

Management of Stress Urinary Incontinence by TVT, PVT, SPARC SLING

INTRODUCTION

Pubovaginal sling procedures have long been utilized for effective treatment of stress urinary incontinence. Traditional sling procedures, however have never been standardized, require relatively large vaginal and suprapubic incision(s) or bone fixation devices and have been reported to have high incidence of postoperative voiding dysfunction. Recently, minimally invasive mid-urethral mesh slings have been introduced in Europe and the United States. The Tension-Free Vaginal Tape sling was the first sub-urethral sling in this new category of minimally invasive mid-urethral slings to be introduced for the surgical correction of female genuine SUI (stress urinary incontinence). First described in Sweden by Ulmsten in 1995, the TVT procedure (Tension-Free Vaginal Tape, Gynecare, Somerville, NJ) has been used extensively in Europe and in the United States since clinical trials established its safety and effectiveness as an ambulatory surgical procedure for treatment of genuine SUI in women.^{1,2} Recent studies have shown that the TVT procedure is associated with high success rates comparable to the traditional sub-urethral sling procedure, yet may lower the incidence of intra- and postoperative complications (Figs 31.1 to 31.31). The procedure is routinely done via the vaginal route with a 1.5 cm vaginal incision, two small suprapubic stab incisions (< 5 mm), requires no fixation, can be completed in 20-25 minutes and is the first sling that is adjusted intraoperatively in a tension-free manner with a cough stress test. This objective adjustment is thought to contribute to its success rate and reduce postoperative voiding dysfunction. The procedure is completed under local or regional anesthesia either

as an outpatient or with a hospital stay of less than 24 hours.³ Long-term data and clinical experience have proven exceptional efficacy and safety. Success rates continue to be excellent (85% cured, 96% significantly improved) at 5 years and impressive success rates have also been shown with recurrent SUI (91%), intrinsic sphincter deficiency (86%), and mixed incontinence (89%).⁴⁻⁸ Over 200,000 procedures have been completed worldwide and the procedure has revolutionized the treatment of SUI in women.

More recently, similar procedures have been developed that utilize some of the same basic concepts of mesh tape placed sub-urethrally in a minimally invasive approach. The SPARC (American Medical Systems) is a mid-urethral sling procedure that utilizes a prolene mesh tape as well, however it is completed via an abdominal approach (Figs 31.32 to 31.60). Needles are first passed from above abdominally through small suprapubic incisions, to a small vaginal incision and the tape is then pulled up from below. A prolene suture is woven through the mesh so that the sling can be adjusted, if necessary, after the outer sheath is removed. The procedure was developed for surgeons who were more comfortable passing needles from above to below, such as Stamey or Raz needles.

A new approach that is being investigated and utilized in Europe and will soon be released in the United States, is the transobturator approach to place the mesh tape suburethrally. The MONARC (Figs 31.61 to 31.70) subfascial hammock sling (AMS) utilizes the same mesh from the SPARC, however the needle and sling is passed laterally through the obturator membrane and muscle instead of the retropubic space and rectus muscle. The approach is thought to possibly be safer and was developed by surgeons wishing to reduce risk of bladder

