



Minimally Invasive Sling Operation for Stress Incontinence

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■ INTRODUCTION

Female stress urinary incontinence (SUI) may be broadly subcategorized into types I, II, and III as follows:

- Type I SUI is defined as urine loss occurring in the absence of urethral hypermobility. This is the mildest form of SUI
- Type II SUI is defined as urine loss occurring due to urethral hypermobility. This is also known as genuine stress urinary incontinence (GSUI)
- Type III SUI is defined as urine leakage occurring from an intrinsic sphincter deficiency (ISD). ISD is a more complex form of female SUI

The subcategories of female SUI can be ascertained by direct physical examination and by measuring an abdominal leak point pressure (ALPP). ALPP, also known as the Valsalva or stress leak point pressure, is defined as the lowest abdominal pressure necessary to cause urine leakage.

An ALPP < 60 cm water is considered diagnostic of type III SUI, whereas an ALPP of 90–120 cm water is consistent with type II SUI. Values of 60–90 cm water reflect the presence of both type II and type III in combination. An ALPP > 120 cm water is considered diagnostic of type I SUI. Recent experience suggests that leak point pressures need not be stratified as they were in the past, as new slings manage all types of SUI.

Von Giordano is usually credited with performing the first pubovaginal sling operation in 1907, using a gracilis muscle graft around the urethra. In 1914, Frangenheim used rectus abdominis muscle and fascia for pubovaginal slings. In 1942, Aldridge, Millin, and Read corrected urinary incontinence using fascial slings. In 1965, Zoedler and Boeminghous first introduced synthetic slings.

Several different sling procedures are currently used to treat incontinence. Whatever sling surgery is performed, one should use the technique that produces the best outcomes in the hands of that particular surgeon.

Mesh sling procedures are currently the most common types of surgery performed to correct SUI. Based on industry estimates, there were approximately 250,000 of these procedures performed every year.

■ TENSION-FREE VAGINAL TAPE

Stress urinary incontinence or genuine stress incontinence is a problem of the urinary bladder where the urethral sphincter weakens and as a result cannot prevent the flow of urine through it when the intra-abdominal pressure rises such as in coughing, sneezing, lifting something heavy, or even standing or walking.

There are several causes of urethral sphincter weakness, most common being:

- Unattended pregnancy and childbirth
- Frequent heavy lifting
- Estrogen deficiency or menopause
- Obesity

Urinary incontinence is reported by 14% of women and urodynamic stress incontinence, the involuntary leakage of urine during increased abdominal pressure in the absence of a detrusor contraction, is diagnosed in over half of the women out of those presenting to hospital with urinary incontinence. Systematic reviews have shown that colposuspension has the best surgical results when compared with other treatments for urodynamic stress incontinence, with cure rates of up to 90% in women who have had no previous surgery for incontinence, although there are only limited data from randomized trials on which to base clinical practice. Although colposuspension remains the most popular choice for the treatment of stress incontinence, some authors have reported less than half of patients remaining dry and free of complications long term. Complications include hemorrhage, hematoma, bladder injury, and urinary tract infection. Up to 20% of women may develop *de novo* detrusor overactivity; voiding dysfunction has been reported in 3–32% of women and surgery for vaginal prolapse may be required in 2.5–26.7% after the procedure.

Minimally invasive suburethral sling procedures have nowadays become the most popular surgical treatment of SUI in women. Transvaginal tape is a minimally invasive procedure for women who suffer from SUI. In transvaginal tape, the urinary bladder and urethra are repaired, strengthened, and returned to its original position in the pelvis. Tension-free vaginal tape (also known as TVT) was first introduced in Sweden in the mid-1990s by Ulf Ulmsten

and Papa Petros. The American Urological Association (AUA) had established a task force to determine the most effective operations for the treatment of SUI. They concluded with the most curative operations as published in the worldwide medically indexed literature as these: Burch urethral suspension procedure and the suburethral sling operation. Cure rates for both procedures were found to fall routinely between 80 and 90%. The TVT operation is a “sling” operation and its cure rate falls within the international standards of cure for other types of sling procedures. The TVT procedure is a relatively recent treatment for stress incontinence.

A polypropylene tape is inserted suburethrally under local anesthesia with sedation. The procedure is thought to work by providing a pubourethral “neoligament”. Increased intraabdominal pressure results in a kink at the point of fixation, which prevents urine flow (**Fig. 1**).

Surgical Technique

The patient should be placed in the lithotomy position taking care to avoid hip flexion $>60^\circ$. The procedure can be carried out even under local anesthesia, but it may also be performed using regional or general anesthesia. The extent of dissection is minimal, i.e., a vaginal midline entry with a small paraurethral dissection to initially position the needle and two suprapubic skin incisions.

Using forceps, grasp the vaginal wall at each side of the urethra. Using a small scalpel, make a sagittal incision about 1.5 cm long starting approximately 1.0 cm from the outer urethral meatus. This incision will cover the midurethral zone and will allow for subsequent passage of the sling (tape).

With a small pair of blunt scissors, two small paraurethral dissections (approximately 0.5 cm) are made so that the tip

of the needle can then be introduced into or passed through the paraurethral dissection (**Fig. 2**).

Then, two abdominal skin incisions of 0.5–1 cm are made one on each side of the midline just above the symphysis not >4 –5 cm apart. Incision placement and needle passage near the midline and close to the back of the pubic bone are important to avoid anatomic structures in the inguinal area and lateral pelvic sidewall.

The TVT rigid catheter guide is inserted into the channel of the Foley catheter (18 French). The handle of the guide is fixed around the catheter, proximal to its widening. The purpose of the guide is to move the bladder neck and urethra away from where the tip of the needle will pass into the retropubic space (**Figs. 3A and B**).

Via use of the Foley catheter and the rigid catheter guide, the urethra and bladder are moved contralaterally to the side of the needle passage. During this maneuver, the bladder should be empty. Using the introducer, the needle is passed paraurethrally penetrating the urogenital diaphragm. Insertion and passage are controlled by using the long or index finger in the vagina under the vaginal wall on the ipsilateral side and fingertip control on the pelvic rim. The curved part of the needle should rest in the palm of the “vaginal” hand.

If you are right handed, this means that the left hand generally is the one to be used for needle guidance (**Figs. 4A to C**). With the other hand, grip the handle of the introducer gently. Now introduce the needle tip into the retropubic space. Once again, observe that this should be done by the palm of the vaginal hand and with the needle tip horizontally, i.e., in the frontal plane. After passage of the urogenital diaphragm, you will feel that the resistance is significantly reduced. Immediately aim the tip of the needle



Fig. 1: Tension-free vaginal tape.

