Obstetrics & Gynecology Science

Surgical treatments for vaginal apical prolapse

Mi Kyung Kong, Sang Wook Bai

Department of Obstetrics and Gynecology, Institute of Women's Life Medical Science, Yonsei University College of Medicine, Seoul, Korea

Pelvic organ prolapse is a common condition, occurring in up to 11% of women in the United States. Often, pelvic organ prolapse recurs after surgery; when it recurs after hysterectomy, it frequently presents as vaginal apical prolapse. There are many different surgical treatments for vaginal apical prolapse; among them, abdominal sacral colpopexy is considered the gold standard. However, recent data reveal that other surgical procedures also result in good outcome. This review discusses the various surgical treatments for vaginal apical prolapse including their risks and benefits.

Keywords: Abdominal sacral colpopexy; Pelvic organ prolapse; Vaginal apical prolapse

Introduction

Pelvic organ prolapse (POP) is a common condition, affecting approximately half of parous women, and correlates with increasing age [1]. Although POP is not closely related to death, interest in POP has increased as quality of life has become an increasingly important factor in patients' lives. Accordingly, annual incidence of POP surgery currently ranges from 1.5 to 1.8 cases per 1,000 women-years [2]. Eleven percent of women undergo POP surgery by the age of 80 years [3]. Up to 30% of women who undergo surgery require a re-operation, with the total cost of POP surgery being over 1 billion dollars per year in the United States [4]. When POP recurs after hysterectomy, it often presents as vaginal apical prolapse.

There are many different surgical treatments for vaginal apical prolapse. In this article, we discuss the feasibility and efficacy of sacral colpopexy, McCall culdoplasty, sacrospinous ligament fixation (SSLF), uterosacral ligament suspension (USLS), and iliococcygeus fascia suspension (ICG) in correcting vaginal apical prolapse.

Surgical procedures

1. Sacral colpopexy (open, robotic, and laparoscopic)

For a long time, abdominal sacral colpopexy (ASC) has been considered as the optimal treatment for vaginal vault prolapse. In this procedure, the prolapsed vaginal vault is fixed to the anterior longitudinal ligament of the sacrum using polypropylene mesh. After the vaginal vault is dissected and isolated from the bladder and rectum, one end of the mesh is stitched to the vaginal vault, while the other end is sutured to the longitudinal ligament (Fig. 1) [5]. Because the mesh is supporting the vagina, it has greater stability resulting in a high success rate and low recurrence rate. On the other hand, ASC is associated with a relatively long operating time and hospital stay, greater blood loss, and higher risk of serious complications.

There are numerous vessels next to the sacrum, and a safe space to suture is limited. To make matters more complicated, vessel locations vary among patients, and their routes are difficult to anticipate. Injury of a vessel can be very dangerous, carrying a heavy burden to surgeons. In addition, the ureter is
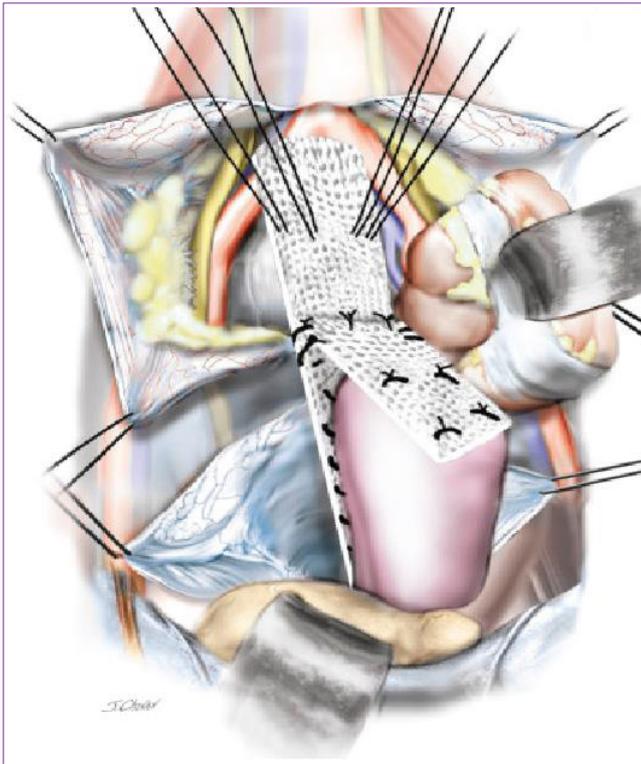
Fig. 1. One end of two pieces of mesh are fixed to vagina (extends much farther down in the posterior direction). Both pieces are brought together and attached to the sacrum on the other end (From Baggish M, Karram MM, editors. Atlas of pelvic anatomy and gynecologic surgery. 4th ed. Philadelphia (PA): Elsevier; 2016, with permission from Elsevier) [5].

