

Mini-invasive tension-free surgery for female urinary incontinence

V. LEANZA, E. INTAGLIATA, F. FERLA, A. LEANZA, G. LEANZA, M.A. CANNIZZARO, R. VECCHIO

SUMMARY: Mini-invasive tension-free surgery for female urinary incontinence.

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The Authors describe the techniques they perform of prepubic, retropubic and transobturator mini-invasive anti-incontinence surgical procedures and point-out some technical details. The state of art and the results of these three main surgical procedure are compared and discussed.

Data from the Literature have been reviewed in order to evaluate the efficacy of the techniques. A Medline search has been performed, and 65 relevant articles from 1996 to 2012 were selected.

Literature showed similar cure rates among retropubic (71,4-91%), trans-obturator (77,3-95%) and prepubic (81-87,2%) anti-incontinence procedures. Cystoscopy was considered necessary in the retropubic, optional in transobturator and in the prepubic techniques. Intra-operative cough stress test was believed useful only in the retropubic and prepubic procedures. Obstruction symptoms prevailed in the retropubic, were rare in the transobturator and missing in the prepubic technique. Erosion rate was very low and similar for all the three techniques. Intra-operative vascular and perforating risks prevailed in the retropubic technique, due to the danger present in the retropubic space, whereas late infective complications overcame in the transobturator procedure. Severe complications in the prepubic procedure were not reported, but the procedure is performed only in few centers.

KEY WORDS: Urinary incontinence - Prepubic TVT - Retropubic TVT - TOT - Midurethral sling.

Introduction

Stress urinary incontinence (SUI) is a common problem in the female population (1, 2), and it is the most common cause of urine leakage, accounting for approximately 50% of incontinence in women (3). Patients usually complain involuntary leakage on effort or exertion, or on sneezing or coughing (4). A better comprehension of the pathophysiology of this disease, has allowed the introduction of modern techniques for its treatment, including the recent minimally invasive techniques using tension-free tape. With the advent of laparoscopic surgery, which has been successfully performed with great advantages compared to the traditional techniques (5-8), incontinence surgical repair has been also performed with this mini-invasive approach.

Advantages of the tension-free mini-invasive techniques reported in this paper and of the mini-invasive procedure (9-11), include fewer incisions, less use of local anesthetic, shorter hospital stay and quicker patient recovery, up to the point that they can return to their daily activities (12). A number of synthetic materials have been developed and use of modern synthetic meshes has reduced post-surgical morbidity (13). The properties of recent meshes, especially monofilament macroporous polypropylene mesh, allow a better incorporation in the patient tissue, lowering the risk of infection.

In this study some technical pearls of the mini-invasive anti-incontinence surgical procedures are pointed out and data from the Literature are reviewed to compare the three main anti-incontinence approaches consisting in the retropubic, transobturator and prepubic routes (14).

Retropubic procedure

The retropubic tension-free vaginal tape (TVT) was introduced by Ulmsten in 1996 as a mini-invasive surgery to treat urinary stress incontinence.

Department of Surgery, University of Catania, Italy

Corresponding author: Eva Intagliata, e-mail: evaintagliata@vodafone.it

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Retropubic TVT is a minimally invasive mid-urethral sling that is passed through the retropubic space and that was designed to replace functionally deficient pubo-urethral ligaments. It consists of two curved stainless steel needles attached to a prolene mesh sling sheathed in plastic, a detachable handle to facilitate retropubic passage of the needles. Variations include needles designed to be passed from the suprapubic incisions into the vaginal incision, where the tape is picked up and passed through the space of Retzius (15).

In our personal experience, we use a modified Stamey needle with an eye.

With the woman in the lithotomic position, 3 small incisions are made: two suprapubic and one on the anterior vaginal wall at the mid-urethra. Excess sling is trimmed. Cystoscopy is performed to ensure that there have been no bladder perforations. The direction of the wings is vertical and intra operative stress test is useful.

The cure rate ranges from 71,4 to 91% (16-20), and the failure rate from 0 to 1,6% (21, 22). The most common complications of all the mini-invasive tension-free techniques are urinary urgency, lower urinary tract infections, bladder or urethral perforation, and urine retention.

In the retropubic mini-invasive procedure, urinary urgency is found in 9,38-20,6% (18, 22), lower urinary tract infections in 0,8-4,7% (18, 23), bladder or urethral perforation in 0,8-21% (24-27), and urine retention in 3,1-62,2% (18, 19).

Urinary urgency, bladder or urethral perforation and urine retention have a wide range, which may be due to the personal experience of the surgical team.

