The Use of a Concomitant Tension-free Vaginal Mesh Technique and a Tension-free Midurethral Sling in Treating Pelvic Organ Prolapse and Occult Stress Urinary Incontinence

Tian-Ni Kuo[1], Ming-Ping Wu[1,2]*

[1]Division of Urogynecology and Pelvic Floor Reconstruction, Department of Obstetrics and Gynecology, Chi Mei Foundation Hospital, Tainan, and [2]Department of Obstetrics and Gynecology, College of Medicine, Taipei Medical University, Taipei, Taiwan.

It has been reported that, among women, the risk of undergoing surgery for the treatment of a pelvic organ prolapse (POP) is greater than 10% by the age of 80 [1]. This percentage is expected to increase as life expectancy continues to rise. Prevalence rates of POP vary considerable according to the definition and survey method used, as well as the population studied. Meanwhile, there would seem to be a large proportion of repetitive procedures for recurrence of POP (29.2%) and the time interval between the repetitive procedures decreases with each successive repair [1]. Occult stress urinary incontinence (SUI) is estimated to be 36–80% associated with advanced POP [2]. Therefore, it is distressing to encounter postoperative symptomatic SUI after surgical correction of severe POP.

There are different surgical access routes for pelvic reconstructive surgery, namely the abdominal, laparoscopic and vaginal approaches. A variety of abdominal and vaginal repairs are commonly utilized to repair an apical defect, and the choice is often based on the surgeon's preference. Among the available abdominal repair approaches, abdominal sacrocolpopexy with mesh interposition remains the gold standard. Laparoscopic sacrocolpopexy, although feasible, has not gained widespread acceptance because of technical difficulties. Of the vaginal restorative procedures, there are proponents of both uterosacral ligament vault suspension and of sacrospinous ligament fixation [3]. The vaginal approach for pelvic reconstructive surgery is reported to have fewer complications and a shorter rehabilitation period than the abdominal route [4]. Hysterectomy, which is empirically regarded as having a potential additive curative effect in reducing postoperative POP recurrence, is widely performed with a significantly prolapsed uterus [5]. However, there is no clear evidence supporting the idea that hysterectomy improves the surgical outcome [5]. Here, we presented a case who received concomitant tension-free vaginal mesh (TVM) technique and tension-free midurethral sling to treat POP and to prevent further postoperative SUI. The related issues, such as occult SUI and uterine preservation during pelvic reconstructive surgery, are also addressed.

A 54-year-old, gravida 2, para 2, woman had suffered from a protruding vaginal mass and voiding difficulty for 2 years. She had suffered from SUI during coughing, laughing and walking 10 years previously, and these symptoms had been resolved after the emergence of POP. During the outpatient clinic examination, a pelvic examination revealed stage III anterior vaginal wall prolapse, stage III posterior vaginal wall defect, and stage III uterine prolapse, with pelvic organ prolapse quantification (POP-Q) measurements: Aa + 2, Ba + 5, C + 5, GH 7, PB 3, TVL 7, Ap + 2, Bp + 3, D 0 (Figure 1A). At the same time, she had occult SUI. This was demonstrated with pad test, which gave 0.02 g and 9.31 g before and after the reposition of the prolapsed uterus, respectively. A urodynamic study by uroflowmetry showed bladder outlet obstruction with the maximal flow rates being 8.7 mL/s and 18.6 mL/s,