Fig. 2. Anatomy of the sacral promontory (From Baggish M, Karram MM, editors. Atlas of pelvic anatomy and gynecologic surgery. 4th ed. Philadelphia (PA): Elsevier; 2016, with permission from Elsevier) [5].
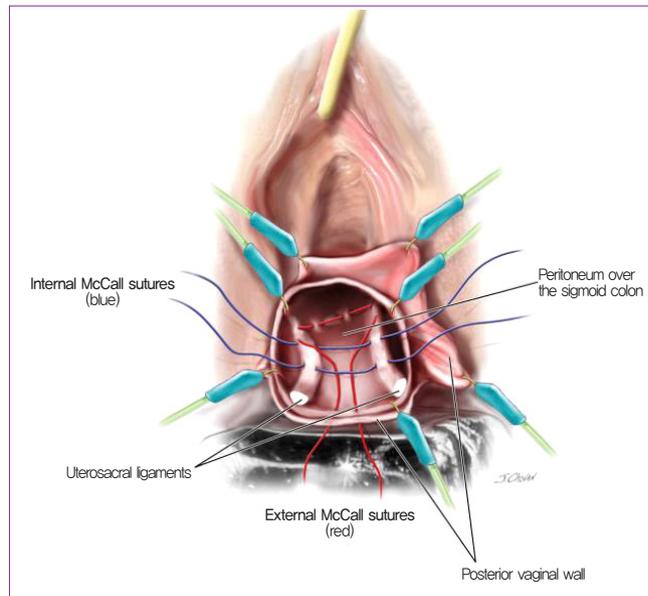
Fig. 3. Internal and external McCall stitches (From Baggish M, Karram MM, editors. Atlas of pelvic anatomy and gynecologic surgery. 4th ed. Philadelphia (PA): Elsevier; 2016, with permission from Elsevier) [5].

very close to the midsacral promontory, which is a landmark for sacrocolpopexy and its location varies among patients [6] (Fig. 2) [5].

Numerous studies have compared ASC with other procedures for vaginal vault prolapse. In 2014, Milani et al. [7] performed an observational cohort study comparing ASC (n=41) with ICG (n=36) in patients with symptomatic vaginal vault prolapse who had undergone prior hysterectomy. Both procedures achieved restoration of normal anatomy and improvement of related symptoms with similar rates of postoperative complications.

Traditionally, sacrocolpopexy has been performed via an open transverse abdominal route; however, more recently, robotic or laparoscopic sacrocolpopexy is commonly performed. In a previous prospective multicenter trial, Freeman et al compared open (n=27) and laparoscopic (n=26) sacrocolpopexy for posthysterectomy vaginal vault prolapse [8]. Point C after 1 year (the primary ob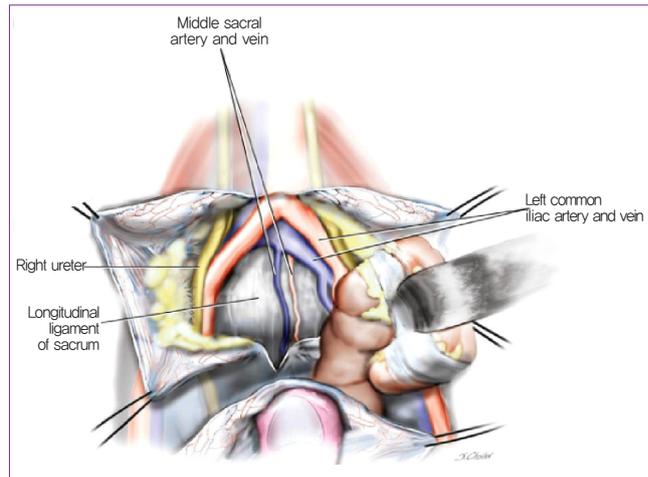jective outcome) was -6.63 for open sacrocolpopexy and -6.67 for laparoscopic sacrocolpopexy, which was not significantly different. Subjective outcomes also showed equivalence between methods. Therefore, open sacrocolpopexy is no longer the only procedure for correcting vaginal apical prolapse.

