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Transobturator vaginal tape inside-out A minimally invasive treatment of stress urinary incontinence: Surgical procedure and anatomical conditions

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Abstract

Objective: The aim of this study was to review the surgical transobturator vaginal tape inside-out (Gynecare TVT-O, Ethicon Inc., Somerville, NJ) technique as described by de Leval and to present the relevant anatomical conditions of the lower pelvis on the basis of corpse dissections after TVT-O placement.
Study design: In order to visualize the anatomical structures through which the tape runs, anatomical dissections of five corpses after TVT-O placement were performed. Furthermore, the dissections made possible to give a detailed description of the neighbouring neurovascular structures.
Results: The anatomical dissections show that the transobturator tape does not reach into the retropubic space at any time during the procedure, so that injuries of the bladder, of the epigastric vein and the external iliac vessels are not to be expected. The distance between the tape and the major neighbouring neurovascular structures shows slight individual differences, however without the danger of neurovascular injuries if the surgical procedure is performed as recommended.
Conclusion: Precise knowledge about the anatomy of the area of operation provides the surgeon with the possibility to safely conduct the operation and it contributes to a reduction of perioperative complications.

Keywords: Anatomy; Transobturator vaginal tape inside-out (TVT-O); Stress urinary incontinence

1. Introduction

Stress urinary incontinence is a devastating condition that afflicts 20% of the women. Although many therapeutic options are available for the treatment of stress urinary incontinence, the surgical treatment remains the most effective [1].

The tension-free vaginal tape operation (TVT) as described by Ulmsten and Petros [2] has become one of the most popular surgical procedures for the treatment of stress urinary incontinence. Several reports have confirmed a high curing rate [3–6].

The frequent use of retro-pubic tension free suburethral slings has been associated with various peri- and post-operative complications [5–12]. To reduce these complications, particularly with high-risk patients like those who have been operated on before in the lower pelvis, an alternative approach with a transobturator passage of the tape has been developed [13,14].

The aim of this article is to review the surgical transobturator vaginal tape inside-out (Gynecare TVT-O,

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Ethicon Inc., Somerville, NJ) technique as described by de Leval in 2003 [13] and to present the anatomical conditions of a part of the lower pelvis on the basis of corpse dissections after TVT-O placement.

2. Material and methods

At the University of Tuebingen, the TVT-O operation generally is performed under local anaesthesia, unless the patient undergoes surgical treatment of stress urinary incontinence in combination with a surgical treatment of genital prolaps at the same time. The surgical technique is the same as described by de Leval in 2003 [13].

In order to visualize the anatomical structures through which the tape runs, anatomical dissections of five corpses after TVT-O placement were performed.

The surgical procedure of the implantation of the TVT-O in the corpses was identical with operations performed on patients with stress urinary incontinence following de Leval's technique.

Bodies donated for research and medical education to the Institute of Anatomy Tuebingen were used. For the study the corpses were preserved with alcohol–glycerol. The arteries were filled with collared silicone for better visibility. This preservation technique maintains tissue properties and the legs can be positioned in hyperflexion. The injection solution consists of five parts ethanol and two parts glycerol. Twenty-one to 30 l of embalming solution were injected into the femoral artery, depending on the size of the corpse. Fifty milliliters of lysoformin were added to the injection solution as desinfecting agent. The corpses are kept airthight under refrigerated conditions (8 °C).

3. Results

3.1. Surgical procedure

The patient is placed in the gynaecological position with thighs in hyperflexion. After the usual preparation of the patient a urethral catheter is inserted into the bladder, which is emptied. Then the local anaesthesia is performed.

The anterior vaginal wall is incised at a length of 1 cm and at a distance of 1 cm proximally to the urethral meatus. This step is followed by introducing fine dissection scissors through the initial dissection path towards the upper part of the ischio-pubic ramus on a horizontal plane with a 45° angle to the urethral sagittal plane as indicated in Fig. 1. Once the upper part of the ischio-pubic ramus is reached, the obturator membrane is perforated with the tip of the scissors. An introducer, with the open side of its gutter facing the surgeon, is pushed along the preformed dissection canal until it reaches and perforates the obturator membrane. The distal end of the tube mounted onto the spiral segment of the needle (Fig. 2) is gently slipped along the gutter of the

