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Laparoscopic surgical anatomy for pelvic floor surgery



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A B S T R A C T

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Understanding anatomy is one of the pillars for performing a safe, effective, and efficient surgery, but recently, it is reported that there has been a decline in teaching anatomy during the preclinical years of medical school. There is also evidence that by the time a medical student becomes a clinician, a considerable proportion of the basic anatomy knowledge is lost. Hence, it is crucial for surgeons performing or assisting in pelvic floor surgery to revisit this integral clinical aspect of pelvic anatomy for performing a safe surgery.

Pelvic organ prolapse repair, especially abdominal laparoscopic sacrocolpopexy, which is the gold standard of pelvic organ prolapse repair, presents a significant challenge to surgeons because the technique requires thorough and meticulous negotiation through abdomino-pelvic vascular structures and nerves supplying the pelvis, rectum, and ureters. The abdominal laparoscopic sacrocolpopexy surgery requires surgeons to have a deep understanding of anatomy to prevent potential life-threatening complications, which is as critical as it is for a pilot to understand the navigation route for a safe landing. This review is an extensive look and a great reminder to laparoscopic surgeons working in the pelvic cavity, especially those performing a pelvic floor surgery, about the anatomical safe routes for performing laparoscopic pelvic floor repairs.

For easy reading and clear understanding, we have described step by step the safe anatomical journey a surgeon needs to take during laparoscopic sacrocolpopexy. We divided the technique into five critical anatomic locations (landmarks), which serves as our “flight map” for performing safe and efficient laparoscopic sacrocolpopexy.

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Introduction

Understanding anatomy is one of the pillars in performing a safe, effective, and efficient surgery, but recently, it has reported that there has been a decline in teaching anatomy during the preclinical years of medical school [1]. There is also evidence that by the time a medical student becomes a clinician, a considerable proportion of the basic anatomy knowledge is lost [2]. Hence, it is crucial for surgeons performing or assisting in pelvic floor surgery to revisit this integral clinical aspect of pelvic anatomy for performing a safe surgery.

Pelvic organ prolapse repair, especially abdominal laparoscopic sacrocolpopexy, which is the gold standard of pelvic organ prolapse repair [3], presents a significant challenge to surgeons because the technique requires thorough and meticulous negotiation through abdomino-pelvic vascular structures and nerves supplying the pelvis, rectum, and ureters. The abdominal laparoscopic sacrocolpopexy surgery requires surgeons to have a deep understanding of anatomy to prevent potential life-threatening complications, which is as critical as it is for a pilot to understand the navigation route for a safe landing. Hence, in this review, we navigate anatomical safe routes for performing laparoscopic sacrocolpopexy. (see Fig. 1)

To understand the anatomical journey a surgeon needs to take during laparoscopic sacrocolpopexy, we divide the technique into five critical anatomic locations (landmarks), which will serve as our “flight map” for performing safe and efficient laparoscopic sacrocolpopexy.

Anterior abdominal wall

Knowledge of the structure of the abdominal wall is vital when performing any surgery, especially laparoscopic surgery. This is crucial not only to avoid complications (e.g inferior epigastric vessel injury) but also for proper port placement that makes ergonomic sense for the planned surgery.

The anterior abdominal wall extends from the costal margin and xiphisternum cephalad to the pubic bones and symphysis pubis caudally. For ease of reference, the abdomen is divided into 9 anatomic areas (3×3 grid), divided by the bilateral midclavicular lines in the vertical plane and two horizontal lines, i.e., the intertubercular plane (between the iliac tubercles) and the transpyloric plane (approximately a hand's breadth from the xiphisternum). The anterior abdominal wall has numerous layers that vary depending on the location on the abdominal wall. The skin covering the anterior abdominal wall is loosely connected to the underlying tissue, hence allowing for flexibility and distensibility of the abdomen. The only anatomical area of the skin of the anterior abdominal wall that is firmly attached to the underlying tissue, where they seem to converge and condense, is the umbilicus. This area tends to have the least amount of subcutaneous tissue and hence chosen as the standard site of the first port insertion during laparoscopic surgery. The subcutaneous adipose layer may vary in depth between individuals and the site on the abdomen. Above the umbilicus, there is a single layer of connective tissue,



Fig. 1. An initial bird's eye view during laparoscopic sacrocolpopexy.

while below the umbilicus, two layers of the connective tissue exist. Camper's fascia layer is the most superficial fatty layer, while Scarpa's fascia layer is a deeper, membranous layer. The next layer is the muscles of the anterior abdominal wall invested in the rectus sheath, which converges in the midline below the umbilicus as the linea alba (no muscle present). On either side of the midline linea alba is the rectus abdominis muscle. Lateral to these muscles, from superficial to deeper, are the external oblique, internal oblique, and transversus abdominis muscles, whose aponeuroses contribute to the rectus sheath medially. The pyramidalis muscle is a small triangular-shaped muscle that lies suprapubically, just anterior to the rectus abdominis muscle. The transversalis fascia, preperitoneal adipose, and parietal peritoneum form the layer that lies between the abdominal wall and the abdominal cavity. Within this layer, the median umbilical ligament, the remnant of the urachus, runs from the bladder to the umbilicus. On either side of this run the left and right medial umbilical ligaments.