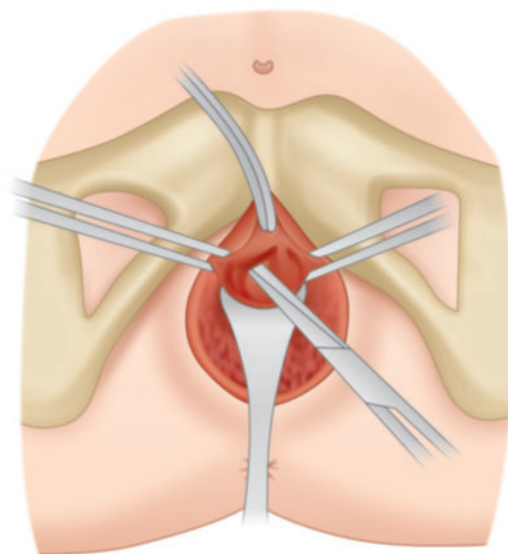
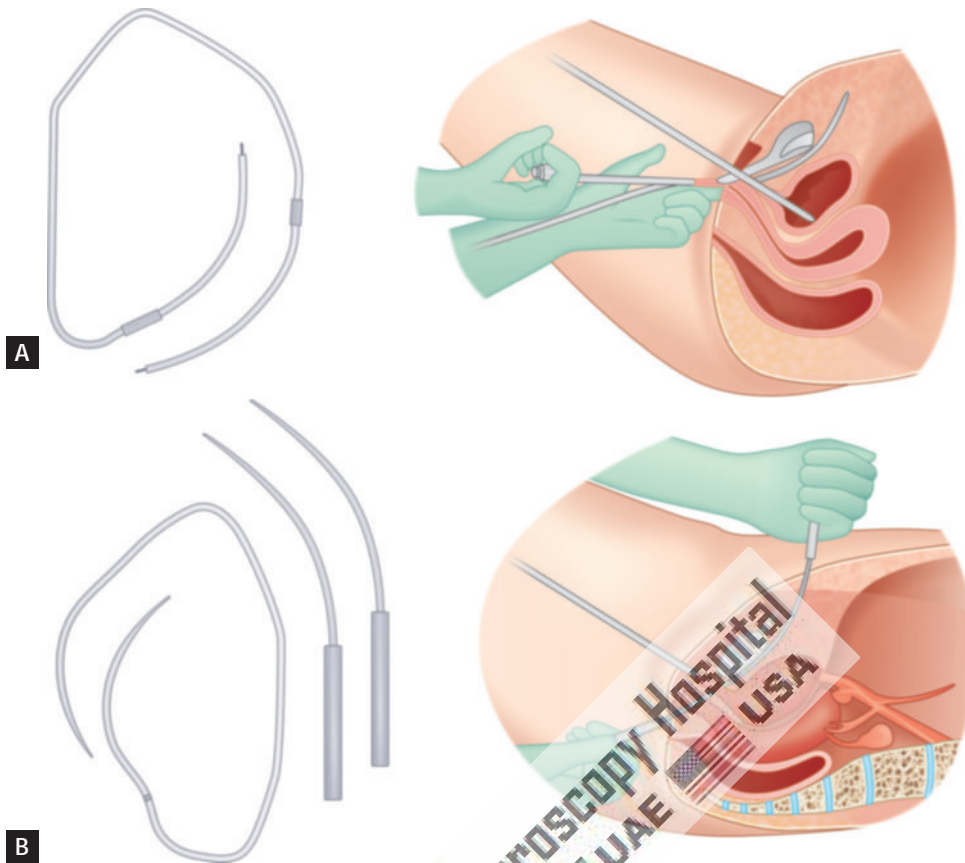
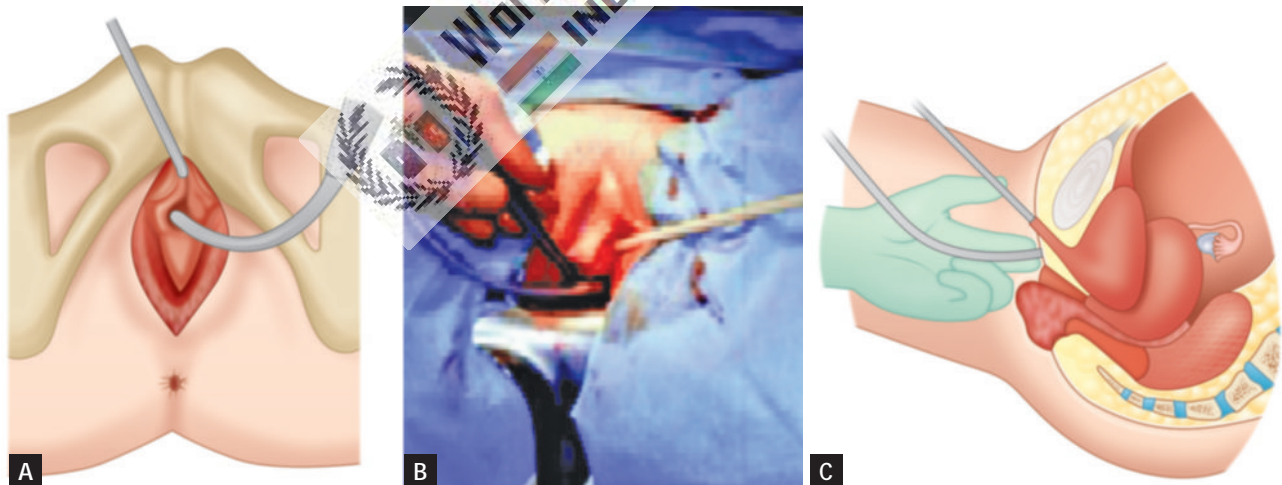


Fig. 2: Abdominal and vaginal incision for tension-free vaginal type (TVT).



Figs. 3A and B: Passage of needle through retropubic space.