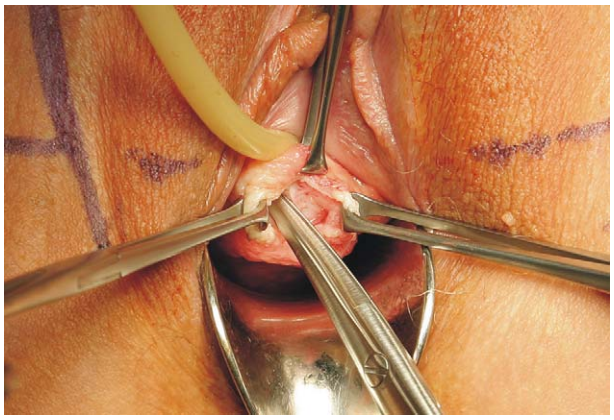

Fig. 1. Median sagittal incision of the vaginal wall. Introduction of fine dissection scissors towards the upper part of the ischio-pubic ramus to perforate the obturator membrane.

introducer in order to pass through the obturator foramen (Fig. 3). Then the introducer is removed. After the tube has appeared at the previously determined skin exit point (Fig. 4a), the tube is pulled off from the supporting needle, which is removed. The same technique is applied at the other side.

Next the ends of the tape are cut, the tape is aligned under the middle of the urethra, creating space and avoiding any tension of the tape by grasping the tape at its middle with a blunt clamp (e.g. Babcock clamp), thus creating a small loop of 5 mm. The plastic sheaths are then removed simultaneously. The tape ends are cut in the subcutaneous layer and the incisions are closed.

Postoperative indwelling catheterisation is not required. The patient should be encouraged to try to empty the bladder 2–3 h after the operation.

3.2. Anatomical conditions

After the transobturator placement of the tension-free vaginal tape in the above-described manner, we performed the corpse dissections. Because of the preservation of the

Fig. 2. Gynecare TVT-O special device.

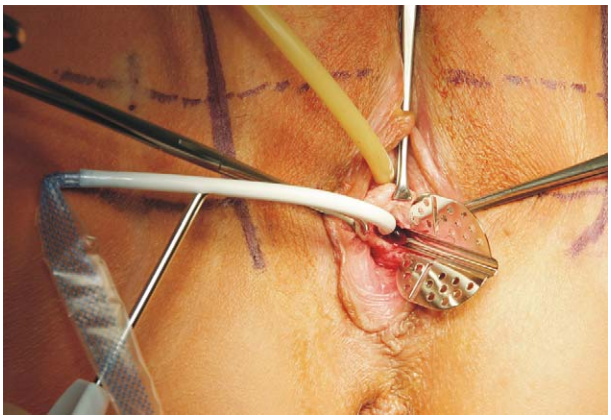

Fig. 3. The introducer is pushed along the preformed dissection canal until it perforates the obturator membrane. The tube mounted onto the spiral segment of the needle is slipped along the gutter of the introducer so as to pass through the obturator foramen.

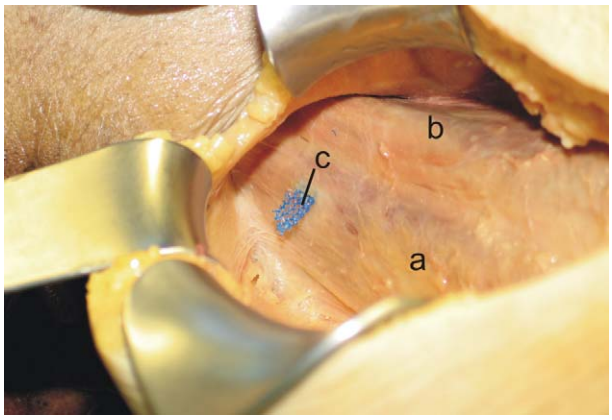

Fig. 5. The position of the tape through the adductor muscles of the thigh, through the gracilis muscle and its fascia (left side): a, musculus gracilis covered by its fascia; b, musculus adductor longus covered by its fascia; c, tape.

corpses with alcohol–glycerol the properties of the tissues were maintained and the legs were able to be positioned in hyperflexion. First dissections are performed going from the outer layer of the skin of the thigh to the inner layer of the fascia of the internal obturator muscle. Then dissections of the retropubic space and the lateral pelvic wall using a laparotomy have been done. This enabled the identification and description of the anatomical structures of the pelvic floor through which the tape passes. Furthermore, the dissections made it possible to give a detailed description of the neighbouring anatomical structures and to determine the distance between the tape and the major neighbouring neurovascular structures.