The inferior epigastric artery (IEA) is a branch of the external iliac artery that separates from it above the inguinal ligament. Below the umbilicus, the inferior epigastric vessels run posterior to the rectus muscles and create a fold in the parietal peritoneum called the lateral umbilical ligament. It forms the main blood supply to the anterior abdominal wall and is vulnerable to injury during surgical procedures, especially when laparoscopic port placement does not account for the course through which these vessels run. Injury to the IEA is more common than other major vessel injuries during laparoscopic procedures, with a rate of 0.2%–2% [1]. At the level of the anterior superior iliac spine (ASIS), the inferior epigastric vessels run vertically approximately 4.1 cm from the midline, up to the level of the umbilicus where it is approximately 4.5 cm from the midline [2]. To avoid inferior epigastric vessel injury, the recommendation is to insert trocar and port for laparoscopy approximately 5.5 cm from the midline.

The umbilicus is at the level of the fourth lumbar vertebra (varies T3–T5), and it can be used as an external landmark for the bifurcation of the aorta. This is important to know from a safety aspect, often being the first port inserted, especially if an entry technique is used rather than the open technique.

Sacral promontory dissection

The sacral promontory is a projection at the anterior superior margin of the first sacral vertebra and fused to the four other sacral vertebrae to form the sacrum, which joins the two hip bones posteriorly. It articulates superiorly to the lumbar vertebrae and inferiorly to the coccyx, which contains 3–5 fused coccygeal vertebrae. The clinical significance of the sacral promontory is that this is where the pelvic anatomy begins.

At the level of the sacral promontory, the common iliac artery bifurcates into external and internal iliac arteries. At the same level, the ureter crosses from lateral to medial over the common iliac artery. Immediately just before the sacral promontory at the fourth lumbar vertebra (L4), the abdominal aorta and inferior vena cava bifurcate [4].

Knowledge of this anatomical landmark is particularly important in abdominal sacrocolpopexy because the mesh fixation is currently recommended at the anterior longitudinal ligament of the sacrum at this level (S1) [5]. To abate the potential risk of trauma to these critical structures at and around the sacral promontory, the interiliac triangle (shown in Fig. 2) provides a safe zone where the peritoneum can be lifted and dissected to access the presacral space for mesh attachment at the anterior longitudinal ligament of the sacral promontory during sacrocolpopexy.

The borders of this interiliac triangle include the sacral promontory at the base and common iliac arteries on both sides, with the apex of the triangle at the bifurcation of the aorta [6]. The interiliac triangle contains the common iliac artery and vein, middle sacral artery, and vein branching from the posterior aspect of the abdominal aorta, just superior to aortic bifurcation and presacral nerve plexus. Lateral to the lateral borders of the interiliac triangle run the ureters, overriding the common iliac arteries on both sides.

The presacral nerve plexus lies to the left of midline in 75% of the patients and in the midline in 25% of the patients [7]. Hence, when performing a sacrocolpopexy, it is advised to approach the dissection of the sacral promontory on the right side just medial to the right border (right common iliac artery) of the interiliac triangle (Fig. 3). This is done to identify and reflect the sacral nerve plexus medially to spare it from unintended presacral neurectomy, which could result in postoperative constipation, sexual dysfunction, and urinary symptoms.

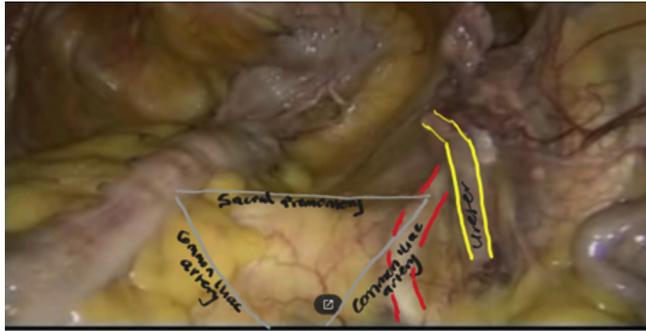


Fig. 2. Interiliac triangle with sacral promontory at the base, common iliac arteries on both the side and the apex of the triangle at the bifurcation of the aorta.