Correspondence to: Dr Ming-Ping Wu, Division of Urogynecology and Pelvic Floor Reconstruction, Department of Obstetrics and Gynecology, Chi Mei Foundation Hospital, 901, Chung Hwa Road, Yung Kang City, Tainan, Taiwan.
E-mail: mpwu@mail.chimei.org.tw
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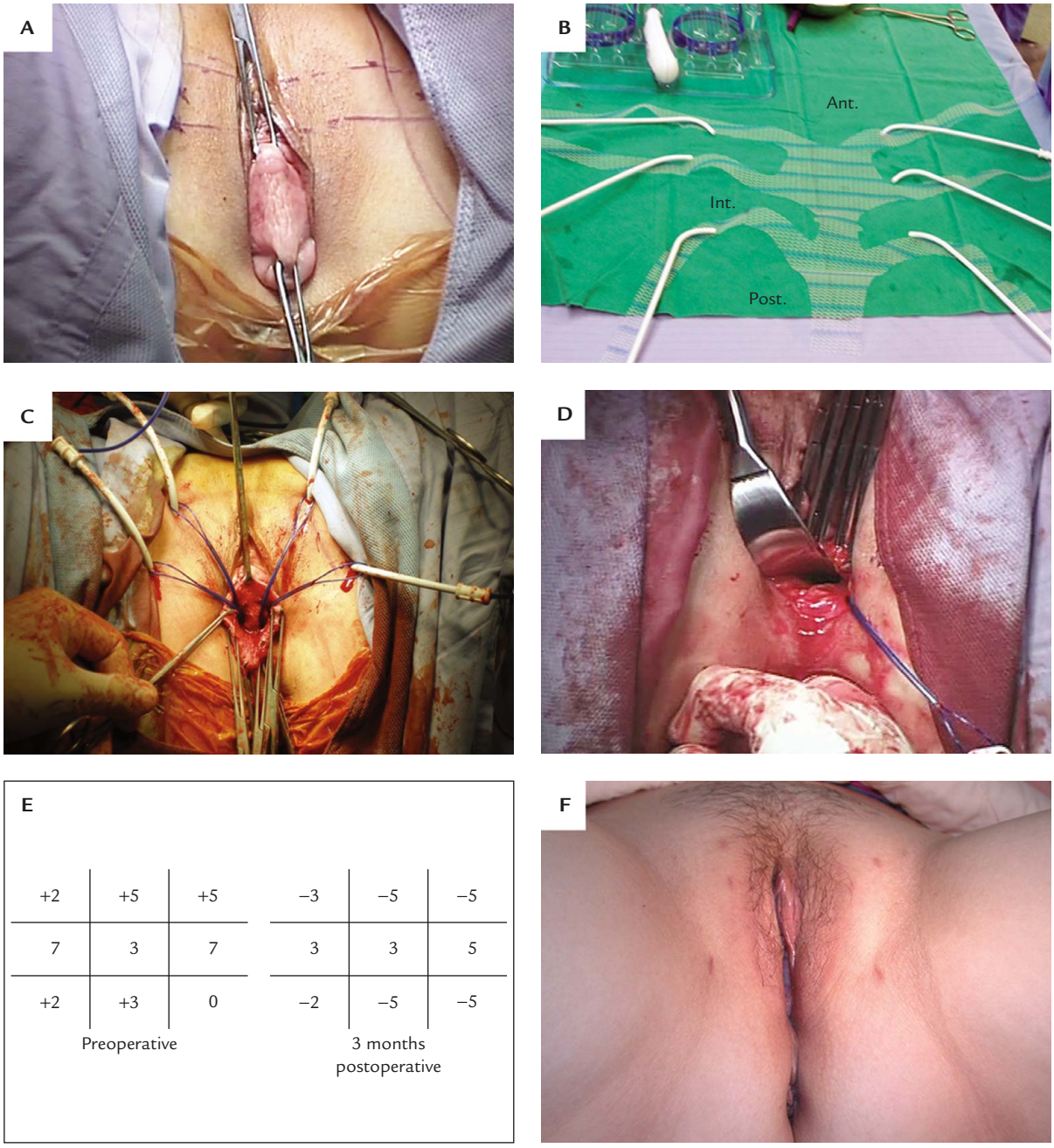

Figure. An operation involving transvaginal pelvic floor reconstructive surgery using the total Gynecare Prolift System (Ethicon Inc., Somerville, NJ, USA). (A) A preoperative perineal view reveals a prolapsed uterus and anterior wall defect. (B) The total Gynecare Prolift System consists of six cannulae, a guide, and mesh with six arms. Ant = anterior part; Int = intermediate part; Post = posterior part. (C) The placement of the anterior part with the four cannula-equipped guides. (D) The placement of the posterior part with a surgeon's finger placed into the anal canal to check for the potential risk of rectal perforation. (E) The pelvic organ prolapse quantification (POP-Q) system measurements: preoperative and 3 months postoperative. (F) Postoperative perineal view.

before and after repositioning of the prolapsed uterus, respectively. The stress urethral pressure profile showed a negative pressure transmission ratio (PTR) (30–50%) in the mid-urethra. After informed consent was obtained, she received the TVM technique using a procedural kit (Gynecare Prolift System; Ethicon Inc., Somerville, NJ, USA), which was followed by the introduction of a tension-free midurethral sling (Tension-free Vaginal Tape Obturator System, TVT-O; Ethicon Inc., Somerville, NJ, USA) as part of the prophylactic anti-incontinence surgery.