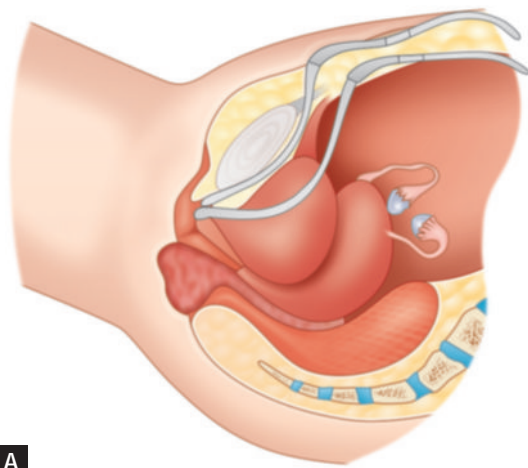


Figs. 4A to C: Safe entry of needle with use of urethral catheter guide.

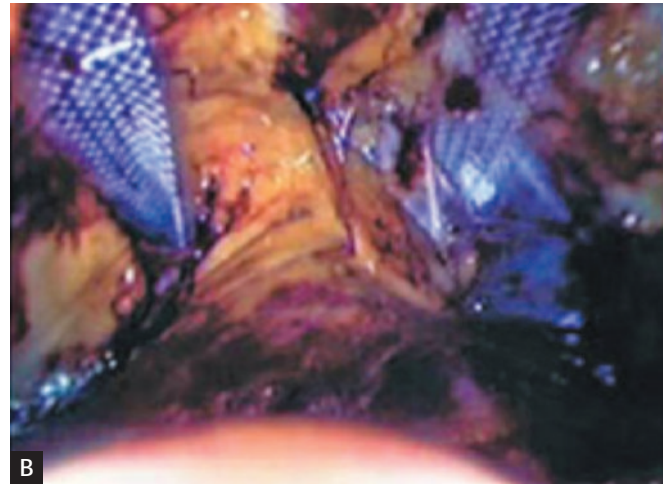
toward the abdominal midline and lower the handle of the introducer thereby, pressing the tip of the needle against the back of the pubic bone. Now, move the needle tip upward to the abdominal skin incision, keeping in close contact with the pubic bone all the way. When the needle tip has reached the abdominal incision, cystoscopy is performed to confirm bladder integrity. The bladder must be emptied after the first cystoscopy. Disarticulate the reusable introducer and

pull the remaining portion of theTVT needle through the abdominal incision. The procedure is then repeated on the other side.

The needles are then pulled upward to bring the tape (sling) loosely, i.e., without tension under the midurethra. Cut the tape close to the needles. Now, adjust the tape so that leakage is reduced allowing a few drops of urinary leakage to occur under stress. For this, use patient feedback, i.e.,



A

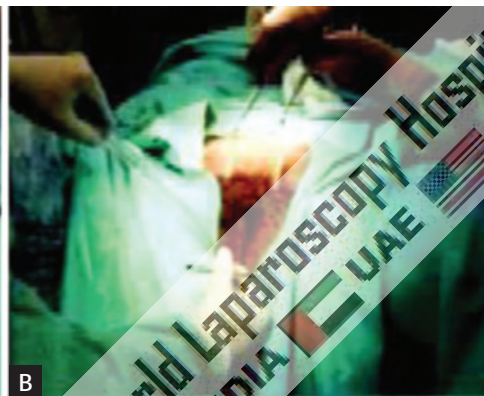


B

Figs. 5A and B: Completed application of tape with laparoscopic view.



A



B



C

Figs. 6A to C: Removal of plastic tape with cutting the excessive mesh.

coughing with a full bladder (approximately 300 mL) and keep the vaginal incision temporarily closed by a gentle grip with small forceps (**Figs. 5A and B**).

The plastic sheaths that surround the tape are then removed (**Figs. 6A to C**). To avoid putting tension on the tape, a blunt instrument (scissors or forceps) should be placed between the urethra and the tape during removal of the plastic sheaths (**Fig. 7**).

Premature removal of the sheath may make subsequent adjustments difficult. After proper adjustment of the tape, close the vaginal incision. The abdominal ends of the tape are then cut and left in subcutis. Do not suture them. Suture the skin incisions. Empty the bladder. Following this procedure, postoperative catheterization is not typically required. The patient should be encouraged to try to empty the bladder 2–3 hours after the operation.

■ TRANSOBTURATOR TAPE

When TVT was first introduced into clinical practice in the mid- to late 1990s, the gold standard surgical procedure in the treatment of SUI was the Burch colposuspension. Several randomized controlled trials have compared the efficacy

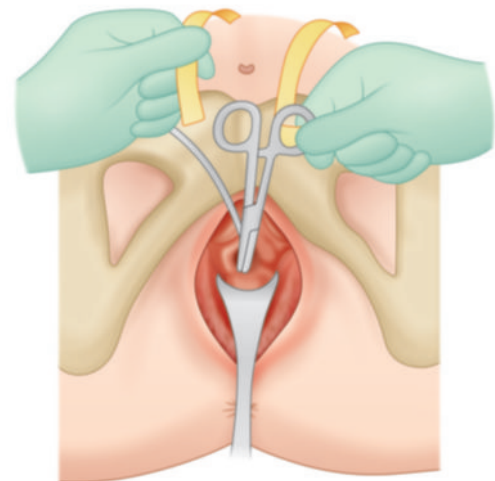


Fig. 7: Scissors or forceps should be placed between the urethra and the tape.

and safety of these two procedures and shown that TVT has a lower morbidity rate and equal or superior efficacy at mid-term follow-up. TVT has gradually replaced the colposuspension as the first choice of procedure, especially

now that the long-term results (5–7 years outcome) are known (81.3% and 82% cure rate).

There are, however, concerns over the safety of TVT. A Finnish series of 1,455 women treated for SUI demonstrated several vascular injuries (venous lacerations were the most frequent injury reported), while Zilbert et al. reported a case of right external iliac artery injury. In addition, two deaths due to serious vascular injuries have been reported to the manufacturers as have bowel perforations. Most of these complications are related to the penetration of the retropubic space. In order to avoid these complications, but keep the principle of a minimally invasive procedure to reinforce the structures supporting the urethra, Delorme described the transobturator tape (TOT). In this technique a 2-cm incision is made through the vagina over the urethra and a tunnel created out to the obturator foramen on either side. A trocar is then passed from the thigh fold through the obturator foramen from the outside to the inside and brought round through the vaginal incision. A multifilament microporous tape is then fed through the trocar and brought through the obturator foramen. The procedure is repeated on both sides and the tape is left under no tension under the midurethra. De Leval et al. described a further modification to this surgical technique, which allows the passage of a trocar and tape through the obturator foramen from inside to out. The authors felt that this further reduced any risk of damage to the urethra and bladder; however, the long-term safety of this type of procedure is not known.