After removal of the skin and the subcutaneous layer of the thigh the position of the tape through the gracilis muscle and through the fascia lata can be identified (Fig. 5). Then the fascia lata is dissected so that the position of the tape through the adductor brevis muscle can be visualized (Fig. 7). Both the gracilis muscle as well as the adductor brevis muscle is traversed by the tape in their muscular parts.

The adductor muscles of the thigh originate in the form of a semi-circle from different points of the bony edge of the obturator foramen (Fig. 6) and are arranged in three layers. The ventral layer is composed by the pectineus muscle, the adductor longus muscle and the gracilis muscle. The pectineus muscle originates from the pectineal line of the superior pubic ramus, the adductor longus muscle from the superior ramus of the pubic bone and the gracilis muscle from the symphysial surface of the body of the pubic bone. The middle layer comprises the adductor brevis muscle, which originates from the symphysis pubica. The dorsal layer is the largest one and contains the adductor magnus muscle only. The latter originates from the place where the

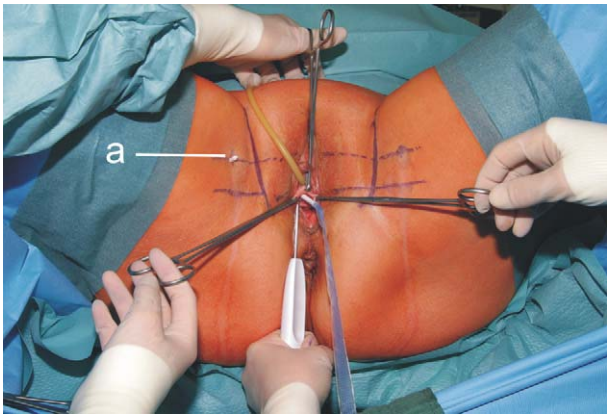

Fig. 4. The tube appears at the previously determined skin exit point a. The skin exit points are identified by tracing a horizontal line at the level of the urethral meatus and a second line parallel and 2 cm above the first line. The exit points are located at the second line 2 cm outside of the genitofemoral folds.

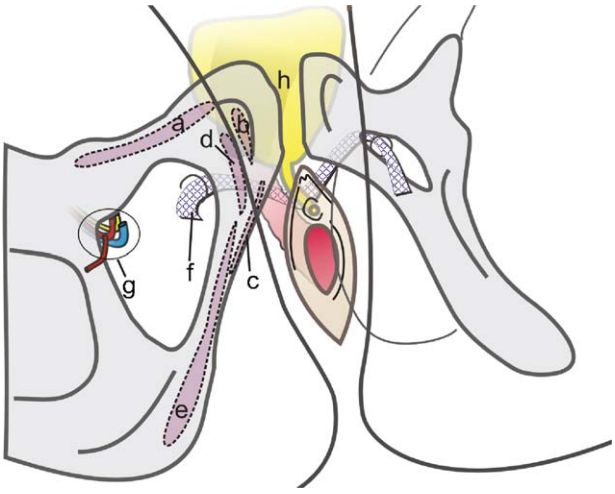

Fig. 6. Schematic drawing of the position of the TVT-O, important neighbouring structures and insertion points of the adductor muscles of the thigh: a, musculus pectineus; b, musculus adductor longus; c, musculus gracilis; d, musculus adductor brevis; e, musculus adductor magnus; f, tape; g, canalis obturatorius with the obturator nerve, artery and vein; h, vesica urinaria.

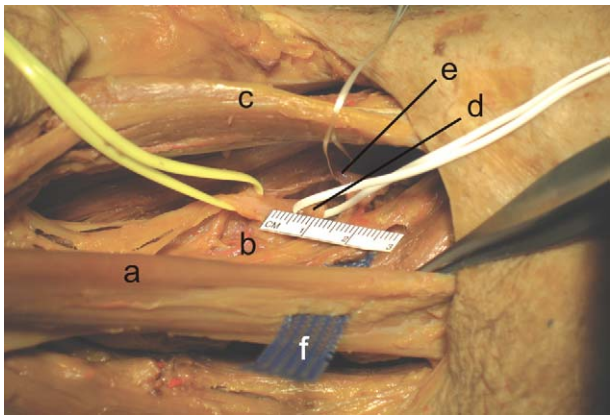

Fig. 7. The position of the tape through the adductor muscles of the thigh, through the adductor brevis and gracilis muscles with the ramus anterior of the obturator nerve exposed (right side): a, musculus gracilis; b, musculus adductor brevis; c, musculus adductor longus; d, ramus anterior of nervus obturatorius; e, ramus of vena obturatoria; f, tape.