Fig. 4. Anatomy of the coccygeus-sacrospinous ligament complex (CSSL) (From Baggish M, Karram MM, editors. Atlas of pelvic anatomy and gynecologic surgery. 4th ed. Philadelphia (PA): Elsevier; 2016, with permission from Elsevier) [5].
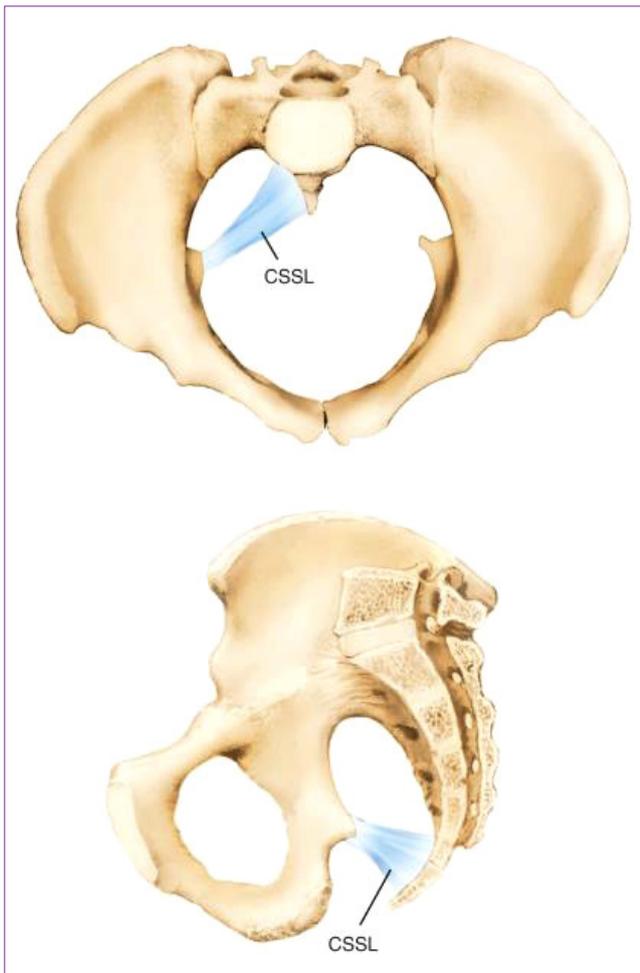
2. McCall culdoplasty

Although McCall culdoplasty was not originally developed for vaginal vault prolapse, it is known to help prevent prolapse recurrence after hysterectomy. Among the various methods of suspending the vaginal apex while performing vaginal hysterectomy, the most common procedure is McCall culdoplasty. It is performed by obliterating the posterior cul-de-sac and plicating the uterosacral ligaments across the midline [9,10] (Fig. 3) [5]. In a large study conducted at the Mayo clinic, prolapse did not recur in a high percentage of patients who underwent McCall culdoplasty, and most were satisfied with the result [11]. Therefore, McCall culdoplasty seems to be efficient in preventing vaginal vault prolapse in primary repair after hysterectomy with minimal morbidity.
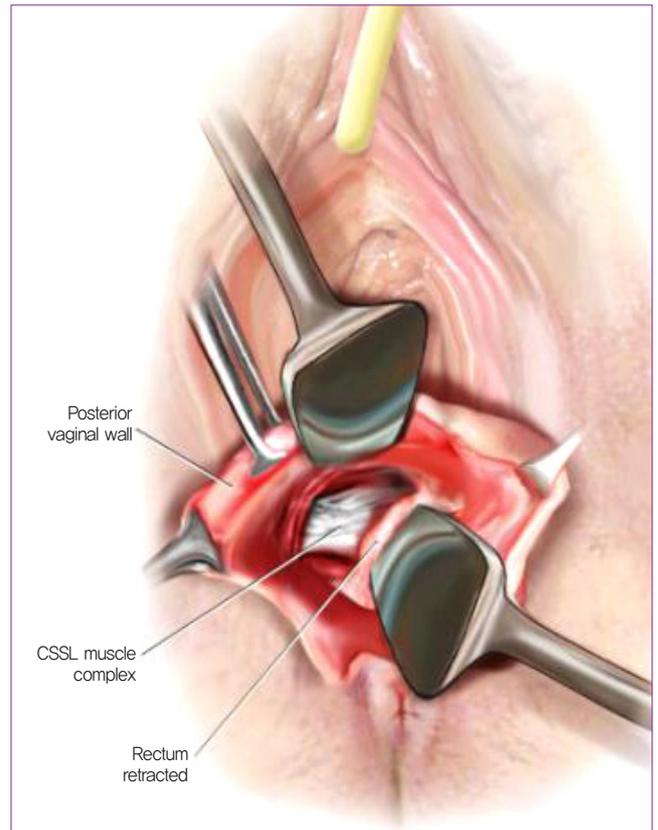