The procedure was performed under endotracheal general anesthesia according to the manufacturer's instructions [6]. She was placed in the dorsal lithotomy

position with thighs flexed at approximately 90°. After cleaning the entire surgical area with antiseptic, an indwelling catheter was placed. We began by placing the anterior part and the posterior part, after cutting the mesh at the intermediate segment (Figure 1B). We infiltrated the vaginal wall using normal saline containing a vasoconstrictive solution (tranexamic acid, Transmin; Yung Shin Pharmaceutical, Taichung, Taiwan); this allowed easier hydrodissection and reduced bleeding. A sagittal anterior colpotomy was performed, starting approximately 3 cm below the urethral orifice and ending 1 cm away from the cervix. After opening the paravesical fossa, palpation via a finger was able to identify the arcus tendineus fascia pelvis (ATFP), which extends from the posterior aspect of the pubic arch to the ischial spine. Four skin incisions were made on the genitocrural crease; then two incisions were made in the anteromedial edge of the obturator foramen at the level of the urethra and finally another two incisions 2 cm below and 1 cm lateral to the first ones. Two upper cannula-equipped guides (superficial straps) were passed at 1–2 cm from the prepubic part of the ATFP bilaterally, while two lower cannula-equipped guides (deep straps) were passed at 1–2 cm from the distal part of the ATFP 1 cm from the ischial spine. These four cannulae allowed each retrieval device to catch each prosthetic arm, and this procedure was followed by passing them through the obturator foramen. Afterwards, the mesh was positioned tension-free under the bladder. We fixed the mesh to the uterine isthmus with a single stitch of Prolene suture in order to provide efficient support of the uterus (Figure C).

For the posterior part, a short longitudinal incision over the posterior vaginal wall was created in a similar way to the anterior wall incision. The entire thickness of the posterior vaginal wall was dissected while keeping the rectovaginal fascia on the vaginal mucosa. The pararectal spaces were opened and dissected between the rectum and the levator ani muscle plane until the sacrospinous ligament could be palpated. A skin incision was made 3 cm lateral and 3 cm down from the anus. Another cannula-equipped guide was inserted into the incision, passed through the buttock and the ischiorectal fossa until it reached the middle part of the sacrospinous ligament. The cannula was left in place. A surgeon's finger was placed into the anal canal to check for the potential risk of rectal perforation (Figure D). The procedure was repeated on the opposite side. The posterior arm was retrieved using the retrieval device, and once it passed through the ischiorectal fossa, the posterior mesh was positioned over the rectum medially and the levator ani muscles laterally. The mesh was also fixed to the posterior part of the uterine isthmus. Tension on the anterior and posterior meshes was adjusted before removing the cannulae. No colpectomy was performed to remove the redundant vaginal mucosa. Closure of the colpotomy was accomplished with non-locking continuous absorbable sutures. At the end of the pelvic reconstructive surgery, a rectal examination was again performed to check for rectal laceration or any stricture of the rectal lumen (Figure D). A TVT-O procedure was also performed using the standard procedure with one vaginal incision 1 cm below the urethral orifice. The tapes were passed from the anterior vaginal wall underneath the urethra, through the obturator foramens, towards the thigh fold with the winged guided protection, without entering the pelvic region at any time during the procedure [7]. The surgical procedures went smoothly and the recovery was excellent during the postoperative follow-up period. The postoperative POP-Q measurements were: Aa –3, Ba –5, C –5, GH 3, PB 3, TVL 5, Ap –2, Bp –5, D –5, at 3 months postoperatively (Figures E and F). At the time of writing, she had received 9 months of postoperative follow-up, which was still on-going.

Our report offers short-term follow-up experience of the use of concomitant TVM technique and a tension-free midurethral sling to correct POP and prevent postoperative SUI. Fatton et al [6] reported on a retrospective multicenter study that included 110 patients using the Gynecare Prolift System; this had a failure rate (recurrent prolapse, even asymptomatic, or a low-grade symptomatic prolapse) of 4.7%. According to the perioperative and immediate postoperative results, repair with the Gynecare Prolift System seems to be a safe technique when correcting vaginal apical and anterior/posterior wall support simultaneously [6]. However, anatomic and functional results must be assessed by long-term follow-up to confirm the effectiveness and safety of the procedure [6].

Occult SUI is a controversial subject and is diagnosed once leaking occurs with Valsalva maneuvers after reduction of prolapse, in the absence of detrusor contractions [2]. The available limited evidence suggests that 11–22% of continent patient with severe POP will develop postoperative SUI [2,8]. The relative benefits and harm of routinely adding a continence operation in women undergoing prolapse surgery require evaluation. Brubaker et al [9] conducted the Colpopexy and Urinary Reduction Efforts trial, which was a prospective randomized study designed to assess whether the addition of Burch colposuspension to abdominal sacrocolpopexy in women without preoperative symptoms of SUI decreases postoperative SUI. In women without SUI who are undergoing abdominal sacrocolpopexy for prolapse, Burch colposuspension significantly reduced

the postoperative objective condition (44.1% to 23.8%) and subjective symptoms (24.5% to 6.1%) of SUI without increasing other lower urinary tract symptoms, such as urge incontinence [10].