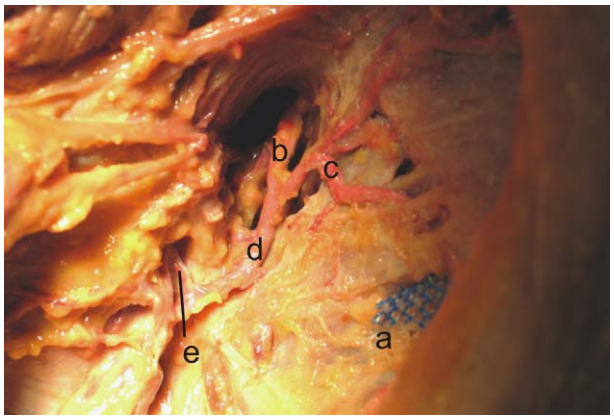

Fig. 9. Obturator membrane, the adductor muscles of the thigh and the obturator externus muscle removed. The tape passes the obturator foramen along the upper third of the ramus superior of the pubic bone. The obturator artery is prepared: a, tape; b, arteria obturatoria; c, ramus anterior; d, ramus posterior; e, ramus acetabularis.

ischial and pubic bones join. The points of insertion of the adductor muscles of the thigh are situated at different points of the femur with the exception of that of the gracilis muscle, which is at the shinbone.

The distance between the tape and the anterior ramus of the obturator nerve at the surface of the adductor brevis muscle varied between 2 and 2.8 cm (Fig. 7) (mean ± S.D., 2.42 ± 0.47). After removal of the adductor muscles of the thigh the position of the tape through the obturator externus muscle can be identified (Fig. 8). In the obturator foramen, the distance between the tape and the neurovascular structures in the obturator canal varied in the five dissected corpses between 2.0 and 2.9 cm (mean ± S.D., 2.48 ± 0.34). The distance between the tape and the ramus posterior of the obturator nerve is the same at the distance between the tape and the obturator canal because the posterior ramus goes to the adductor magnus muscle.

The obturator foramen is formed on the one hand by the ramus superior and ramus inferior of the pubic bone and on the other hand by the ramus and the body of the ischial bone. The obturator canal runs through the obturator foramen at its cranial and ventral part and connects the lower pelvis with the adductor muscles of the thigh (Fig. 6). The 20–25 mm long obturator canal is bordered by the tuberculum obturatorium anterior of the pubic bone at the front and by the tuberculum obturatorium posterior of the ischial bone at the back. Between these two structures there is the sulcus obturatorius of the ramus superior of the pubic bone, which forms the upper border of the obturator canal. The lower border of the obturator canal is formed by the obturator membrane and the internal and external obturator muscles.

Figs. 9 and 10 show the position of the tape through the obturator membrane after removal of the adductor muscles of the thigh and the obturator externus muscle. The obturator artery with its ramus anterior, posterior and acetabularis is prepared (Fig. 9). The distance between the tape and the obturator artery varied between 2.0 and 2.9 cm (Fig. 10) (mean ± S.D., 2.48 ± 0.34). The anterior ramus of the obturator artery runs along the external edge of the inferior ramus of the pubic bone by which it is protected.

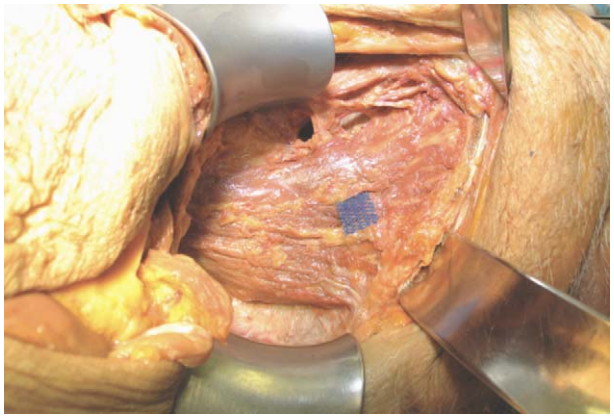

Fig. 8. The position of the tape through the obturator externus muscle (right side).