Fig. 5. The sacrospinous ligament can be exposed via posterior pararectal approach. CSSL, coccygeus-sacrospinous ligament complex (From Baggish M, Karram MM, editors. Atlas of pelvic anatomy and gynecologic surgery. 4th ed. Philadelphia (PA): Elsevier; 2016, with permission from Elsevier) [5].

3. Sacrospinous ligament fixation

SSLF is a common procedure for treating apical vault prolapse via a vaginal route. Introduced in 1958 by Sederl in Germany [12], SSLF involves attaching the vault to the sacrospinous ligament, approaching through the dissected pararectal space (Figs. 4, 5) [5]. The sacrospinous ligament is located between the ischial spine and the lower part of sacrum and coccyx, lying within the coccygeus muscle, which is often referred to as the coccygeus-sacrospinous ligament complex (Fig. 4) [5]. The vaginal vault can be anchored to unilateral or bilateral ligament. If performed unilaterally, the end of the vagina is deviated to one side. There have been numerous studies on SSLF, which have revealed a low recurrence rate of 2.4% to 19% [9]. Despite the low recurrence rate, prolapse of the anterior compartment seems to recur more easily than that of the posterior compartment [13]. Several authors have suggested that this is due to deflection of the vagina toward the posterior direction,
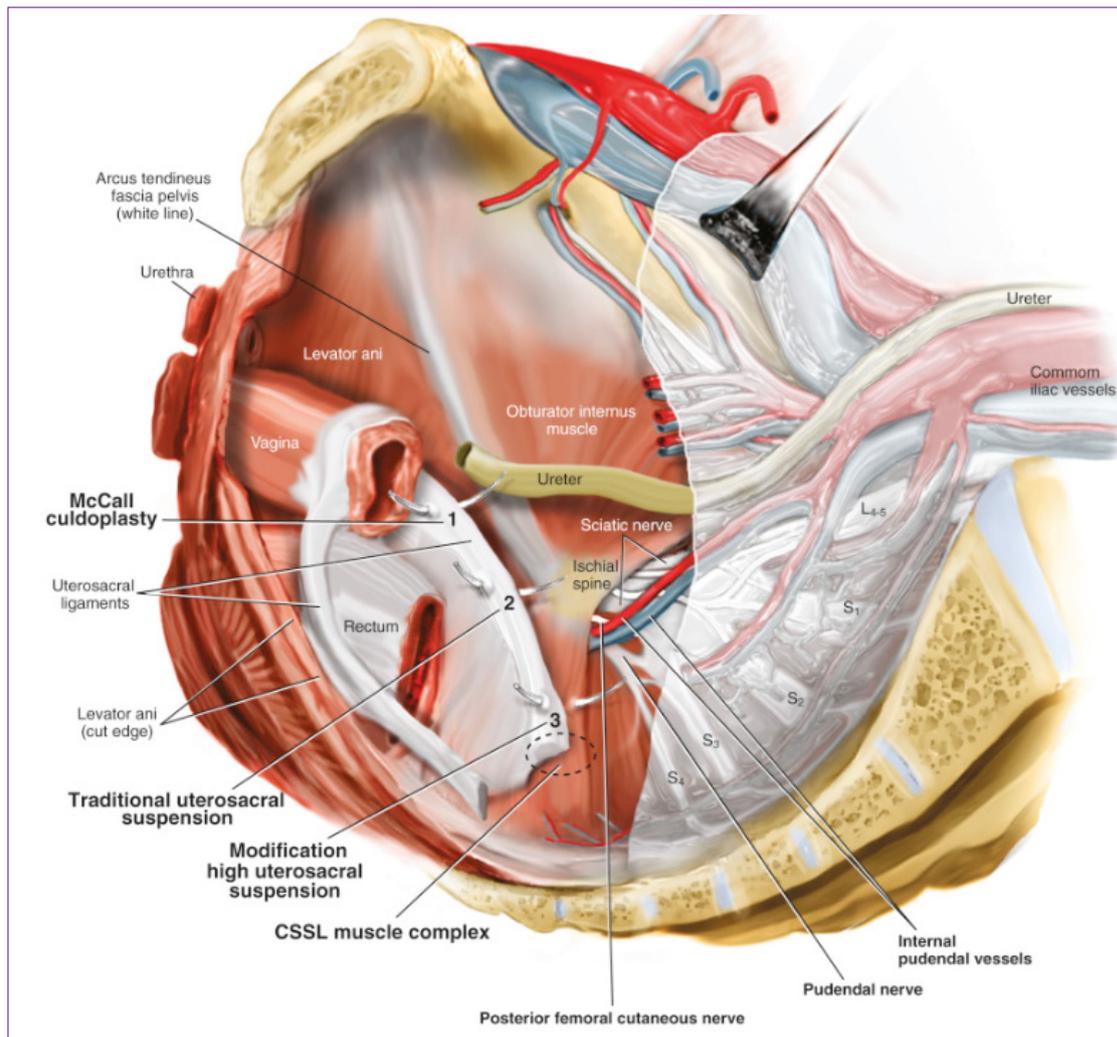
Fig. 6. Cross-section of the pelvic floor demonstrating intraperitoneal placement of sutures for (1) McCall culdoplasty, (2) traditional uterosacral suspension, and (3) modified high uterosacral suspension. CSSL, coccygeus-sacrospinous ligament complex (From Baggish M, Karram MM, editors. Atlas of pelvic anatomy and gynecologic surgery. 4th ed. Philadelphia (PA): Elsevier; 2016, with permission from Elsevier) [5].