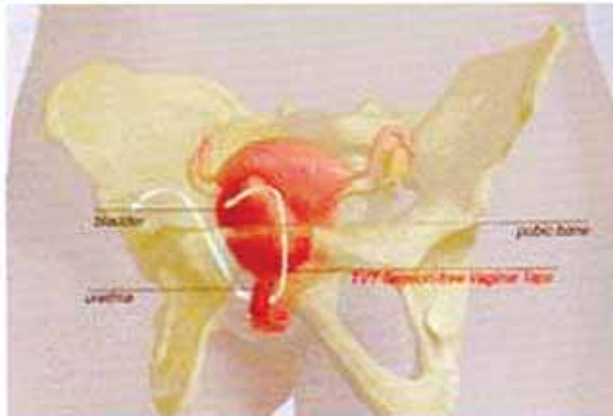


Fig. 31.1: Color schematic of TVT sling in place suburethraly

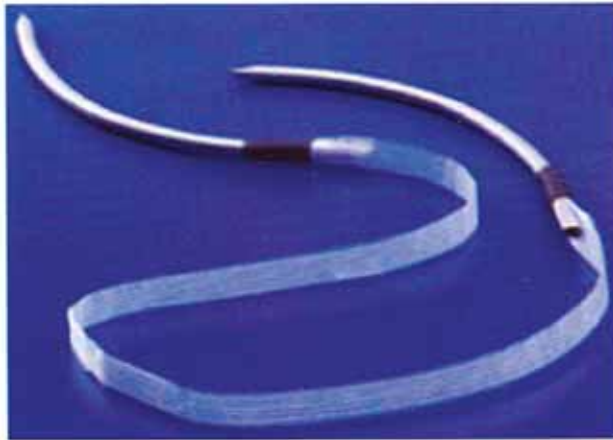


Fig. 31.2: TVT mesh: 1.1 cm x 40 cm polypropylene mesh (Prolene, Ethicon, Inc., Somerville, NJ) covered by a plastic sheath and connected to two 5 mm stainless steel needles. Plastic sheath allows easy passage/placement of tape, which is designed to stay fixed in place once the smooth protective cover is removed and thought to reduce risk of infection by covering mesh during passage



Fig. 31.3: Suprapubic incisions marked approximately 2 cm off the midline (clitoral hood marks the midline). Two small abdominal skin incisions (0.5 cm) are made on each side of the midline just above the pubic symphysis. No dissection is necessary



Figs 31.4 and 31.5: Local anesthesia is injected bilaterally via a long spinal needle in the skin and abdominal wall just above the pubic symphysis, downward posterior to the pubic bone through the space of Retzius



Fig. 31.6: Local anesthetic agent injected into vaginal mucosa and submucosal tissues in the midline and bilaterally at the level of the midurethra toward the bladder neck and in direction of retropubic space. Once incision and dissection complete, then local anesthesia is injected bilaterally with a spinal needle along the tract the TVT needle will take, i.e. through the pubocervical fascia and then up into retropubic space right behind pubic bone

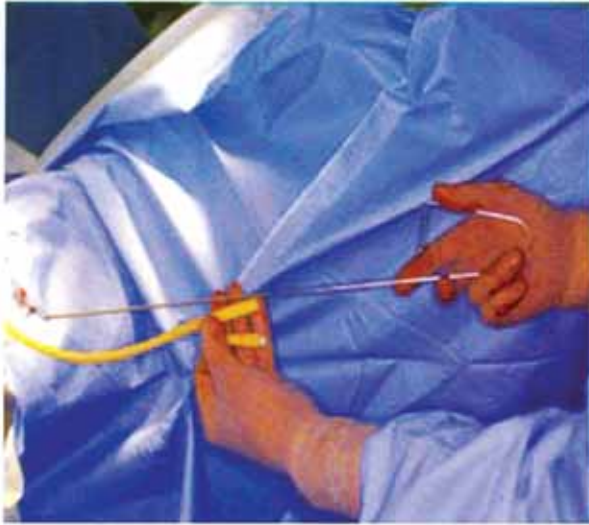
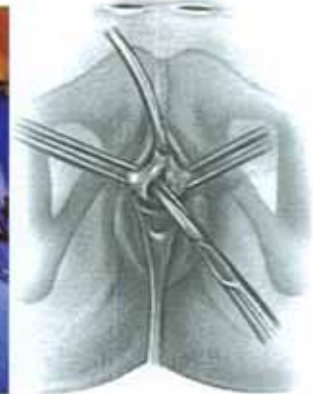
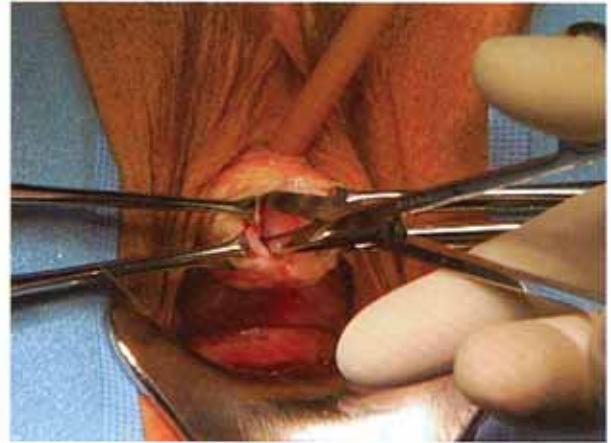
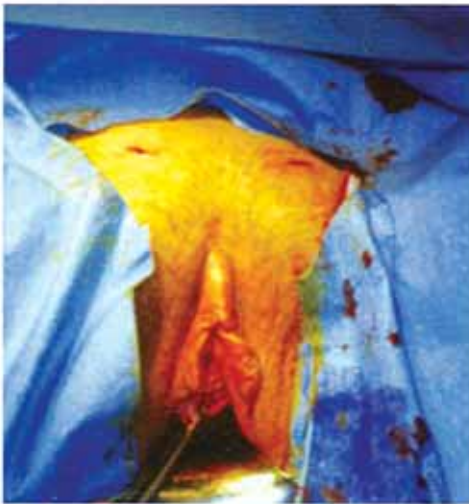