The TVT has revolutionized the surgical treatment of SUI, but remains an abdominal procedure with all of the potential complications therein. The TOT procedure described here produces the same end result, i.e., a tension-free tape left under the midurethra, but without the risks of a blind abdominal procedure.

Bladder perforation is the most common complication occurring during the TVT procedure with the incidence reported as between 0.8 and 21%. However, with the TOT procedure, the risk of bladder perforation is significantly reduced (**Fig. 8**).

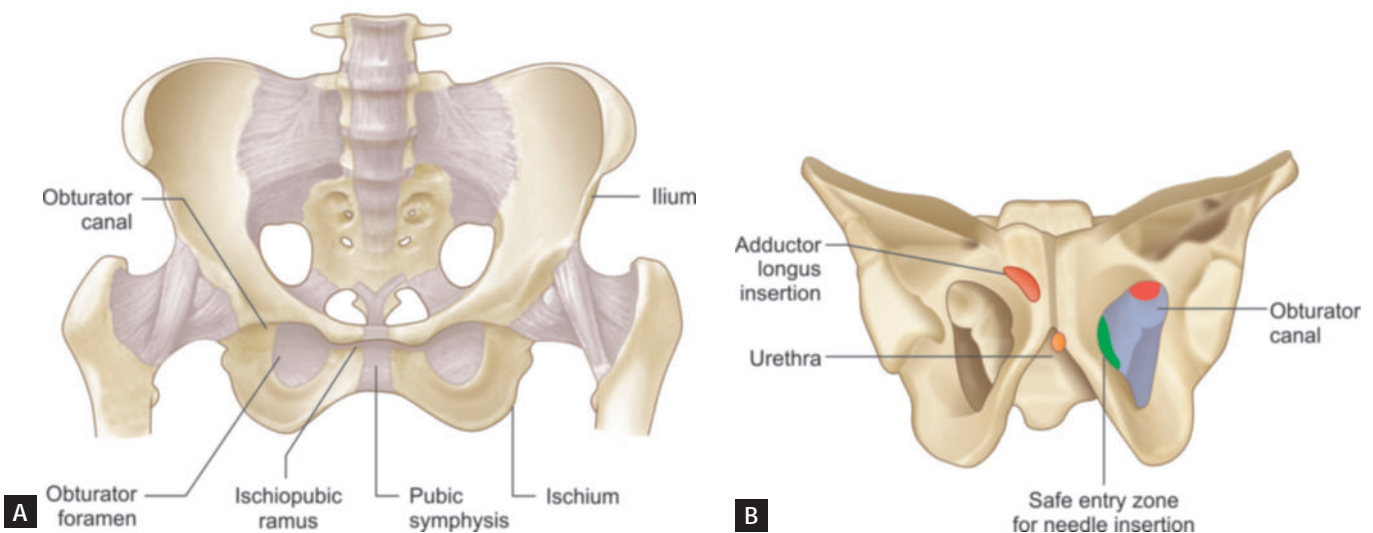
Functional Theories and Comparison with Tension-free Vaginal Tape

DeLancey's theories on pelvic support for the bladder and urethra help to explain the mechanism of action of the TOT in the treatment of SUI in that the position of the tape is similar to that of the natural hammock supporting the urethra. The TOT procedure using polypropylene tape satisfies most of the requirements for effective surgery.

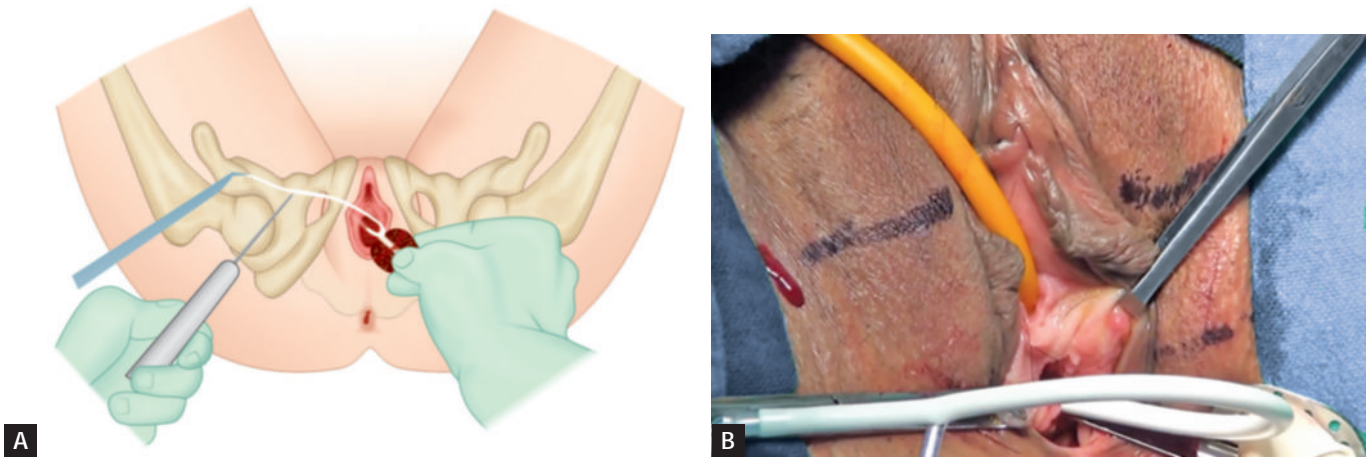
In the medium term, the results are satisfactory and, unlike the retropubic tape (TVT), the purely perineal location of the TOT minimizes the risk of trauma to the bladder, intestine, major vessels, and nerves (**Figs. 9A and B**).