Transobturator procedure

The pioneer of transobturator suburethral tape (TOT) was Delorme in 2001 (28). The aim of TOT was to reduce the range of the retropubic complications.

The procedure we commonly use, which is mostly performed in the Literature, consists into two small incisions in the groin lateral to inferior pubic ramus, and one vaginal incision in the mid-urethral area. The needles are inserted in the groin incision and passed into the mid-urethral incision (out-in) or vice-versa (in-out) (29). The direction of the wings is horizontal and intra-operative stress test is not necessary. Once the tape is in place, it is adjusted to the appropriate tension. The sheath is then removed, the excess mesh trimmed from the surgical site, and the incisions closed with sutures. Cystoscopy is optional (28).

The cure rate ranges from 77,3 to 95% (16, 17, 19, 30-32), and the failure rate from 2,2 to 25% (21, 22).

Urinary urgency is found in 4,44-10% (18, 22), lower urinary tract infections in 1-4,4% (18, 22), bladder or urethral perforation are rare (24-26), and urine retention in 0-55,8% (18, 19).

Prepubic - TVT procedure

The prepubic mini-invasive procedure consists in a mid-urethral sling in which the tape crosses the space placed in front of the pubic bone. It was introduced to facilitate the anti-incontinence techniques through a less risky pathway. With the woman in the lithotomic position, three small incisions are made: two prepubic and one on the anterior vaginal wall transversally at the mid-urethra. The eye needles are then passed from the vagina to the suprapubic area. The tape is passed and adjusted following the stress test. Excess sling is then trimmed. Cystoscopic control is not necessary.

The cure rate ranges from 81 to 87,2% (33, 34), and the failure rate from 6 to 13,4% (33, 34). Urinary urgency is found in 6,40% (34), lower urinary tract infections in 1% (34), bladder or urethral perforation in 0% (34), and urine retention in 0% (34).

The results of the three procedures described above, are summarized in Table 1.

These results show that the retropubic TVT, the TOT and the pre-pubic TVT are effective for the treatment of SUI. They minimize morbidity, improve the quality of life with low complications, thus reducing costs and recovery time.

Although many different studies have observed a high cure rates using the retropubic approach, perioperative complications have been described, including intestinal, vascular and bladder injuries (24, 35, 36). In attempt to reduce these complications, Delorme et al. (28) developed a procedure through which the sling is introduced via the obturator foramen. There is now a significant evidence in the Literature with several Authors who remark the success of retropubic TVT for the treatment of SUI, and a large number of prospective trials have been conducted to evaluate the effectiveness of the retropubic TVT procedure (35, 37-39).

However, Holmgren conducted a long-term study, published in 2005, concluding that initial cure rates of retropubic TVT were good for mixed incontinence but did not persist after four years (36). Concerns about the safety of retropubic TVT have been prompted by a growing number of case reports of complications, including injury to the bowel, major vessels, and bladder or urethral perforation. Complications with retropubic TVT also include bleeding, hematoma, erosion of the mesh into the urethra or vagina, bladder perforation, de novo urge symptoms, voiding dysfunction, and infection (40-43). Rarely case reports include delayed bowel

TABLE 1 - DATA FROM THE LITERATURE REVIEW OF RETROPUBIC, TRANSOBTURATOR AND PREPUBIC TECHNIQUES (%).

	CURE RATE	FAILURE RATE	URINARY URGENCY	INFECTIONS	BLADDER OR URETRAL PERFORATION	URINE RETENTION
Retropubic TVT	71,4-91% (Falkert ¹⁶ , Schierlitz ¹⁷ , Palma ¹⁸ , Holly ¹⁹ , Leanza ²⁰)	0-1,6% (Tanur ²¹ , Hérvas ²²)	9,38-20,6% (Palma ¹⁸ , Hérvas ²²)	0,8-4,7% (Palma ¹⁸ , Kuuva ²³)	0,8-21% (Meschia ²⁴ , Debodinance ²⁵ , Abouassaly ²⁶ , Hammad ²⁷)	3,1-62,2% (Palma ¹⁸ , Holly ¹⁹)
Trans-obturator	77,3-95% (Falkert ¹⁶ , Schierlitz ¹⁷ , Holly ¹⁹ , Mellier ³⁰ , Giberti ³¹ , Cindolo ³²)	2,2-25% (Tanur ²¹ , Hérvas ²²)	4,44-10% (Palma ¹⁸ , Hérvas ²²)	1-4,4% (Palma ¹⁸ , Hérvas ²²)	RARE (Meschia ²⁴ , Debodinance ²⁵ , Abouassaly ²⁶)	0-55,8% (Palma ¹⁸ , Holly ¹⁹)
Prepubic TVT	1-87,2% (Daher ³³ , Leanza ³⁴)	6-13,4% (Daher ³³ , Leanza ³⁴)	6,40% (Leanza ³³)	1% (Leanza ³³)	NONE (Leanza ³³)	NONE (Leanza ³³)