Fig. 31.7: 18-French Foley catheter used to drain bladder throughout case. Rigid catheter guide facilitates identification of urethra and bladder neck and used to manipulate these structures during needle passage to help protect urethra and open up space that TVT needle will be passing through



Figs 31.10 and 11a and b: The edges of the vaginal incision grasped with Adair clamps and minimal dissection is used to free the vaginal wall from the suburethral tissues and develop a small tunnel paraurethrally bilaterally. The pubocervical fascia is not broken through. Dissection is completed sharply with Metzenbaum scissors, blunt dissection utilizing fingers should not be completed



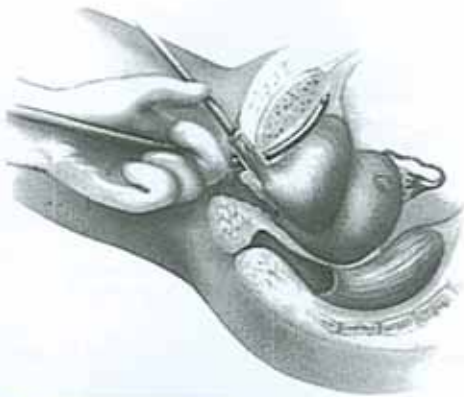
Figs 31.8 and 9: Suprapubic stab incisions (5 mm) made bilaterally. A small sagittal incision (1.5 cm) is made in the midline of the anterior vaginal wall approximately 1 cm distal to external urethral meatus



Fig. 31.12: Re-usable TVT handle inserted on needle preparing for passage. Speculum removed from vagina



Fig. 31.13a to c: Bladder is drained, catheter guide placed and deviated to side of needle passage. Needle tip placed through vaginal incision into paraurethral space and directed toward ipsilateral shoulder. Two hands are used to pass needle, one on the needle itself and the other on the handle. A finger should be placed vaginally (not in the incision) and the inferior ramus should be palpated; the needle should then be advanced directly under the inferior ramus and through the endopelvic fascia. Once the needle tip has broken through the fascia, the needle is adjusted slightly to the midline and the handle of the needle is then directed downward and the needle is advanced through the retropubic space upward, being careful to try to hug the pubic bone as the needle passes through the space. The force advancing the needle actually comes from the palm or thumb of the vaginal hand and the vaginal finger guiding it. The second hand on the handle directs or “steers” the needle, but does not advance it



Figs 31.14 and 31.15: The dominant hand then grasps the base of the needle and the handle and the other hand is placed on the abdomen to advance the needle tip through the abdominal fascia and stab incision



