improvement that exists when urinary loss is resolved. Moreover, patient satisfaction at the median follow-up is excellent for both methods. In conclusion, the modified and shortened inside-out transobturator Abbrevio seems to have similar efficacy and safety compared with TVT-O in women with SUI.

Using a shorter sling could help to reduce the rate of groin pain associated with TVT-O. On the other hand, it is necessary to make a correct selection of the patient and to decide which is the best sling to use to increase effectiveness and improve quality of life by decreasing complications. More prospective studies are needed to assess the long-term efficacy and safety in normal-weight and obese women.

Compliance with ethical standards

Conflicts of interest None.

References

- Haylen BT, de Ridder D, Freeman RM, Swift SE, Berghmans B, Lee J, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Int Urogynecol J*. 2010;21(1):5–26.
- Norton P, Brubaker L. Urinary incontinence in women. *Lancet*. 2006;367:57–67.
- Ulmsten U, Falconer C, Johnson P, Jomaa M, Lannér L, Nilsson CG, et al. A multicenter study of tension-free vaginal tape (TVT) for surgical treatment of stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct*. 1998;9(4):210–3.
- Angioli R, Plotti F, Muzii L, Montera R, Panici PB, Zullo MA. Tension-free vaginal tape versus transobturator suburethral tape: five-year follow-up results of a prospective, randomised trial. *Eur Urol*. 2010;58(5):671–7.
- Ford AA, Rogerson L, Cody JD, Aluko P, Ogah JA. Mid-urethral sling operations for stress urinary incontinence in women. *Cochrane Database Syst Rev*. 2017;7:CD006375.
- Zullo MA, Plotti F, Calcagno M, Marullo E, Palaia I, Bellati F, et al. One-year follow-up of tension-free vaginal tape (TVT) and trans-obturator suburethral tape from inside to outside (TVT-O) for surgical treatment of female stress urinary incontinence: a prospective randomised trial. *Eur Urol*. 2007;51(5):1376–82.
- Ford AA, Rogerson L, Cody JD, Aluko P, Ogah J. Mid-urethral sling operations for stress urinary incontinence in women. *Cochrane Database Syst Rev*. 2017:7.
- Shaw JS, Jeppson PC, Rardin CR. Decreasing transobturator sling groin pain without decreasing efficacy using TVT-Abbrevio. *Int Urogynecol J*. 2015;26(9):1369–72.
- Avery K, Donovan J, Peters TJ, Shaw C, Gotoh M, Abrams P. ICIQ: a brief and robust measure for evaluating the symptoms and impact of urinary incontinence. *Neurourol Urodyn*. 2004;23(4):322–30.
- Rogers RG, Coates KW, Kammerer-Doak D, Khalsa S, Qualls C. A short form of the pelvic organ prolapse/urinary incontinence sexual questionnaire (PISQ-12). *Int Urogynecol J Pelvic Floor Dysfunct*. 2003;14:164–8.
- Cogan SL, Weber AM, Hammel JP. Is urethral mobility really being assessed by the pelvic organ prolapse quantification (POP-Q) system? *Obstet Gynecol*. 2002;99(3):473–6.
- Gammie A, Clarkson B, Constantinou C, Damaser M, Drinnan M, Geleijnse G, et al. International Continence Society urodynamic equipment working group. International Continence Society guidelines on urodynamic equipment performance. Good urodynamic practices: uroflowmetry, filling cystometry, and pressure-flow studies. *Neurourol Urodyn*. 2002;21(3):261–74.
- de Leval J, Waltregny D. New surgical technique for treatment of stress urinary incontinence TVT-obturator: new developments and results. *Surg Technol Int*. 2005;14:212–21.
- Waltregny D, de Leval J. New surgical technique for treatment of stress urinary incontinence TVT-ABBREVO from development to clinical experience. *Surg Technol Int*. 2012;22:149–57.
- Yalcin I, Bump RC. Validation of two global impression questionnaires for incontinence. *Am J Obstet Gynecol*. 2003;189:98–101.
- Haylen BT, Freeman RM, Swift SE, Cosson M, Davila GW, Deprest J, et al. International Urogynecological Association; International Continence Society; joint IUGA/ICS working group on complications terminology. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint terminology and classification of the complications related directly to the insertion of prostheses (meshes, implants, tapes) and grafts in female pelvic floor surgery. *Neurourol Urodyn*. 2011;30(1):2–12.
- Blaivas JG, Groutz A. Bladder outlet obstruction nomogram for women with lower urinary tract symptomatology. *Neurourol Urodyn*. 2000;19(5):553–64.
- Delorme E. Transobturator urethral suspension: miniinvasive procedure in the treatment of stress urinary incontinence in women. *Prog Urol*. 2001;11:1306–13.
- De Leval J. Novel surgical technique for the treatment of female stress urinary incontinence: transobturator vaginal tape inside-out. *Eur Urol*. 2003;44:724–30.
- Fischer A, Fink T, Zachmann S, Eickenbusch U. Comparison of retropubic and outside-in transobturator sling systems for the cure of female genuine stress urinary incontinence. *Eur Urol*. 2005;48:799–804.
- Sung VW, Schleinitz MD, Rardin CR, et al. Comparison of retropubic vs transobturator approach to midurethral slings: a systematic review and meta-analysis. *Am J Obstet Gynecol*. 2007;197:3–11.
- Canel V, Thubert T, Wigniolle I, Fernandez H, Deffieux X. Postoperative groin pain and success rates following transobturator midurethral sling placement: TVT ABBREVO® system versus TVT™ obturator system. *Int Urogynecol J*. 2015;26(10):1509–16.
- Schiavi MC, D'Oria O, Aleksa N, Vena F, Prata G, Di Tucci C, et al. Usefulness of Ospemifene in the treatment of urgency in menopausal patients affected by mixed urinary incontinence underwent mid-urethral slings surgery. *Gynecol Endocrinol*. 2019;35(2):155–9.