A study by Thomas Shiozawa and colleagues analyzed nerve-preserving sacrocolpopexy, and their aim was to describe the course of the autonomic nerves in the presacral space and to determine the best nerve-preserving approach for sacrocolpopexy. This was established by dissecting six embalmed female cadavers. They derived a conclusion that a longitudinal incision of the peritoneum along the right common iliac artery and above the sacral promontory allows for a safe approach for sacrocolpopexy. After exposing the vascular structure above the sacral promontory, the anterior longitudinal ligament becomes visible and can be prepared for the mesh fixation to suspend the vagina [8].

The middle sacral vessels can then be identified in the middle of the interiliac triangle and is not uncommon to find it duplicated as a normal variant in some patients [9] (Fig. 4). Because of multiple normal variations of the structures around the sacral promontory, this area should be carefully dissected by lifting the peritoneum up to create a safe distance between the peritoneum and major vascular structure after palpating the sacral promontory (Fig. 3).

The opening at the sacral promontory must be wide enough for better visualization of the important landmarks within the interiliac triangle. To prevent presacral hematomas, middle sacral artery and veins are identified and ligated. Access to this presacral space can be arduous particularly in obese patients because of the excess adipose tissue, patients with previous lumbar spinal surgery secondary to adhesions, or those with bowel adhesions obscuring the sacral promontory. Taking extra caution to create good visualization at the sacral promontory is paramount because poor visualization in any surgery contributes to a high incidence of surgical adverse events. This is particularly true during the dissection at the sacral promontory, as an adverse event at this site can be life threatening. To expose the surgical field at the sacral promontory, especially in obese women, the T-lift can be used to mobilize bowel at the epiploic appendages to the left side of the abdominal wall as shown in Fig. 5.



Fig. 3. Approaching the dissection of the sacral promontory on the right side just medial to the right border of the interiliac triangle and lifting the peritoneum up to create a safe distance from major vascular structures at the sacral promontory.

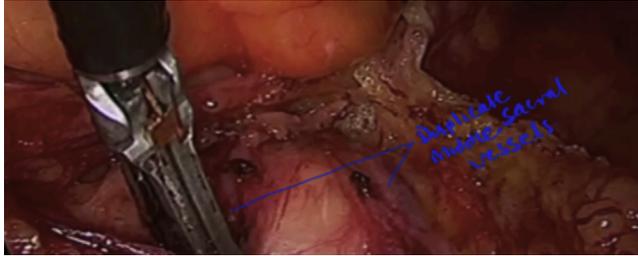


Fig. 4. Duplicate middle sacral vessels.

The method of mesh fixation at the sacral promontory varies and is dependent on each surgeon's preference. A study of mesh fixation to the longitudinal vertebral ligament comparing nonabsorbable sutures to spiral staples demonstrated that nonabsorbable sutures had a stronger biomechanical resistance than staples and also that more than one staple is needed to avoid mesh snapping off under tension [10]. Each method of fixation of the mesh to the anterior longitudinal vertebral ligament presents unique anatomical challenges. The use of nonabsorbable sutures is technically challenging and requires wide dissection at the sacral promontory compared to the use of staples, hence the increased risk of vascular injuries. On the other hand, the use of staples has been reported to have a high prevalence of spondylodiscitis owing to the deep penetration of the spiral staple to the anterior longitudinal vertebral ligament (5 mm) compared to a depth of 2–3 mm obtained with nonabsorbable sutures [11].

Lateral pelvic wall dissection

The lateral wall of the pelvis is divided by the uterine artery into two commonly accepted avascular spaces: pararectal space posteriorly and paravesical space anteriorly (Fig. 6).

The main branches from the abdominal aorta and its subsidiary branches are depicted in Fig. 8. The abdominal aorta bifurcates at the fourth lumbar vertebra (L4) into common iliac vessels, which in turn also bifurcate as soon as they enter the pelvis anterior to the sacroiliac joints at the level of the sacral promontory [12]. The common iliac artery bifurcates to form the internal and external iliac arteries. The external iliac artery runs above and along the psoas major muscle on the superior aspect of the lateral wall of the pelvis, whereas the internal iliac artery branches into an anterior and a posterior division. The uterine artery, which divides the lateral avascular spaces of the pelvis, is the first branch to arise from the anterior division of the internal iliac artery (Figs. 6 and 7). The significance of these lateral



Fig. 5. T-lift used to mobilize bowel at the epiploic appendages to the left side of the abdominal wall.