Fig. 31.16: Cystoscopy is completed with the needle in place to rule out any perforation of the bladder. The bladder should be completely distended. Most perforations occur at the lateral border of the dome of the bladder as demonstrated in this photograph. The bladder is drained and the needle passed on the contralateral side in an identical fashion



Figs 31.17 to 31.18: Laparoscopic view of TVT needle and tape in space of Retzius. Tip of TVT needle is seen perforating pubocervical fascia at the midurethra, then through the space (in front of the pubic bone) and anterior abdominal wall fascia. Final position of tape bilaterally visualized retropubically (urethra and bladder neck can be seen in the middle). Clearly, one can visualize the support or hammock effect the tape provides the urethra

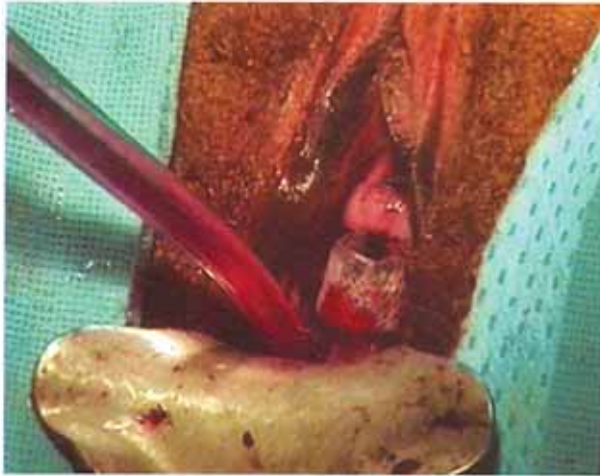


Fig. 31.22: Once final adjustment is reached, the tape is held in place suburethrally with an instrument such as curved Mayo scissors and the outer sheath is removed from above and excess mesh cut off. The suprapubic incisions are closed with steri-strips and the vaginal incision with absorbable suture



Figs 31.19 to 31.21: Cough test and tension-free adjustment. The tape is left very loose under the urethra (both needles have been pulled through and are on abdomen still attached to tape), the bladder is filled with 250 cc of fluid and the patient is asked to cough. The tape is then tightened sequentially (always with an instrument between the tape and the suburethral tissues) until only a small "welling up" of fluid is seen with cough