erosion, bowel injury, bowel obstruction, urethral diverticulum, bladder calculi, paraurethral abscess, necrotizing fasciitis, fistulas, urethral erosions, and nerve damage (44, 48). However, Ammendrup et al. note that retropubic TVT's complications rate is low, with very few serious complications (49). In case of severe SUI, recurrent SUI and intrinsic sphincter deficiency, the retropubic TVT remains the favorite surgical technique in absence of obstructive symptoms (50), while for the other cases the most common procedure performed is TOT.

Silva et al. reported that the short-term efficacy of TOT was comparable with the retropubic TVT; however, preliminary evidence suggested that TOT may have a lower success rate compared with retropubic TVT for the treatment of intrinsic sphincter deficiency (51). Although TOT avoids the retropubic area, the risk of lesions to the obturator vessels is to be considered (52, 53). Furthermore, there is a higher risk of vaginal erosion after TOT than after TVT approach.

De Leval et al. found neither vesical nor urethral injuries and stated that TOT is a safe procedure not requiring intraoperative cystoscopy (54).

Complications observed after TOT surgery include inguinal and obturator abscesses, and perineal cellulites (32, 55). Groin abscesses have been reported with TOT (56) and are more common with certain types of sling material (57, 58). Late complications after TOT, as severe troubles during claudicatio, have never been reported with the retropubic and prepubic techniques (33, 59-63).

There is few Literature showing the outcomes of prepubic TVT for the treatment of stress urinary incontinence. This route was introduced to make easier the anti-incontinence procedure. Pre-pubic TVT is a simple technique with very low complications rate, and the pre-

liminary results are consonant with those of the other techniques. Comparing it with the retropubic TVT, the prepubic TVT is simpler, non-obstructive but less stable. Complications (bladder perforation, vascular or nervous damages) found in the retropubic TVT are reduced in the TOT and disappear in the prepubic route. Intraoperative vascular and perforating risks prevail in the retropubic TVT due to the danger present in the retropubic space, whereas late infective complications prevail in the TOT. Severe complications in the prepubic TVT were not reported, but the procedure is performed in very few centers.

In our multicenter randomized trial we compared the prepubic with the retropubic procedure (20). In the prepubic TVT, SUI was subjectively cured in 177 out of 203 patients (87.2%). Objectively, SUI was cured in 175 cases (86.2%). Cystocele was cured 173 (85.2%) patients. Postoperative complications included neither cases of "de novo" instability nor obstruction, whereas 13 (6.4%) patients suffered from urge incontinence, 14 (6.9%) patients from urgency and 9 (4.4%) patients from pollakiuria. There were 5 cases (2.5%) of erosion treated through excision of protruding mesh without suturing vaginal skin and the pelvic floor was not compromised. During the follow-up, two other pelvic procedures were requested. Postoperative Q tip test average was 27 degrees (range 12-51). We found significant difference in VAS scores and in the majority of the main domains in King's health Questionnaire regarding preoperative and postoperative data ($p < 0.001$), whereas the results of the prepubic procedure were comparable to the retropubic one. Besides, subject satisfaction was not significantly different between retropubic and prepubic TVT (88 versus 89%).

In another study by Leanza et al. (34), the prepubic and the retropubic procedure were compared. The re-

tropubic TVT was found to be more effective to solve recurrent SUI (83.3% versus 76.7%), but had a higher rate of complications, among which 7.4% of patients presented voiding difficulties.

Conclusions

Good results of the mini-invasive tension-free anti-incontinence techniques are related to a proper surgical technique performed by experienced surgical teams. The performance of some technical steps are important to

achieve the best functional results. Incontinence is mainly related to the anterior compartment, although other defects may be associated (64).

Anesthesiology plays an important role and loco-regional anesthesia is to be preferred (65).

At the present time, it is important to point out the need for further studies with larger samples and longer follow-up, in order to determine the potential advantages of each technique.

To our knowledge, this is the first review of the Literature comparing retropubic, obturator and prepubic mini-invasive anti-incontinence procedures.

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