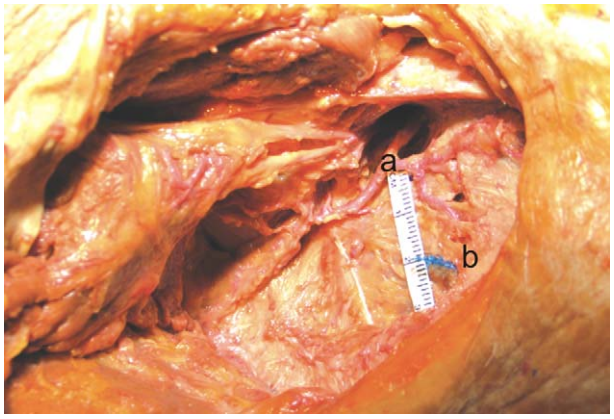

Fig. 10. Distance between the tape and the obturator artery: a, arteria obturatoria; b, tape.

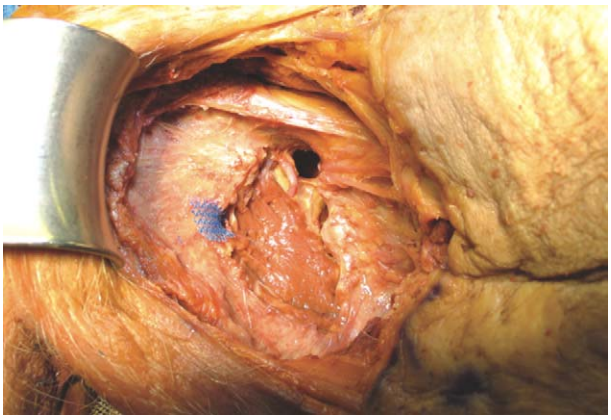

Fig. 11. The position of the tape through the obturator internus muscle after removal of the obturator membrane, the obturator externus muscle and the adductor muscles of the thigh.

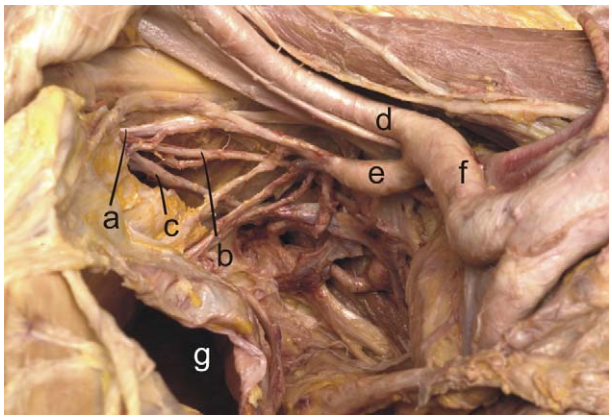

Fig. 13. The dissected right pelvic sidewall, obturator nerve, artery and vein: a, nervus obturatorius; b, arteria obturatoria; c, vena obturatoria; d, arteria iliaca externa; e, arteria iliaca interna; f, arteria iliaca communis; g, cavitas peritonealis.

After removal of the obturator membrane the internal obturator muscle can be visualized (Fig. 11).

The internal obturator muscle is the major part of the pelvic sidewall and, together with the obturator membrane covers the obturator foramen (Figs. 11 and 9). It originates at the medial edge of the obturator foramen, the obturator membrane and the pelvic surfaces of the iliac and ischial bone. The point at which the internal obturator muscle inserts is the greater trochanter of the femur. Laterally, the obturator membrane is covered by the external obturator muscle (Fig. 8), which originates at the medial edge of the obturator foramen and the obturator membrane and inserts at the trochanteric fossa.

Three anatomical structures pass through the obturator canal namely: the obturator nerve, the obturator artery and the obturator vein (Figs. 5 and 13). After the dissections of the pelvic sidewalls and the retropubic space per laparotomy the obturator artery can be traced back to the internal iliac artery and runs below the obturator nerve along the pelvic sidewall to the obturator canal (Fig. 13). In the canal, the artery divides into an anterior and posterior ramus. With its branches the anterior ramus leads to the adductor muscles of the thigh whereas the posterior ramus of the obturatory artery leads to the gluteus muscles. The obturator artery branches into two more rami namely: the ramus acetabularis (Fig. 9) and the ramus pubicus. Although in different textbooks of anatomy [15–17] variations are described, in four corpses the obturator artery constituted a ramus of the internal iliac artery. In the fives case, the obturator artery came from the epigastrica inferior artery (Fig. 12).