Fig. 31.23: Final position of TVT sling

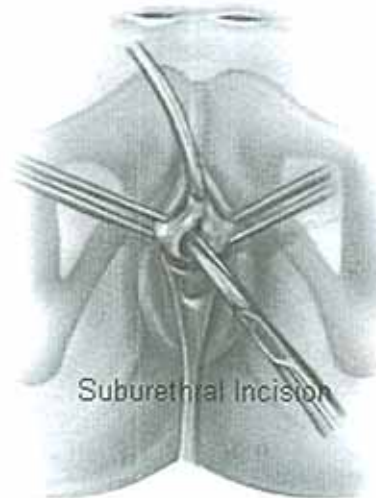


Fig. 31.24: Illustration of step I of TVT placement

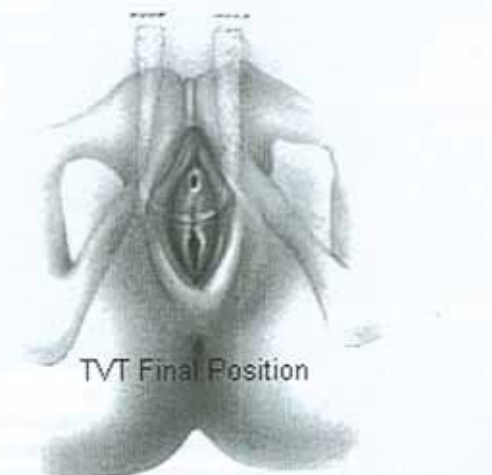
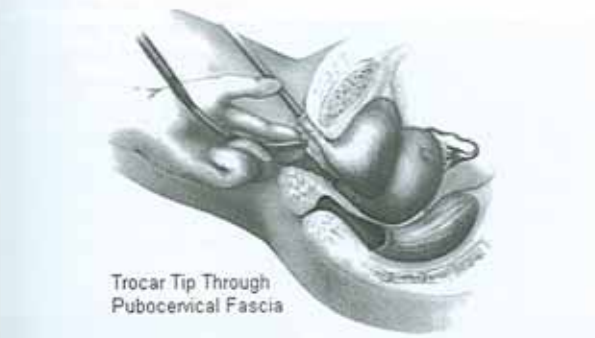
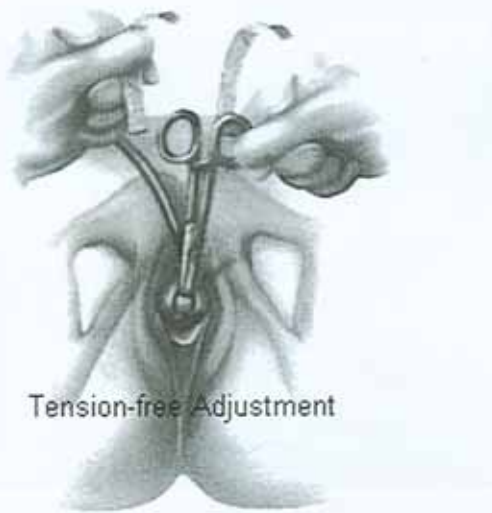
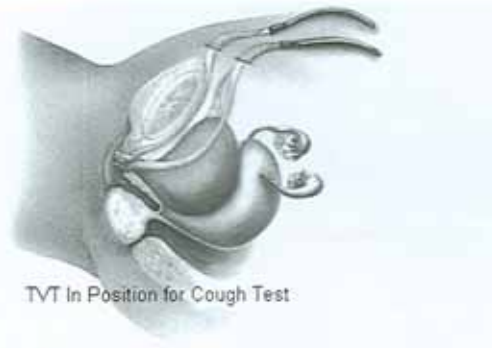
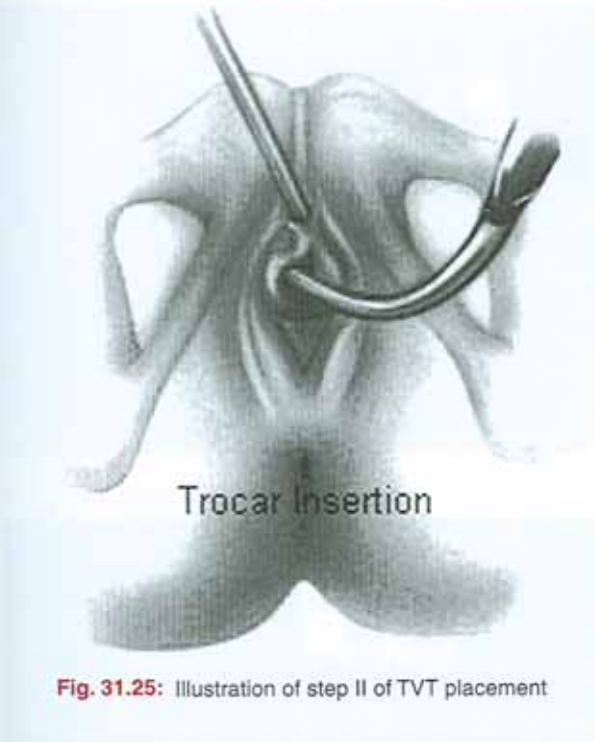




Fig. 31.32: Patient in dorsal lithotomy position, adjustable Allen stirrups. Vaginal speculum in place. Presence of concomitant mild cystocele



Fig. 31.33: 18-French Foley catheter placed to drainage



Fig. 31.34: Superior aspect of pubic bone outlined with continuous mark. Midline (located superior to clitoral hood) as well as location of incisions (2 cm lateral to midline bilaterally) for trocar passage marked just superior to pubic ramus. Small stab incisions (5 mm) made at these 2 lateral locations with a #15 scalpel blade