To detect occult SUI preoperatively, some researchers have recommended the use of barrier tests, midurethral closure pressure, PTR during urodynamic study, etc. [2]. Liang et al [11] proposed the use of preoperative pessary tests to predict postoperative SUI in 79 patients with severe POP but without symptoms of SUI. The study demonstrated that among patients with a positive pessary test who did not undergo TVT, 64.7% (11/17) developed urine leakage after their hysterectomies; in contrast, this occurred in only 3.3% (1/ 30) who had a negative pessary test. Although occult SUI is not uncommon in clinical practice, a true definition does not exist and the terminology has not yet been recognized by the International Continence Society [2]. Therefore, surgeons continue to explore diagnostic and treatment modalities in an effort to prevent postoperative SUI. Moreover, the mechanisms underlying occult SUI in POP are still controversial. Different diagnostic criteria with variable urodynamic parameters, such as PTR, midurethral closure pressure and functional urethral length, likely explain the broad underlying pathophysiology [12,13].

Although vaginal hysterectomy has been the traditional surgical treatment for POP, hysterectomy and the associated pelvic floor dissection may increase the risk of pelvic neuropathy and disrupt the natural support structure [14]. Meanwhile, the ideal pelvic floor reconstructive surgery needs to take into consideration minimal invasiveness together with anatomic restoration of the vaginal apex. Therefore, various surgical modalities for POP have been addressed in an effort to preserve the uterus, such as sacrocolpopexy and sacrospinous ligament fixation performed vaginally, laparoscopically or by laparotomy [14]. Krause et al [15] reported a prospective study on laparoscopic sacral hysteropexy with uterine preservation (81 patients), with a mean follow-up of 20.3 months. The findings revealed a 5.3% recurrence rate and 81.4% patient satisfaction using the Visual Analogue Score. Hefni et al [16] reported that sacrospinous cervicocolpopexy with uterine conservation (61 patients) resulted in significantly less blood loss, a shorter operation time and fewer complications, compared with vaginal hysterectomy performed concomitantly with sacrospinous colpopexy (48 patients), with mean follow-up periods of 33 and 34 months, respectively. These two groups had comparable success rates with regard to uterine and upper vaginal support. Diwan et al [17] reported that laparoscopic uterosacral ligament uterine suspension resulted in lower recurrence rate for apical prolapse (0/25 patients), compared with vaginal hysterectomy with vaginal vault suspension (3/25 patients). The mean duration of follow-up was 40 months and age-matched controls were used. Fatton et al [6] reported that the use of Gynecare Prolift System for the restoration of the anatomic position of the vaginal apex with the conservation of the prolapsed uterus had a high successful rate during the immediate postoperative follow-up of 3 months. Preservation of the uterus has lately been shown to contribute positively to the patient's self-esteem, body image, confidence and sexuality [18].

One major concern is the troublesome postoperative complication of mesh exposure or protrusion. Erosion rates seem to vary with the different types of prostheses. Early experience with type II and type III synthetic prostheses for pelvic reconstructive surgery was associated with significant mesh complications. Erosion rates of 20–30% occurred in patients after implantation of Dacron (Invista, Wichita, KS, USA), Mersilene (Ethicon, Somerville, NJ, USA), and Marlex (CR Bard, Haverhill, MA, USA) mesh materials [19]. The currently available reports indicate reported erosion rates of 0.5% for polypropylene, 3.1% for polyethylene terephthalate (Mersilene), 5.6% for Teflon (DuPont, Wilmington, DE, USA) and 5.0% for polyethylene (Marlex) when carrying out abdominal sacrocolpopexy [20]. The erosion rates also vary with the different approaches, such as abdominal or vaginal mesh placement. The median times to mesh erosion have ranged from 4.1 to 15.6 months. A study involving the use of polypropylene mesh to augment the surgical correction of anterior vaginal prolapse reported erosion rates from 8.3% to 13% [21]. In a series reported by Fatton et al [6] involving 110 patients who received TVM with procedural kits, perioperative and immediate postoperative results showed that mesh exposure occurred in 4.7% of cases (5/110) and two of these required surgical management. The complications were able to be treated with segmental tape resection on an outpatient clinic basis. Granuloma without exposure was found to occur in 2.8% of the cases (3/110) [6]. Here, we reported a case of a woman who received concomitant TVM technique and a tension-free midurethral sling to treat POP and to prevent further postoperative SUI. However, it is still difficult to draw any conclusions about the use of transvaginal placement of permanent mesh. In this evolving field, there is still poor standardization of what constitutes an anatomic and functional cure. The transvaginal approach is the most promising of all techniques, and new techniques are evolving mainly in this area. There continues to be a need for a multicenter, prospective, randomized trial that will provide more

definitive evidence [4]. In addition, there remain concerns about the long-term anatomic and functional results of the procedure and the possibility of postoperative mesh erosion/protrusion.

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