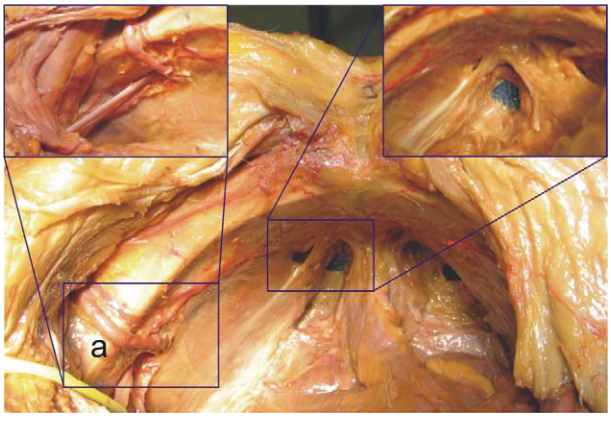

Fig. 12. The Retzius' space: the tape does not reach into the retropubic space. The left part of the tape is only visible after removal of the fascia of the obturator internus muscle. In this case, the obturator artery originates from the inferior epigastric artery (''Corona mortis''): a, arteria obturatoria.

Above the oburator artery, the obturator nerve (Fig. 13), which originates from the lumbosacralis trunk, runs along the pelvic sidewall and divides in the obturator canal into the ramus acetabularis, the ramus anterior and posterior (Fig. 7). The latter two provide with innervation the adductor muscles, the femur and the skin of the thigh with innervation. The ramus anterior of the nervus obturatorius branches after crossing the ventral side of the musculus adductor brevis.

The tape passes through the obturator foramen along the upper third of the ramus inferior of the pubic bone (Figs. 9 and 11).

The retropubic space and the pelvic sidewalls were dissected per laparotomy. In the Retzius' space the tape cannot be seen (Fig. 12). The tape remains covered by the fasciae and fibres of the internal obturator muscle, so that it does not reach into the lower pelvis at any time (Fig. 12).

4. Discussion

The tension-free vaginal tape (TVT) procedure as described by Ulmsten was introduced into clinical practice in 1994–1995 after extensive preclinical research and since then more than 600,000 patients worldwide have been treated [18].

In the meantime, the Tension-free Vaginal Tape has become one of the most popular surgical procedures for the treatment of stress urinary incontinence. If conducted by

experienced surgeons the TVT operation is a simple and effective procedure that can be performed under local anaesthesia and requires only a short operative and recovery time [2]. Several reports have confirmed a high curing rate with low morbidity.

In a prospective long-term multicenter study Nilsson et al. evaluated 90 patients who had a tension-free vaginal tape operation because of primary stress urinary incontinence. The mean follow-up time was 56 months. 84.7% of the patients were completely cured, another 10.6% significantly improved and 4.7% of the operations were regarded as failures. Only few complications during or after surgery occurred. In 1.1% bladder perforation and in 3.3% intraoperative bleeding of >200 ml occurred. In 3.3% a retropubic hematoma formed. 4.4% of the patients had postoperative voiding difficulties. 5.9% of the patients reported de novo urge symptoms. 7.8% experienced urinary tract infections during the first 2 months after operations [3].

During recent years many analyses of results and complications after TVT have been published. In general intra- and postoperative complications were few and included bladder perforations ranging from 3.8% to 6%, voiding difficulties 4–12%, de novo urinary urgency 7.4–12%, urinary infections 3.1–10.9% and retropubic hematoma 0.4–1.9%, major vessel and nerve injury 0.1%, urethral lesion 0.1%, vaginal defect healing 0.7% depending on the respective publication [4–9]. Other rare intraoperative complications include bowel perforation, major vascular injury, obturator nerve injury, urethra penetration and erosion [10–12].

Excellent descriptions of the paraurethral anatomy have enhanced our understanding of the structures involved in maintaining continence [19–21]. Anatomical dissections of the position of retropubic midurethral slings (TVT, IVS) were performed and measured the distance of the relevant pelvic neurovascular structures from the advancing tip of the TVT needle. This contributed to avoiding serious injuries to the patient [22].