which pulls the anterior vaginal wall posteriorly, and exposes the anterior compartment to heavy weight bearing [14]. According to a previous study on postoperative complications of SSLF, neurologic symptoms, such as buttock pain, occurred immediately after surgery in up to 50% of patients. In 15% of patients, symptoms were still not resolved after 6 weeks, and 2% eventually underwent an intervention, such as pain block [15]. However, a retrospective review of 95 patients comparing both objective and subjective outcomes between ASC and SSLF reported that both procedures significantly improved patient's subjective outcomes, including sexual function and quality of life [16].

As seen in Fig. 6 [5], the anchoring point of the vaginal vault is deeper and more posterior in SSLF than in other procedures. As such, there are numerous vessels and nerves nearby, including the pudendal and sciatic nerves, resulting in a high risk of postoperative complications.

4. Uterosacral ligament suspension

USLS is another method of apical vault fixation via a vaginal approach. However, its intraperitoneal approach is different from SSLF, which can be performed via an extraperitoneal route. USLS has become a common procedure since it was first introduced by Miller in 1957. When performing McCall culdoplasty, the uterosacral ligament is also used to suspend the vaginal vault, followed by internal McCall sutures [10].
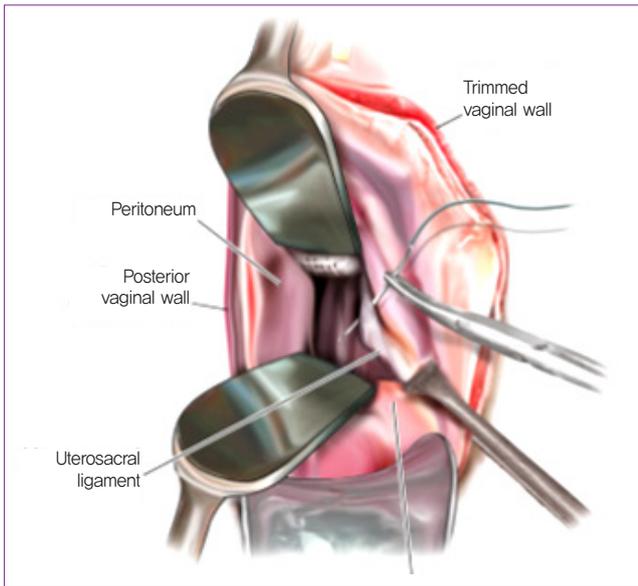
Fig. 7. With appropriate traction downward on the uterosacral ligaments, the uterosacral ligaments are easily palpated bilaterally (From Baggish M, Karram MM, editors. Atlas of pelvic anatomy and gynecologic surgery. 4th ed. Philadelphia (PA): Elsevier; 2016, with permission from Elsevier) [5].
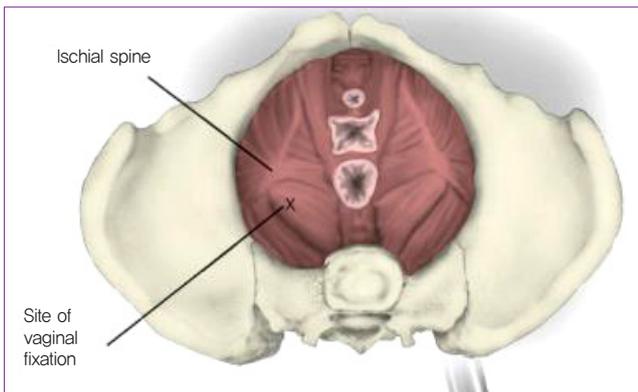