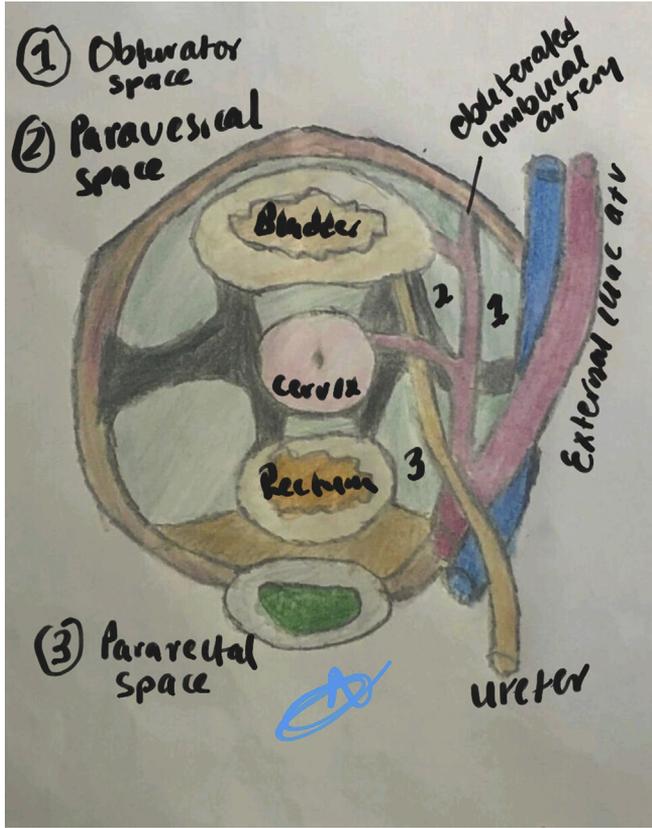


Fig. 6. Pararectal and paravesical space.

avascular spaces in laparoscopic sacrocolpopexy is that they provide a safe zone for the dissection of the lateral wall to facilitate the tunneling of the mesh from the vagina to sacral promontory (see Fig. 9).

During the peritoneal lateral pelvic wall dissection in sacrocolpopexy, there are several anatomical structures to clearly identify to avoid inadvertent damage or injury, which include the following:

Hypogastric nerve

The hypogastric nerve is derived from the presacral plexus or superior hypogastric plexus. It is situated in the paravesical space approximately 2 cm lateral and superior to the uterosacral ligament and carries the

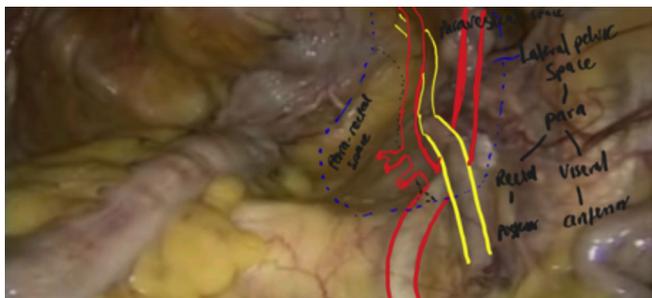


Fig. 7. Laparoscopic view of pararectal and paravesical space.