Fig. 31.35: Injection with local infiltrate (1/4% lidocaine w/ epinephrine 1:400,000) subcutaneously, into myofascial layer and down into retropubic space for trocar incisions and passage of SPARC needle



Fig. 31.36: Alice clamps placed on suburethral vaginal mucosa in midline, the first approximately 1 cm distal to urethral meatus and the second 3 cm distal to the first



Fig. 31.37: Location of suburethral incision marked



Fig. 31.38: Suburethral tissues injected subcutaneously with local anesthetic solution



Figs 31.39 and 31.40: Dissection of suburethral tissues utilizing sharp Metznanbaum scissors. A pocket is created on each side, dissecting the vaginal mucosa off the underlying suburethral tissues. The dissection is taken laterally to the pubocervical fascia, however it is not broken through. The incision for the SPARC is made slightly larger than the TVT as a finger is placed in the incision against the pubocervical fascia to guide the SPARC needle through the pubocervical fascia from above and into the incision. Wide Allis' clamps (adairs) are placed on the edges of the vaginal epithelium for better grasping and less risk of tearing of the edges



Figs 31.41 and 31.42: Injection of local anesthetic into retropubic space utilizing a 21 gauge spinal needle. Typically 10-20 cc injected bilaterally for anesthesia and/or hydrodissection of space of Retzius. The needle is passed through the pubocervical fascia and up behind pubic bone and injection is carried out through the path that the SPARC needle will pass



Fig. 31.43: SPARC needle passed on right side from above through suprapubic stab incision, down through myofascial layer and behind pubic bone, trying to stay as close to the back of the pubic bone through the retropubic space. A finger is placed in the previous small pocket created vaginally and this finger guides the needle from below through the pubocervical fascia and then through the vaginal incision



Fig. 31.45: Needle passed on patient's left side, again from above through the suprapubic incision abdominally, through retropubic space and into vaginal incision. Both needles are viewed coming through the vaginal incision bilaterally. Cystoscopy is completed at this time to ensure that needle penetrated neither the bladder nor the urethra



Fig. 31.44: View of the needle coming through the vaginal incision that was passed on patient's right side

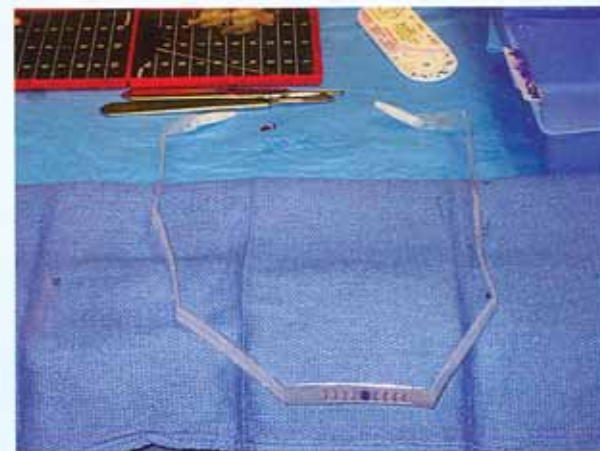


Fig. 31.46: View of the SPARC tape, polypropylene mesh covered by an outer clear plastic sheath. There is also a prolene suture weaved through the midline of the mesh that can be utilized to adjust the tape if necessary after removing the outer sheath, without stretching or fraying the mesh



Fig. 31.50: The bladder is then filled with 250 cc and the patient is asked to cough. Leakage is noted and the tape is tightened sequentially in a tension free manner (with a spacer between the tape and the sub-urethral tissues, in this case scissors are used) until there is only a small welling up at the urethral opening with deep cough



Figs 31.47 to 31.49: Tape attached to the needles bilaterally, these lock in place once attached. Tape is then pulled up through space of Retzius and up onto abdominal wall with the SPARC needles. It is left loose under the urethra