The widely use of retro-pubic tension free suburethral slings has been associated with various peri- and post-operative complications. To reduce these complications, particularly with high-risk patients like those who have been operated on before in the lower pelvis, an alternative approach with a transobturator passage of the tape has been developed.

Before starting our study no anatomical dissections of the position of the transobturator vaginal sling inside-out (TVT-O) had been published. In the meantime one article, which deals with anatomical considerations for the obturator inside-out approach of the suburethral tape has appeared [23]. The exact determination of the position of the implanted tape so far is neither possible with computer-assisted tomography nor nuclear resonance scanning on corpses (own investigations).

The transobturator vaginal tape inside-out was described by de Leval in 2003 as a simple and effective procedure for the treatment of female stress urinary incontinence [13].

In comparison with the outside-in transobturator technique (Uratape, Obtape, Monarc) as described by Dolorme [14], the TVT-O method allows the passage of the needle with the tape attached through the obturator foramina from inside to outside.

With this novel surgical technique for the treatment of female stress urinary incontinence it is possible to reduce the peri- and postoperative complications associated with the widely use of retro-pubic tension free suburethral slings. The TVT-O is a safe technique for high-risk patients like those who were operated on before in the lower pelvis. The anatomical dissections showed that if the transobturator tape is placed from the inside to the outside it does not reach into the lower pelvis so that the risk of injuries of the bladder, the epigastric vein and the external iliac vein are not to be expected, if the surgical procedure is performed in the manner recommended by de Leval. In contrast, if the tape is placed through the retropubic space, those injuries can occur.

If performed in the above-described correct manner the TVT-O operation is a safe procedure for treatment of the stress urinary incontinence. Dissections on five specially preserved corpses show that the distance between the tape and the major neurovascular structures is relatively constant with negligible interindividual differences, so that these are not in danger at any time during the operation.

In comparison with the dissections performed by Bonnet et al. [23], we could show that the inserted tape traversed the muscular part of the gracilis an adductor brevis muscles only, but in none of our cases it went through the adductor magnus muscle. This fact may be explained by the special preservation of our anatomical specimens with alcohol glycerol, which made it possible to maintain the tissue properties and to place the thighs of the corpses in hyperflexion. Furthermore, the difference may also correlate with anatomical variations of the obturator foramen shape and size and the origin of the adductor muscles of the thigh. This fact however has no clinical relevance. The distance between the tape and the obturator canal with the nerve and vessels was approximately the same, ranging from 2.0 to 2.9 cm (mean $\pm$ S.D., 2.48 ± 0.34). At the surface of the adductor brevis muscle the distance between the tape and the anterior ramus of the obturator nerve varied between 2 and 2.8 cm (mean $\pm$ S.D., 2.42 ± 0.47). We agree with the Belgian group that the anterior branch of the obturator artery was protected by the bony edge of the inferior ramus of the pubic bone so that its injury by the passage of the tape is not to be expected.

In contrast with the anatomical investigations performed by Delmas et al. [24] who found that the obturator tape placed outside-in traverses the levator ani muscle and the arch of the pelvic fascia, the trajectory of the inside-out transobturator tape (TVT-O) is different. After the performed dissections the inside-out obturator tape could not be seen in the retropubic space at any time. The tape remains covered by the fascia and the fibres of the internal

obturator muscle, so that bladder injuries are not to be expected. Nevertheless it cannot be denied that during the learning curve due to a false technique, for example, such injuries may occur.

Precise knowledge about the anatomy of the area of operation provides the surgeon with the possibility to safely conduct the operation and it contributes to a reduction of perioperative complications.

The results obtained by the described dissections can help surgeons to conceptualize the anatomical structures through which the advancing TVT-O needle tip passes during surgery and can contribute to a reduction of perioperative complications.

5. Condensation

The study reviews the surgical Transobturator Vaginal Tape Inside-Out technique and presents the relevant anatomical conditions on the basis of corpse dissections after TVT-O placement.

References

[1] Stanton SZP. Female pelvic reconstructive surgery. London: Springer; 2004.

[2] Ulmsten U, Petros P. Intravaginal slingplasty (IVS): an ambulatory surgical procedure for treatment of female urinary incontinence. Scand J Urol Nephrol 1995;29(1):75–82.