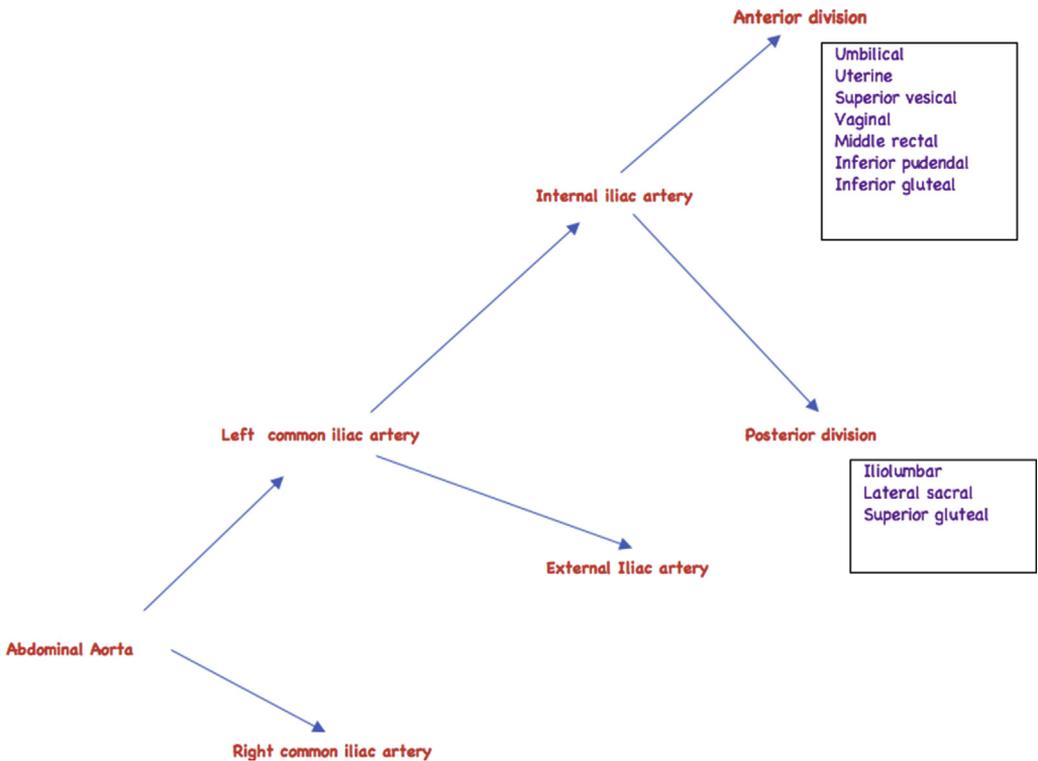


Fig. 8. Branches of the abdominal aorta and its subsidiary branches.

proprioception of the bladder, the rectum, and the uterus. It also provides sympathetic fibers for contraction of the urethral and anal sphincters. This hypogastric nerve is in danger of inadvertent damage during laparoscopic sacrocolpopexy when the right lateral pelvic wall dissection is performed, especially deep into the pelvis proximal to the base of the uterus. The hypogastric nerve is located 2 cm superior and parallel to the uterosacral ligament or 2 cm inferior and parallel to the ureter on the meso-ureter (Fig. 10). Injury to the nerve may result in postoperative constipation and or urinary symptoms (see Fig. 11).

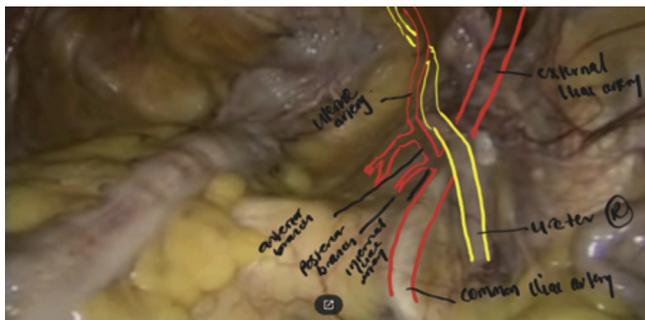


Fig. 9. Laparoscopic view of the branches of the common iliac artery in relation to the pelvis ureter on the right lateral pelvic wall.

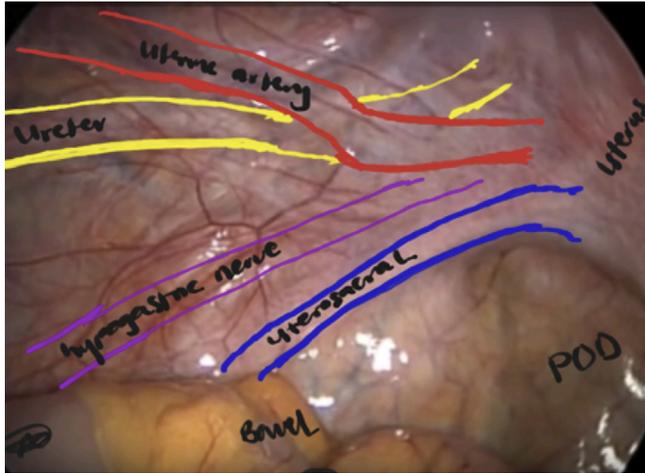


Fig. 10. Relationship between hypogastric nerve, ureter, and uterine artery at the base of the broad ligament.

The ureters

The other structure exposed to the potential risk of injury during the dissection of right lateral pelvic wall is the ureter, and clear understanding of its pelvic course is very helpful to circumvent injury during laparoscopic sacrocolpopexy.

During operative laparoscopy, the incidence of ureteric injury is estimated to be less than 2%, but 75% of the ureteric injuries take place during gynecological procedures. Radical hysterectomy, endometriosis surgery, vesico-vaginal fistula repair, and laparoscopic sacrocolpopexy are understandably the highest contributing gynecological procedures associated with high risks of ureteric injuries [12].