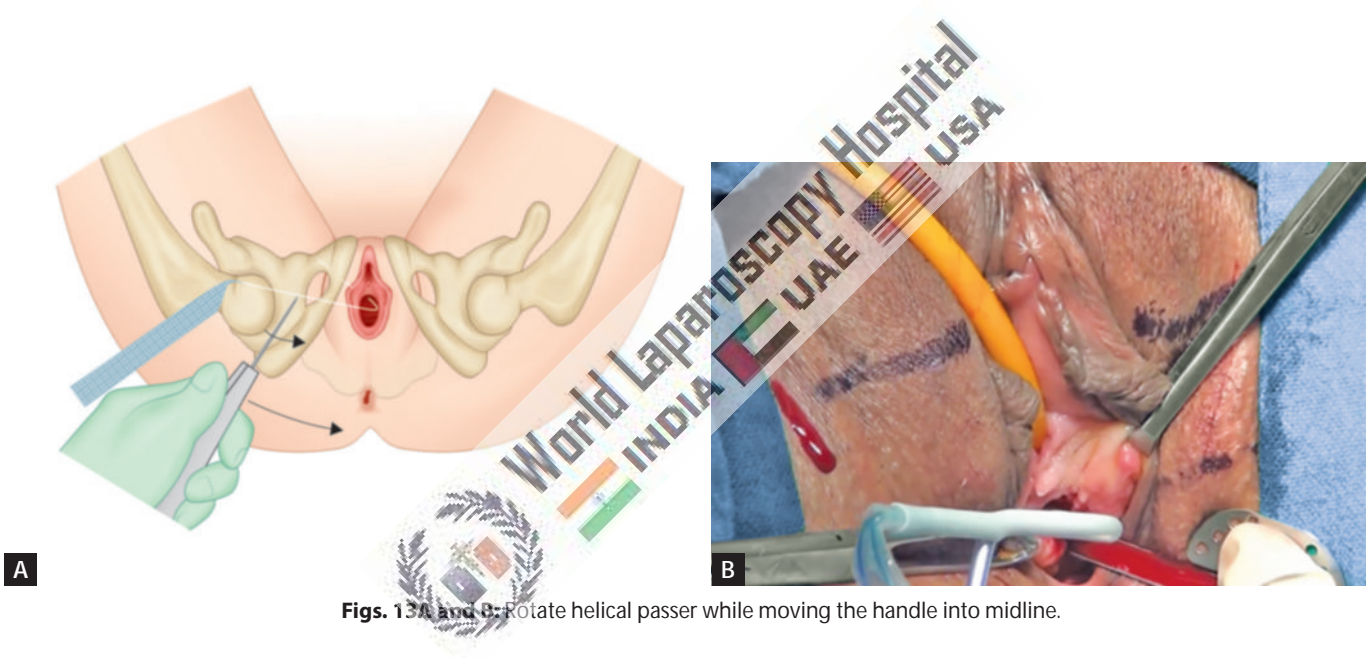
Fig. 8: Injuries in tension-free vaginal tape (TVT) procedure.



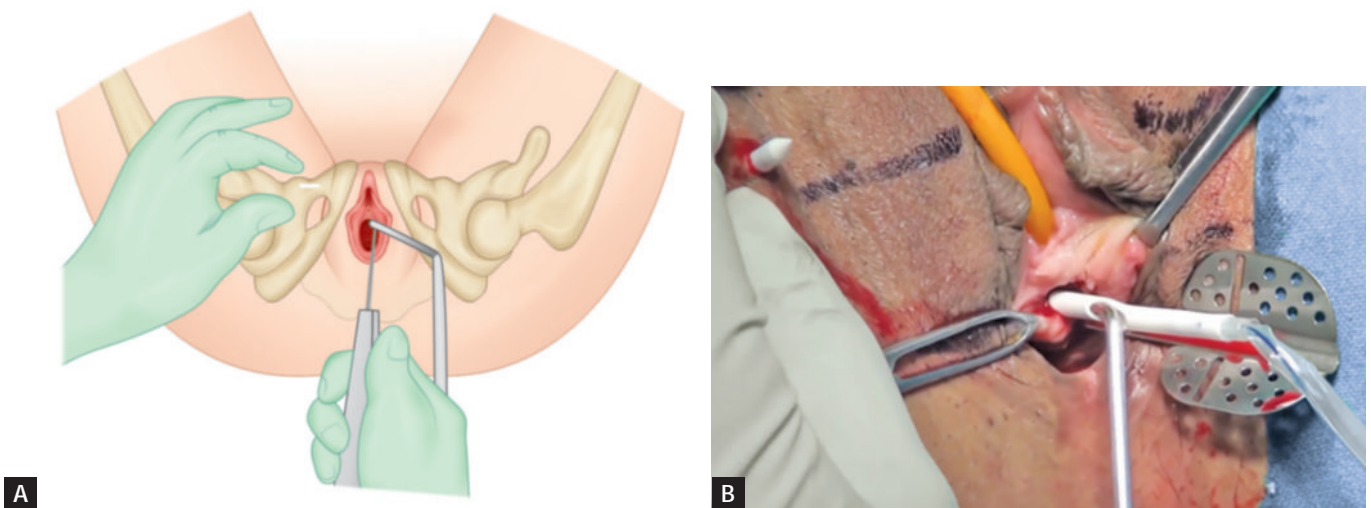
Figs. 9A and B: Pelvic anatomy demonstrating obturator foramen.



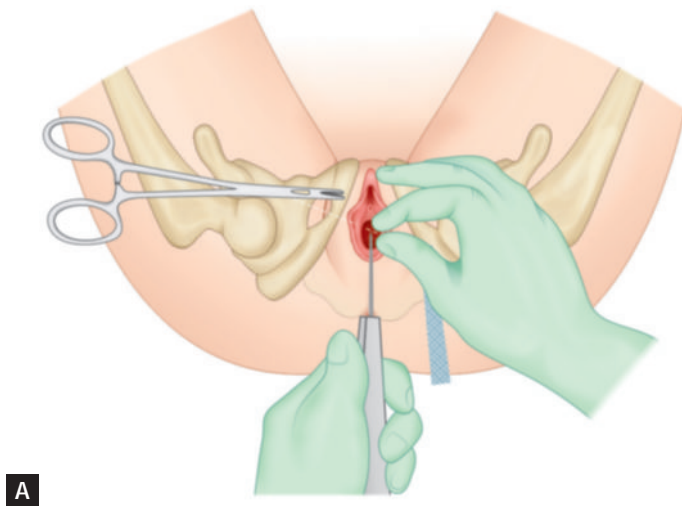
Figs. 12A and B: Insert winged guide and helical passer and then remove winged guide.