[3] Nilsson CG, Kuuva N, Falconer C, Rezapour M, Ulmsten U. Long-term results of the tension-free vaginal tape (TVT) procedure for surgical treatment of female stress urinary incontinence. Int Urogynecol J Pelvic Floor Dysfunct 2001;12(Suppl. 2):S5–8.

[4] Meschia M, Pifarotti P, Bernasconi F, et al. Tension-Free vaginal tape: analysis of outcomes and complications in 404 stress incontinent women. Int Urogynecol J Pelvic Floor Dysfunct 2001;12(Suppl. 2):S24–7.

[5] Moss E, Toozs-Hobson P, Cardozo L, Emens M, Pogmore JR, Constantine G. A multicentre review of the tension-free vaginal tape procedure in clinical practice. J Obstet Gynaecol 2002;22(5):519–22.

[6] Debodinance P, Delporte P, Engrand JB, Boulogne M. Tension-free vaginal tape (TVT) in the treatment of urinary stress incontinence: 3 years experience involving 256 operations. Eur J Obstet Gynecol Reprod Biol 2002;105(1):49–58.

[7] Kuuva N, Nilsson CG. A nationwide analysis of complications associated with the tension-free vaginal tape (TVT) procedure. Acta Obstet Gynecol Scand 2002;81(1):72–7.

[8] Karram MM, Segal JL, Vassallo BJ, Kleeman SD. Complications and untoward effects of the tension-free vaginal tape procedure. Obstet Gynecol 2003;101(5 Pt 1):929–32.

[9] Bodelsson G, Henriksson L, Osser S, Stjernquist M. Short term complications of the tension free vaginal tape operation for stress urinary incontinence in women. Bjog 2002;109(5):566–9.

[10] Vassallo BJ, Kleeman SD, Segal J, Karram MM. Urethral erosion of a tension-free vaginal tape. Obstet Gynecol 2003;101(5 Pt 2): 1055–8.

[11] Fourie T, Cohen PL. Delayed bowel erosion by tension-free vaginal tape (TVT). Int Urogynecol J Pelvic Floor Dysfunct 2003;14(5):362–4.

[12] Meschia M, Busacca M, Pifarotti P, De Marinis S. Bowel perforation during insertion of tension-free vaginal tape (TVT). Int Urogynecol J Pelvic Floor Dysfunct 2002;13(4):263–5 [Discussion 5].

[13] de Leval J. Novel surgical technique for the treatment of female stress urinary incontinence: transobturator vaginal tape inside-out. Eur Urol 2003;44(6):724–30.

[14] Dolorme E. La bandelette trans-obturatrice: un procede mini-infasif pour traiter líncontinence urinaire déffort de la femme. Progres en Urologie 2001;11:1306–13.

[15] Sobotta J, Putz R, Pabst R. Atlas der Anatomie am Menschen. Urban & Fischer Bei Elsevier; 2004.

[16] Lanz T, Wachsmuth W. Praktische Anatomie. In: Bein und Statik. Berlin: Springer-Verlag; 2004.

[17] Bertolini RL. G. Atlas der Anatomie des Menschen, Band 1: Arm und Bein. Leipzig: VEB Georg Thieme; 1978.

[18] Women's health weekly via NewsRx.com & NewRx.net – Health & Medicine Week, December 27, 2004.

[19] DeLancey JO. Structural support of the urethra as it relates to stress urinary incontinence: the hammock hypothesis. Am J Obstet Gynecol 1994;170(6):1713–20 [Discussion 20–23].

[20] DeLancey JO. Structural aspects of the extrinsic continence mechanism. Obstet Gynecol 1988;72(3 Pt 1):296–301.

[21] Oelrich TM. The striated urogenital sphincter muscle in the female. Anat Rec 1983;205(2):223–32.

[22] Abbas Shobeiri S, Gasser RF, Chesson RR, Echols KT. The anatomy of midurethral slings and dynamics of neurovascular injury. Int Urogynecol J Pelvic Floor Dysfunct 2003;14(3):185–90 [Discussion 90].

[23] Bonnet P, Waltregny D, Reul O, de Leval J. Transobturatorial vaginal tape inside out for the surgical treatment of female stress urinatry incontinence: anatomical considerations. J Urol 2005;173: 1223–8.

[24] Delmas V, Hermieu J, Dompeyre P, Messas A, Dumonceau O, Ravery V. The transobturator slingtape uratape: anatomical dangers. Eur Urol 2003;(Suppl. 2):197.