The ureters are approximately 25 cm in length, and half of their course is in the abdomen and the remainder runs in the pelvic cavity, a part that is most encountered during the lateral wall pelvic wall dissection at laparoscopic sacrocolpopexy. The ureters emerge from the renal pelvis and run parallel to abdominal aorta and inferior vena cava on top of the psoas major muscles. They are crossed by the branches of these major abdominal vessels bilaterally. The ureters enter the pelvis at the pelvic brim (L4) and cross at the bifurcation of the common iliac artery. In the pelvic cavity, the ureters move anteriorly to the internal iliac artery down to the lateral pelvic wall, and then, at the level of the ischial spine, the ureters change their vertical direction to horizontal after a sharp turn forward and medially where they subsequently pass underneath the uterine artery. At this level, the ureter is 1.5 cm lateral to the cervix and then travels medially and anteriorly over the vaginal fornix to enter the posterolateral wall of the bladder [13]. The commonest sites of ureteral injuries are the lateral pelvic wall above the



Fig. 11. Champagne effect.

uterosacral ligament, posterior to the infundibulopelvic ligament near the pelvic brim, the base of the broad ligament where the ureter passes under the uterine artery and where it enters the bladder near the insertion of the trigone [14].

Intraoperative measures to avoid ureteric injuries during sacrocolpopexy, especially at the dissection of the right lateral pelvic wall, include keeping sight of the ureter at all times throughout the dissection and adequate exposure to avoid blind clamping of blood vessels. The lateral pelvic wall, as described above, is mostly avascular, and it is therefore advised to avoid using an energy source when dissecting the lateral peritoneal wall but sharp dissection instead. The laparoscopic gas also aids during dissection in this area, especially when the right dissecting plane is achieved. It is therefore crucial to take full advantage of the “champagne effect” and follow the bubbles [15].

Rectum

The average length of the rectum is between 10 and 15 cm, and it extends from the recto-sigmoid junction at around the third sacral vertebra (S3) to the anorectal junction, which is 4 cm away from the anus [16]. During right lateral pelvic wall dissection, the rectum is pushed to the left and can be fixed by a T-lift as previously described. It is important to remember that fat belongs to the rectum; hence, extra caution is advised to stay on the right lateral side of the rectum and its associated adipose tissue and medial to the right ureter. An anchor suture can be placed at the dissected peritoneal incision before the mesh is attached at the sacral promontory to avoid obstruction of the surgical field by the mesh and make reperitonealization a less daunting task (Fig. 12). As closing the peritoneal incision takes time,



Fig. 12. Anchor suture can be placed at the dissected peritoneal incision before the mesh is attached at the sacral promontory.

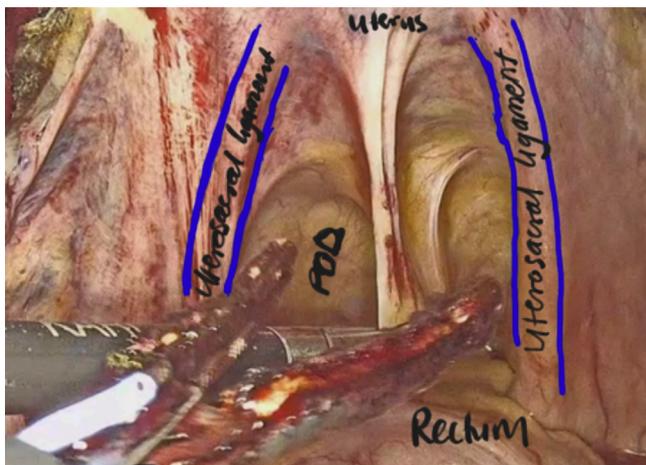


Fig. 13. Pouch of Douglas (POD).

with a risk of ureteric injury and kinking, hematoma, or inadvertent bowel injury, one prospective study of 128 patients who had abdominal sacrocolpopexy without the closure of peritoneal incision showed no mesh-induced bowel injury after 19 months of follow-up [17]. Currently, given this low-powered study, closing peritoneal incision over the mesh is still a common practice to reduce the risk of bowel injury (see Fig. 13).

Dissection at the Pouch of Douglas (POD)

The Pouch of Douglas (POD) is an avascular space that lies between the two uterosacral ligaments. The anterior boundary of the POD is the uterus and posterior fornix of the vagina, whereas the posterior boundary is the rectum and inferiorly the rectovaginal fold. The dissection through this space during laparoscopic sacrocolpopexy helps to separate the posterior vaginal wall and the rectum for the posterior attachment of the mesh. Extra vigilance is required to prevent rectal injury and, once again, the use of the “champagne effect” as previously described becomes very helpful through this avascular space.

Once in the correct plane, the dissection is initially made on both sides medial to the respective uterosacral ligament with a gap in between, which laparoscopically will resemble an owl's eyes (see picture below in Fig. 14), and then, by combining the middle portion once, the dissection is complete (see Fig. 15).

When dissecting in this space to separate the rectum from the posterior vagina, the adipose tissue is a great guide and must always follow the side of the rectum. In a patient who already has hysterectomy, a specially designed vaginal retractor can be used to optimize vaginal wall dissection during laparoscopic sacrocolpopexy [18].