24. Kurien A, Narang S, Han HC. Tension-free vaginal tape-Abbrevio procedure for female stress urinary incontinence: a prospective analysis over 22 months. *Singap Med J*. 2017;58(6):338–42.
25. Hubka P, Nanka O, Masata J, Martan A, Svabik K. TVT ABBREVO: cadaveric study of tape position in foramen obturatum and adductor region. *Int Urogynecol J*. 2016;27(7):1047–50.
26. Li WL, Lu ZW, Li FP, Yu HY. A comparative study on treating femal stress urinary incontinence with TVT-Abbrevio and TVT-obturator. *Zhonghua Yi Xue Za Zhi*. 2016;96(28):2238–40.
27. de Leval J, Thomas A, Waltregny D. The original versus a modified inside-out transobturator procedure: 1-year results of a prospective randomized trial. *Int Urogynecol J* 2011;22(2):145–156. doi: <https://doi.org/10.1007/s00192-010-1264-4>.
28. Schiavi MC, Zullo MA, Faiano P, et al. Retrospective analysis in 46 women with vulvovaginal atrophy treated with ospemifene for 12 weeks: improvement in overactive bladder symptoms. *Gynecol Endocrinol*. 2017;11:1–4.
29. Fürst RV, Bezerra CA, Glina S. Female sexual function following surgical treatment of stress urinary incontinence: systematic review and meta-analysis. *Sex Med Rev*. 2018;6(2):224–33.
30. Schiavi MC, Savone D, Di Mascio D, Di Tucci C, Perniola G, Zullo MA, et al. Long-term experience of vaginal vault prolapse prevention at hysterectomy time by modified McCall culdoplasty or Shull suspension: Clinical, sexual and quality of life assessment after surgical intervention. *Eur J Obstet Gynecol Reprod Biol*. 2018;223:113–8.

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