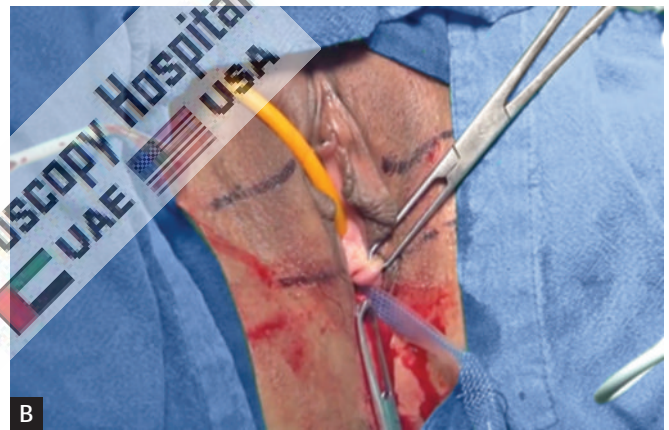
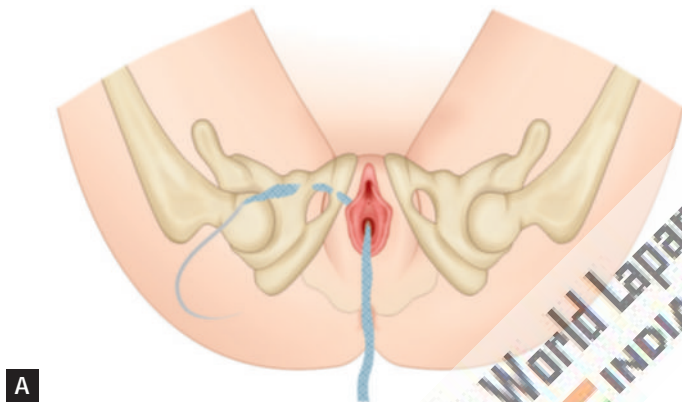
Figs. 13A and B: Rotate helical passer while moving the handle into midline.



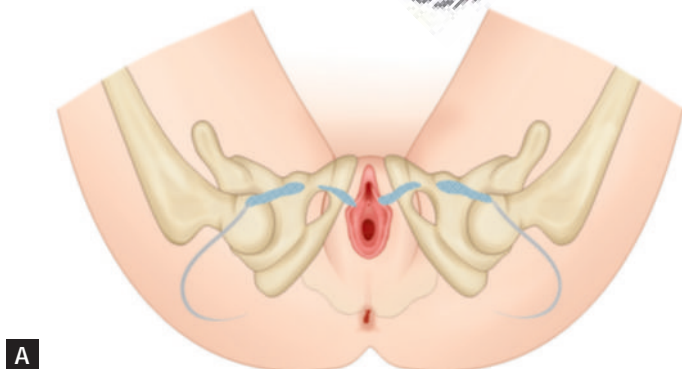
Figs. 14A and B: Facilitate passage of transobturator tape (TOT) through skin incision.



Figs. 15A and B: Grasp tip of plastic tube and then retract helical passer by reverse rotation.



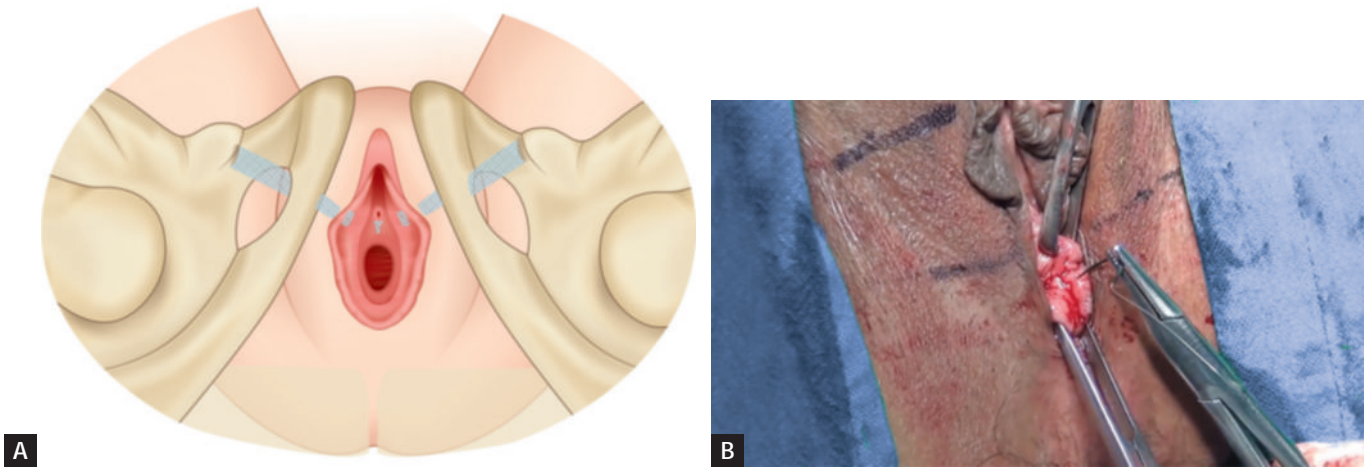
Figs. 16A and B: Pull plastic tube and tape completely through the skin.



Figs. 17A and B: Steps of introduction of mesh should be repeated on patient's other side.

When the tape is in position, the plastic sheath that covers the tape should be removed (**Figs. 18A and B**). One blunt instrument (e.g., scissors or forceps) should be placed between the urethra and the tape during removal of a plastic sheath, or use other suitable means during sheath removal, to avoid positioning the tape with

tension. Following tape adjustment, close the vaginal incisions. Cut the tape ends at the exit points just below the skin on the inner thigh. Close the skin incisions with suture or surgical skin adhesive (**Figs. 18A and B**). Surgeon should remember that “looser is better than tighter”.



Figs. 18A and B: Adjust the tape, remove plastic sheath, and close vaginal incision.

CONTRAINDICATIONS OF TENSION-FREE VAGINAL TAPE AND TRANSOBTURATOR TAPE

As with any suspension surgery, these sling procedure should not be performed in pregnant patients. Additionally, because the prolene polypropylene mesh will not stretch significantly, it should not be performed in patients with future growth potential including women with plans for future pregnancy.