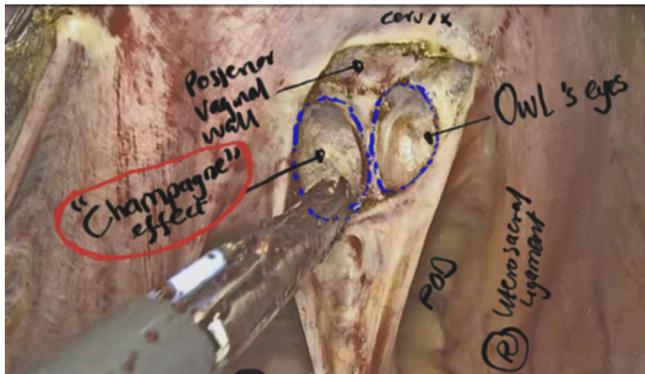


Fig. 14. Owl's eye appearance during posterior vaginal dissection.



Fig. 15. Specially designed vaginal retractor (Colpoassist vaginal manipulator).

In a quest to reduce the operative time during laparoscopic sacrocolpopexy, Kaori Hoshino and colleagues conducted a prospective observational study on their modified laparoscopic sacrocolpopexy technique, which has a number of distinct modifications to the standard approach. They adequately expose the sacral promontory, but a retroperitoneal tunnel is made instead of opening the peritoneum from the sacral promontory to the POD. The vaginal wall is dissected only after transvaginal hydro-dissection, and fixation of mesh to the vaginal wall is achieved using absorbable tacks, and finally, the posterior mesh is omitted in patients with limited posterior vaginal wall descent. Thirty-four women with stage 2 or more pelvic organ prolapse underwent laparoscopic sacrocolpopexy using this modified technique, and the median operative time was 140 min (range between 90 and 255 min). No major intra- or postoperative complications were reported; however, the follow-up period was short with mean of 4 months (ranging between 1 and 14 months), and one patient presented with a recurrent grade 2 cystocele [19]. This technique certainly requires further scrutiny with longer term follow-up. In addition, there is no evidence supporting the use of absorbable tacks for vaginal mesh placement.

The usefulness of the posterior mesh was also questioned by Antiphon et al., who followed up 108 patients who underwent laparoscopic sacrocolpopexy. In this study, 33 of the 108 patients had attachment of the mesh on anterior vagina alone, 71 patients had both anterior and posterior mesh, and the remaining 4 patients had a posterior mesh alone. Their results revealed that posterior vaginal wall recurrence occurred only among patients who underwent laparoscopic sacrocolpopexy and Burch colposuspension, and it was not related to the placement or otherwise of a posterior mesh. Hence, with the potential life-threatening complication of rectal injury and other debilitating complications such as chronic constipation associated with posterior vaginal repair, Antiphon and colleagues concluded that the placement of a posterior mesh is unnecessary in the absence of a concomitant Burch colposuspension procedure being performed or in a patient with absent posterior prolapse [20].

The limitation of both these studies, which advocate sparingly performing posterior vaginal wall mesh attachment in patients with minimal posterior POP during laparoscopic sacrocolpopexy, is that they had very short follow-up. It is also difficult to understand the lower recurrence rates in patients who had only anterior mesh attachment if the hypothesis is correct that POP is usually a result of global loss of pelvic organ support rather than an isolated defect. Until convicting evidence arises, the placement of a posterior vaginal mesh will likely remain a common practice. Therefore, a clear understanding of the anatomy of the POD will remain as the backbone for providing a safe, effective, efficient, and wholistic solution to the patient with multicomponent POP requiring laparoscopic sacrocolpopexy.

Anterior vaginal wall dissection

Vesicovaginal pouch

The vesicovaginal pouch is a continuation of the previously described two avascular spaces in the pelvis (paravesical and pararectal) and in turn is connected to the space of Retzius, which is described below. Dissection in this space can present some challenges, with the potential of bladder injury. The concept of traction and countertraction is key during the anterior vaginal dissection. The vaginal manipulator is also helpful in the case of patients who already had hysterectomy.

The retropubic space

The retropubic space, also known as the space (or Cave) of Retzius and prevesical space, has great clinical significance in urogynecology. It lies extraperitoneally as a potential space, utilized mainly for stress urinary incontinence procedures, i.e., retropubic TVT and the Burch colposuspension, as well as anterior vaginal compartment repairs.

The boundaries of the retropubic space are the pubic symphysis anteriorly and the superior and inferior pubic rami with the obturator internus muscle anterolaterally. The bladder (to varying degrees depending on its capacity) and parietal peritoneum form part of the posterior border of the retropubic space. Inferiorly, the base of the space of Retzius is formed by the anterior aspects of the urethra, adjacent pubocervical fascia, and bladder neck. The median length of the retropubic urethra is 23 mm,

with a range of 15–30 mm [21]. The paraurethral tissue is made up of dense fibrous tissue, smooth muscle bundles, scant adipose tissue, blood vessels, and nerves [23]. The superior boundary of the retropubic space is the anterior abdominal wall and its transversalis fascia.