Fig. 31.51: The tape is visualized to be in position at the midurethra and to be loose under the urethral meatus even after the adjustment has been made. There is clearly still a space between the tape and the suburethral tissues



Figs 31.52 to 31.54: The outer sheath and the tape are cut free from the needles and the outer sheath is grasped with hemostats and removed. It should be noted that an instrument should be placed between the tape and the urethra to stabilize the tape in place so that it does not tighten or change position when the assistant is pulling off the outer sheath from above

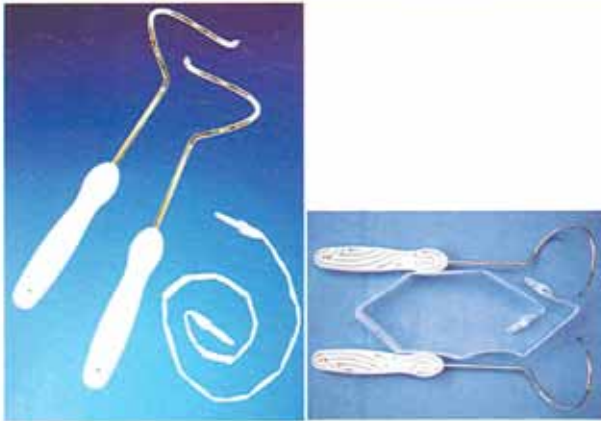


Figs 31.55 and 31.56: The prolene suture that is weaved through the tape by the manufacturer is grasped and the mesh can be adjusted (tightened from above or loosened from below) if necessary after the outer sheath is removed, without stretching or fraying the mesh

Fig. 31.57: After final adjustments are made, the excess mesh is excised at the abdominal incisions first pushing the abdominal skin down slightly so the mesh will retract under the skin



Figs 31.58 and 31.60: The vaginal incision is closed with 3-0 vicryl in a running interlocking fashion and the abdominal skin incisions are closed with Dermabond or steri-strips



Figs 31.61a and b: MONARC needles and mesh



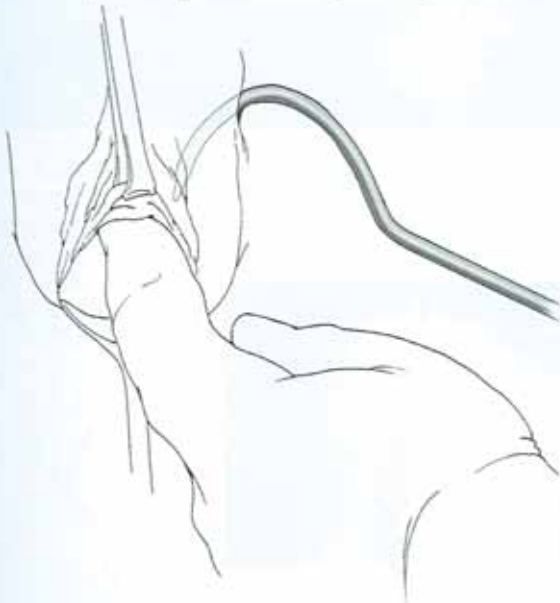
Figs 31.62a and b: Demonstration of MONARC needles