WARNINGS AND PRECAUTIONS

- Do not use TVT or TOT procedure for patients who are on anticoagulation therapy
- Do not use TVT or TOT procedure for patients who have a urinary tract infection
- Users should be familiar with surgical technique for bladder neck suspensions and should be adequately trained in the TVT or TOT implantation procedure before employing these devices. It is important to recognize that TVT or TOT is different from a traditional sling procedure in that the tape should be located without tension under midurethra
- Acceptable surgical practice should be followed for the TVT or TOT procedure as well as for the management of contaminated or infected wounds
- The TVT or TOT procedure should be performed with care to avoid large vessels, nerves, bladder, and bowel. Attention to local anatomy and proper passage of needles will minimize risks, especially in TVT
- Retropubic bleeding may occur postoperatively. Observe for any symptoms or signs before releasing the patient from hospital
- Cystoscopy should be performed to confirm bladder integrity or recognize a bladder perforation
- Do not remove the plastic sheath until the tape has been properly positioned
- Ensure that the tape is placed with minimal tension under midurethra
- Prolene mesh in contaminated areas should be used with the understanding that subsequent infection may require removal of the material
- The patient should be counseled that future pregnancies may negate the effects of the surgical procedure and the patient may again become incontinent
- Since no clinical experience is available with vaginal delivery following the TVT or TOT procedure, in case of pregnancy delivery via cesarean section is recommended
- Postoperatively, the patient is recommended to refrain from heavy lifting and/or exercise (i.e., cycling, jogging) for at least 3–4 weeks and intercourse for 1 month. The patient can return to other normal activity after 1 or 2 weeks
- Should dysuria, bleeding, or other problems occur, the patient is instructed to contact the surgeon immediately
- All surgical instruments are subject to wear and damage under normal use. Before use, the instrument should be visually inspected. Defective instruments or instruments that appear to be corroded should not be used and should be discarded
- As with other incontinence procedures, de novo detrusor instability may occur following the TVT procedure. To minimize this risk, make sure to place the tape tension-free in the midurethral position
- Punctures or lacerations of vessels, nerves, bladder, or bowel may occur during needle passage and may require surgical repair
- Transitory local irritation at the wound site and a transitory foreign body response may occur. This response could result in extrusion, erosion, fistula formation, and inflammation
- As with all foreign bodies, prolene mesh may potentiate an existing infection. The plastic sheath initially covering

the prolene mesh is designed to minimize the risk of contamination

- Overcorrection, i.e., too much tension applied to the tape, may cause temporary or permanent lower urinary tract obstruction

CONCLUSION

Mesh sling surgeries for SUI have been reported to be successful in approximately 70–80% of women at 1 year based on women's reports and physical examinations. Similar effectiveness outcomes are reported following nonmesh SUI surgeries such as Burch colposuspension. The use of mesh slings in transvaginal SUI repair introduces a risk that does not present in traditional nonmesh surgery for SUI repair, which is mesh erosion, also known as extrusion. Erosion of mesh slings through the vagina is the most commonly reported mesh-specific complication from SUI surgeries with mesh. The average reported rate of mesh erosion at 1 year following SUI surgery with mesh is approximately 2%. Mesh erosion is sometimes treated successfully with vaginal cream or an office procedure where the exposed piece of mesh is cut. In some cases of mesh erosion, it may be necessary to return to the operating room to remove part or all of the mesh.




BIBLIOGRAPHY




1. Andersson G, Johansson JE, Garpenholt O, Nilsson K. Urinary incontinence prevalence, impact on daily living and desire for treatment: a population-based study. *Scand J Urol Nephrol*. 2004;38:125-30.
2. Andonian S, Chen T, St-Denis B, Corcos J. Randomized clinical trial comparing suprapubic arch sling (SPARC) and tension-free vaginal tape (TVT): one-year results. *Eur Urol*. 2005;47:537-41.
3. Brophy MM, Klutke JJ, Klutke CG. A review of the tension-free vaginal tape procedure: outcomes, complications, and theories. *Curr Urol Rep*. 2001;2:364-9.
4. Brown JS, Vittinghoff E, Wyman JF, Stone KL, Nevitt MC, Ensrud KE, et al. Urinary incontinence: does it increase risk for falls and fractures? Study of Osteoporotic Fractures Research Group. *J Am Geriatr Soc*. 2000;48:721-5.
5. Burgio KL, Ives DG, Locher JL, Arena VC, Kuller LH. Treatment seeking for urinary incontinence in older adults. *J Am Geriatr Soc*. 1994;42:208-12.
6. Chaliha C, Stanton SL. The ethnic cultural and social aspects of incontinence: a pilot study. *Int Urogynecol J Pelvic Floor Dysfunct*. 1999;10:166-70.
7. Cindolo L, Salzano L, Rota G, Bellini S, D'Afiero A. Tension-free transobturator approach for female stress urinary incontinence. *Minerva Urol Nefrol*. 2004;56:89-98.
8. Costa P, Grise P, Droupy S, Monneins F, Assenmacher C, Ballanger P, et al. Surgical treatment of female stress urinary incontinence with a trans-obturator-tape (TOT) Uratape: short term results of a prospective multicentric study. *Eur Urol*. 2004;46:102-6.
9. Dargent D, Bretones S, George P, Mellier G. Insertion of a sub-urethral sling through the obturating membrane for treatment of female urinary incontinence. *Gynecol Obstet Fertil*. 2002;30:576-82.
10. DeLeval, J. Novel surgical technique for the treatment of female stress urinary incontinence: transobturator vaginal tape inside-out. *Eur Urol*. 2003;44:724-30.
11. DeLancey JO. Structural support of the urethra as it relates to stress urinary incontinence: the hammock hypothesis. *Am J Obstet Gynecol*. 1994;170:1713-20.
12. Delorme E, Droupy S, de Tayrac R, Delmas V. Transobturator tape (Uratape): a new minimally invasive procedure to treat female urinary incontinence. *Eur Urol*. 2004;45:203-7.
13. Delorme E. Transobturator urethral suspension: mini-invasive procedure in the treatment of stress urinary incontinence in women. *Prog Urol*. 2001;11:1306-13.
14. Diokno AC, Burgio K, Fultz NH, Kinchen KS, Obenchain R, Bump RC. Medical and self-care practices reported by women with urinary incontinence. *Am J Manag Care*. 2004;10:69-78.
15. Dugan E, Roberts CP, Cohen SJ, Preisser JS, Davis CC, Bland DR, et al. Why older community-dwelling adults do not discuss urinary incontinence with their primary care physicians. *J Am Geriatr Soc*. 2001;49:462-5.
16. Fultz NH, Fisher GG, Jenkins KR. Does urinary incontinence affect middle-aged and older women's time, use and activity patterns? *Obstet Gynecol*. 2004;104:1327-34.
17. Goldberg RL, Awon C, Gandhi S, Atkuru LV, Sand PK. Urinary incontinence after multiple gestation and delivery: impact on quality of life. *Int Urogynecol J Pelvic Floor Dysfunct*. 2005;16:334-6.
18. Grodstein E, Fretts R, Lifford K, Resnick N, Curhan G. Association of age, race, and obstetric history with urinary symptoms among women in the Nurses' Health Study. *Am J Obstet Gynecol*. 2003;189:428-34.
19. Hagen S, Hanley J, Capewell A. Test-retest reliability, validity, and sensitivity to change of the urogenital distress inventory and the incontinence impact questionnaire. *Neurourol Urodyn*. 2002;21:534-9.
20. Harvey MA, Kristjansson B, Griffith D, Versi E. The incontinence impact questionnaire and the urogenital distress inventory: a revisit of their validity in women without a urodynamic diagnosis. *Am J Obstet Gynecol*. 2001;185:25-31.
21. Heit M, Blackwell L, Thomas S, Ouseph R. Prevalence and severity of urinary incontinence in kidney transplant recipients. *Obstet Gynecol*. 2004;103:352-8.
22. Hermieu JE, Messas A, Delmas V, Ravery V, Dumonceau O, Boccon-Gibod L. Bladder injury after TVT transobturator. *Prog Urol*. 2003;13:115-7.
23. Holroyd-Leduc JM, Straus SE. Management of urinary incontinence in women: clinical applications. *JAMA*. 2004;291:996-9.
24. Kinchen KS, Burgio K, Diokno AC, Fultz NH, Bump R, Obenchain R. Factors associated with women's decisions to seek treatment for urinary incontinence. *J Women's Health (Larchmt)*. 2003;12:687-98.
25. Kuuva N, Nilsson CG. A nationwide analysis of complications associated with the tension-free vaginal tape (TVT) procedure. *Acta Obstet Gynecol Scand*. 2002;81:72-7.
26. Lagace EA, Hansen W, Hickner JM. Prevalence and severity of urinary incontinence in ambulatory adults: an UPRNet study. *J Fam Pract*. 1993;36:610-4.
27. Lukban JC. Suburethral sling using the transobturator approach: a quality-of-life analysis. *Am J Obstet Gynecol*. 2005;193:2138-43.
28. Melville JL, Delaney K, Newton K, Katon W. Incontinence severity and major depression in incontinent women. *Obstet Gynecol*. 2005;106:585-92.
29. Melville JL, Katon W, Delaney K, Newton K. Urinary incontinence in US women: a population-based study. *Arch Intern Med*. 2005;165:537-42.