Fig. 8. Site of Iliococcygeus fascia suspension (From Walters MD, Karram MM. Urogynecology and reconstructive pelvic surgery. 4th ed. Philadelphia (PA): Saunders; 2014, with permission from Elsevier) [22].

In traditional USLS, the uterosacral ligament is plicated at or above the ischial spine level (Figs. 6, 7) [5]. Recently, a modified procedure, referred to as modified high USLS, has been developed. The suture site can be seen in Fig. 6 [5]. High USLS may involve passage of the suture through the coccygeus-sacrospinous ligament complex muscle complex, because a portion of the uterosacral ligament inserts into this structure [5].

According to a previous meta-analysis of USLS, the pooled rate for successful anatomical outcome in the apical com-
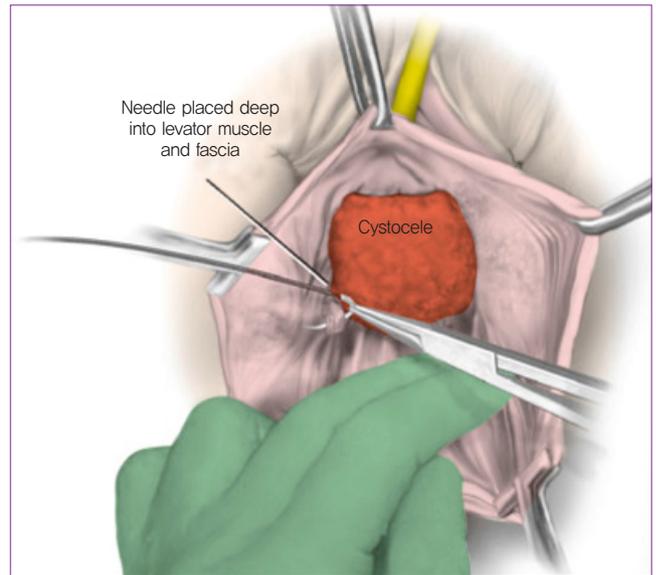

Fig. 9. While pressing the rectum downward, the right iliococcygeus fascia suture is placed (From Walters MD, Karram MM. Urogynecology and reconstructive pelvic surgery. 4th ed. Philadelphia (PA): Saunders; 2014, with permission from Elsevier) [22].

partments was 98.3% (95% confidence interval, 95.7% to 100%). In addition, subjective symptoms were relieved in 82% to 100% of patients, providing evidence that USLS is a highly effective procedure [17].

Recently, in the Operations and Pelvic Muscle Training in the Management of Apical Support Loss trial, Barber et al. [18] conducted a multicenter, randomized study comparing USLS and SSLF in 374 women. After 2 years of follow-up, SSLF (63.1%, 94/149) and USLS (64.5%, 100/155) showed similar success rates (adjusted odds ratio, 1.1; 95% confidence interval, 0.7 to 1.7). In addition, surgical outcomes, including functional and anatomical results, were not significantly different between the 2 procedures. Interestingly, however, incidence of neurologic symptoms was higher in SSLF (12.4%) than in USLS (6.9%) (P=0.0749). On the other hand, there were 6 cases (3.2%) of ureteral complication, such as ureter obstruction, in USLS, while there were 0 cases in SSLF. Because the ureter is located closer to the suture site in USLS than in SSLF, and there are more nerves near the sacrospinous ligament compared with the uterosacral ligament, this result is quite predictable.