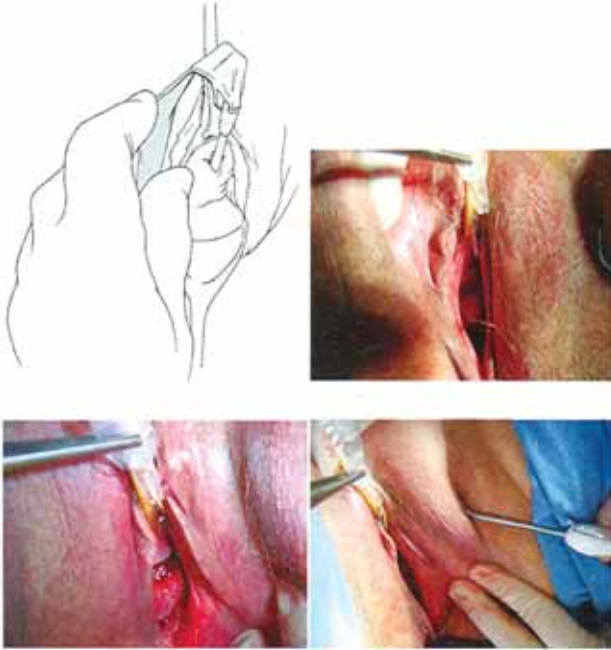
Figs 31.63a and b: Stab incision made in the genitofemoral fold at the level of the clitoris bilaterally. Finger placed in vagina and palpate obturator fascia (obturator internus) from inside vagina. Outside finger palpates tract needle will take through obturator foramen, just lateral to ischiopubic ramus. The index fingers can actually palpate each other. Needle tip is then placed in stab incision



Figs 31.64a and b: With index finger remaining in vaginal incision, needle is rotated and guided through the space and brought into paraurethral space with vaginal hand. Needle path is around the medial edge of the ischiopubic ramus just below the insertion of the adductor longus tendon, then through the obturator externus muscle, obturator membrane, and obturator internus. Pressure is exerted by thumb of vaginal hand on curve of needle as it breaks through the obturator fascia and needle is guided by index finger of vaginal hand throughout the path the needle takes



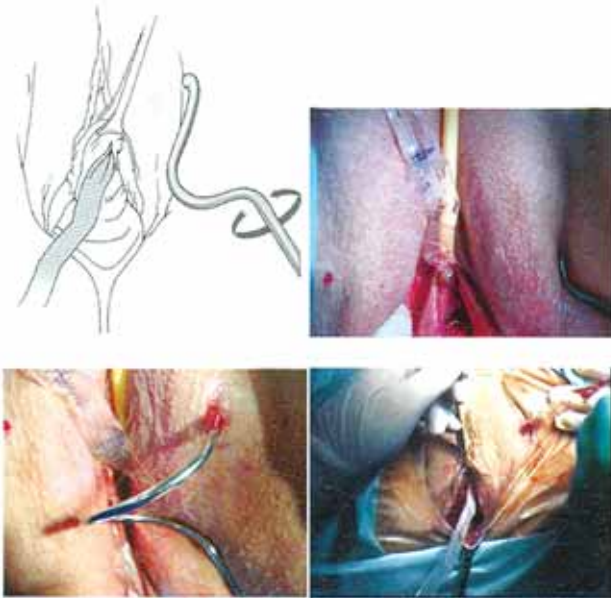
Figs 31.65a and b: Vaginal index finger guides needle through incision



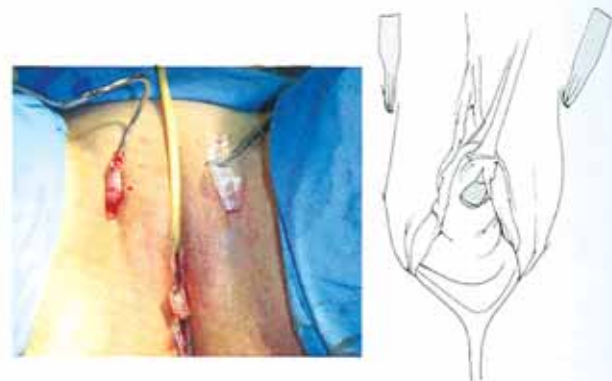
Figs 31.66a to d: Mesh tape covered by outer plastic sheath is connected to needle



Figs 31.68a and b: Needle being placed on contralateral side



Figs 31.67a and b: Tape is then pulled back through the space by opposite rotation of the needle and handle



Figs 31.69a and b: Tape being pulled through on contralateral side



Figs 31.70a and b: Final position of tape determined by cough stress test. Stab incisions closed with steri-strips

perforation, retropubic hematomas, large vessel lacerations and bowel injuries. Early data shows promising results and the procedure is gaining popularity in Europe.⁹

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