30. Muir TW, Tulikangas PK, Paraiso FM, Walters MD. The relationship of tension-free vaginal tape insertion and the vascular anatomy. *Obstet Gynecol.* 2003;101:933-6.
31. Nilsson CG, Falconer C, Rezapour M. Seven-year follow-up of tension-free vaginal tape procedure for treatment of urinary incontinence. *Obstet Gynecol.* 2004;104:1259-62.
32. Novielli KD, Simpson Z, Hua G, Diamond JJ, Sultana C, Paynter N. Urinary incontinence in primary care: a comparison of older African-American and Caucasian women. *Int Urol Nephrol.* 2003;35:423-8.
33. Nygaard I, Turvey C, Burns TL, Crischilles E, Wallace R. Urinary incontinence and depression in middle-aged United States women. *Obstet Gynecol.* 2003;101:149-56.
34. Paraiso MF, Walters MD, Karram MM, Barber MD. Laparoscopic Burch colposuspension versus tension-free vaginal tape: a randomized trial. *Obstet Gynecol.* 2004;104:1249-58.
35. Peyrat L, Boutin JM, Bruyere F, Haillot O, Farfak H, Lanson Y. Intestinal perforation as a complication of tension-free vaginal tape procedure for urinary incontinence. *Eur Urol.* 2001;39:603-5.
36. Reymert J, Hunskaar S. Why do only a minority of perimenopausal women with urinary incontinence consult a doctor? *Scand J Prim Health Care.* 1994;12:180-3.
37. Sampselle CM, Harlow SD, Skurnick J, Brubaker L, Bondarenko I. Urinary incontinence predictors and life impact in ethnically diverse perimenopausal women. *Obstet Gynecol.* 2002;100:1230-8.
38. Sandvik H, Seim A, Vanvik A, Hunskaar S. A severity index for epidemiological surveys of female urinary incontinence: comparison with 48-hour pad-weighting tests. *Neurourol Urodyn.* 2000;19:137-45.
39. Shaw C, Tansey R, Jackson C, Hyde C, Allan R. Barriers to help seeking in people with urinary symptoms. *Fam Pract.* 2001;18:48-52.
40. Shumaker SA, Wyman JF, Uebersax JS, McClish D, Fantl JA. Health-related quality of life measures for women with urinary incontinence: the Incontinence Impact Questionnaire and the Urogenital Distress Inventory: Continence Program in Women (CPW) Research Group. *Qual Life Res.* 1994;3:291-306.
41. Thom D. Variation in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type. *J Am Geriatr Soc.* 1998;46:473-80.
42. Thom DH, Haan MN, Van Den Eeden SK. Medically recognized urinary incontinence and risks of hospitalization, nursing home admission and mortality. *Age Ageing.* 1997;26:367-74.
43. Thom DH, van den Eeden SK, Ragins AI, Wassel-Fyr C, Vittinghof E, Subak LL, et al. Differences in prevalence of urinary incontinence by race/ethnicity. *J Urol.* 2006;175:259-64.
44. Ulmsten U, Henriksson L, Johnson P, Varhos G. An ambulatory surgical procedure under local anesthesia for treatment of female urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct.* 1996;7:81-5.
45. van Brummen HJ, Bruinse HW, van de Pol G, Heintz APM, van der Vaart CH. The effect of vaginal and cesarean delivery on lower urinary tract symptoms: what makes the difference? *Int Urogynecol J Pelvic Floor Dysfunct.* 2007;18:133-9.
46. Ward KL, Hilton P, EK and Ireland TVT Trial Group. A prospective multicenter randomized trial of tension-free vaginal tape and colposuspension for primary urodynamic stress incontinence: two-year follow-up. *Am J Obstet Gynecol.* 2004;190:324-31.
47. Zilbert AW, Farrell SA. External iliac artery laceration during tension-free vaginal tape procedure. *Int Urogynecol J Pelvic Floor Dysfunct.* 2001;12:141-3.



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