With regard to complications, according to a retrospective chart review of 983 women, patients who underwent USLS had an adverse event rate of 31.2%, including urinary tract infection in 20.3%. There was no intraoperative ureteral

injury, but 4.5% of patients required suture removal due to ureteral kinking [19]. Although two-thirds of those who underwent suture removal maintained unilateral USLS and did not undergo resuturing, there was no significant difference in recurrence rate.

5. Iliococcygeus fascia suspension

ICG was first introduced by Inmon in 1963 [20] for patients whose uterosacral ligament was difficult to be identified or insufficient to support the vaginal vault, and was modified by Shull et al. in 1993 [21].

It also was developed to avoid the possible vessel and nerve injury associated with SSLF. The initial pararectal dissection in ICG is similar to that in SSLF, but the suture site to attach the vaginal vault is different. ICG utilizes the fascia of the iliococcygeus muscle just below the ischial spine and lateral to the rectum, where there are much fewer major vessels and nerves (Figs. 8, 9) [22].

Because of this different site of vaginal fixation, the vaginal axis is not distorted significantly and is not deviated anteriorly or posteriorly, as in SSLF. In addition, mean vaginal length is not significantly shortened after ICG surgery [23]. In reports comparing vaginal length before and after SSLF, vaginal length was significantly shortened after surgery [23,24].

According to a prior study comparing ICG and ASC, both procedures achieved restoration of normal anatomy and improvement of related symptoms [6]. However, because there are less vessels and nerves close to the operating site in ICG than in ASC, ICG might be a good alternative to ASC.

In a prospective study of ICG in 44 women, the objective cure rate was reported to be 84.1% (37/44), while the rate of successful subjective outcome was 88.6% (39/44) at a median follow-up of 68 months [25]. Therefore, according to previous studies, ICG can achieve good long-term objective and subjective results.

6. Vaginal mesh to augment apical suspension

All the procedures described in this article, except for sacral colpopexy, aim to fix vaginal apical prolapse by using the patient's own native tissue. There is another technique to fix vaginal apex that uses mesh and a transvaginal approach. However, when using mesh, there are risks of erosion, pain, vaginal immobility, and discomfort.

In 2012, Sokol et al. [26] conducted a multicenter, double-blind, randomized controlled trial of transvaginal polypro-

pylene mesh. They compared vaginal prolapse repair using USLS (n=33) or mesh (n=32; Prolift, Ethicon Women's Health and Urology, Somerville, NJ, USA) in 65 women with POP-Q prolapse stage 2 to 4. Twelve months after prolapse repair, significant objective and subjective improvements were seen with or without interpositional mesh. However, use of mesh resulted in exposure in 15.6% of patients (5/32 subject). Three of five exposures required surgical procedure to remove mesh and 3 patient had reoperation for prolapse, whereas no patient in the no-mesh group required a reoperation (P=0.017)

Currently, no long-term outcome data are available on vaginal mesh, and the optimal size and material have not been established. Therefore, when using mesh in vaginal apical prolapse repair, careful patient selection and counseling, including the risks and benefits, are required.

Conclusion

There are various methods of correcting vaginal apical prolapse, and there is no one right answer when deciding which procedure to perform. In the past, ASC was commonly performed and considered as the gold standard. Recently, other methods have been introduced, including transvaginal procedures, which are sufficient to support the vaginal apex. Meanwhile, sacrocolpopexy can be performed via laparoscopy or a robot instead of an open technique.

Studies on the outcomes of these procedures as well as their risks and benefits are in progress. When deciding which procedure to perform, several factors, such as POP-Q stage, medical condition, difficulty of the procedure, possible adverse events, possibility of recurrence, and sexual activity, should be considered. Being well informed about the previously mentioned surgical procedures and understanding each of their strengths and weaknesses will enable clinicians to select a suitable treatment depending on each patient's desired outcome.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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