Several blood vessels, nerves, and structures of clinical significance either lie within the retropubic space or are in close proximity to it. The locations of these structures are important to be aware of when operating in this area.

Blood vessels: The floor of the retropubic space has a rich venous plexus that may be interrupted during surgery in this area, hence resulting in bleeding or a retropubic hematoma. In a cadaveric study, 2–5 rows of veins were identified within the paravaginal tissue forming this venous plexus that drained into the internal iliac vein [22]. The dorsal vein of the clitoris traverses this space running inferior to the pubic symphysis to drain into the vesical venous plexus (veins of Santorini). The obturator neurovascular bundle runs in the lateral aspect of the retropubic space. The obturator vessels are the vessels closest to the lower edge of the pubic symphysis at a mean distance of 35 mm [23]. Variant anastomoses occur in a proportion of women in the form of the corona mortis, connections between the external iliac vessels or deep inferior epigastric vessels and the obturator vessels. When operating in this area, it is important to be aware of this information.

Ligaments: The arcus tendineus fascia pelvis extends from the inferior aspect of the pubic symphysis and bone, lying medial to the obturator internus and levator ani muscles. It runs postero-laterally to the ischial spine. It is a condensation of the pelvic fascia, which provides support for the pubocervical fascia of the anterior vagina, urethra, and bladder. Another cadaveric study found that at the level of the urethrovesical junction, the median distance from the lateral urethral wall to the arcus tendineus fascia pelvis was 25 mm, with a range of 13–38 mm. One centimeter distal to this point, this distance reduced to 14 mm (10–26 mm) [23]. Disruption of this support may result in prolapse of the anterior vaginal wall (cystocele or urethrocele). The arcus tendineus fascia pelvis may be used for lateral suspension of the anterior vagina during paravaginal repairs.

Cooper's (pectineal) ligament lies along the iliopectineal line on the superior aspect of the pubic bone. It forms the attachment for the Burch suspension sutures. In a cadaveric study, the mean distances from the most lateral Burch suspension suture to the obturator neurovascular bundle and the external iliac vessels were less than 3 cm (25.9 mm to the obturator vessels and 28.9 mm to the external iliac vessels). In some instances, these suspension sutures were as close as 1.5 cm to the vessels [24]. The median umbilical ligament/fold, the remnant of the urachus, lies on the inner aspect of the anterior abdominal wall above the transversalis fascia. It runs from the bladder to the umbilicus in the midline and is flanked bilaterally by the medial umbilical ligaments. These ligaments are used as landmarks, just above the bladder dome, as the site for the peritoneal incision in the Burch colposuspension.

Summary

Anatomy is a cornerstone for any safe surgery, and this article on laparoscopic surgical anatomy of pelvic surgery provides an untainted clear window of opportunity to investigate a safe laparoscopic anatomical route and as a reminder like a “flight map” for effective and efficient laparoscopic pelvic floor repair.

Important anatomical landmarks from the anterior abdominal wall, through the sacral promontory, and lateral pelvic wall to anterior and posterior vaginal wall dissection are imported aspects of laparoscopic pelvic floor repair, especially for laparoscopic sacrocolpopexy. Retroperitoneum in the pelvis including all avascular pelvic spaces (pararectal and paravesical) and their associated structures should be fully understood by the surgeon performing laparoscopic pelvic floor repair. Clinical anatomy should be a major part in training specialist, especially in the surgical discipline, where the safety of their prospective clients hugely depends on it.

Conflict of interest

The authors have no conflict of interest.

Practice points

- The interiliac triangle provides a safe zone where the peritoneum can be lifted up and dissected to access the presacral space for mesh attachment at the anterior longitudinal ligament of the sacral promontory during sacrocolpopexy.
- Performing a sacrocolpopexy, it is advised to approach the dissection of the sacral promontory on the right side just medial to the right border (right common iliac artery) of the interiliac triangle.
- The opening at the sacral promontory must be wide enough for better visualization of the important landmarks within the interiliac triangle.
- The laparoscopic gas also aids during dissection, especially when the right dissecting plane is achieved.

Research agenda

- The tangible relationship between complications during laparoscopic surgery and lack of understanding of anatomy
- Previous spinal surgery and access to the sacral promontory during laparoscopic sacrocolpopexy
- Normal anatomical variant of pelvic anatomy and associated risk of complication during laparoscopic surgery

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