

MASTER CLASS

Keys to the Obliterated Cul-de-Sac



BY CHARLES E. MILLER, M.D.

Although the best approach to treatment of the obliterated cul-de-sac and excision of rectovaginal endometriosis is surgical, this laparoscopic procedure can be a daunting task for even the most experienced minimally invasive gynecologic surgeon.

The potential risk to the rectum and ureter must be immediately recognized. It is for this reason that Dr. Harry Reich, one of the legendary pioneers in minimally invasive gynecologic surgery, stated over 20 years ago that dissection of the obliterated cul-de-sac and excision of deep rectovaginal endometriosis was the most difficult procedure in the gynecologist's armamentarium.

Obviously, the anatomy has remained unchanged, but safety has been enhanced through the creation of a strategic approach for dealing with this unique surgical dilemma. For this current issue of the Master Class in Gynecologic Surgery, I have called upon Dr. Resad Pasic, who was my vice president during my tenure as pres-

ident of the AAGL and who is now the immediate past president of that organization. Dr. Pasic is professor of obstetrics and gynecology, the director of the section of operative gynecologic endoscopy, and a codirector of the fellowship in laparoscopy and minimally invasive surgery at the department of ob.gyn. and women's health at the University of Louisville (Ky.).

As the director of the postgraduate course on advanced laparoscopic anatomy, dissection, and reparative pelvic surgery on unembalmed female cadavers, Dr. Pasic's expertise in anatomy and minimally invasive gynecologic surgery makes him an excellent candidate to lead the discussion of the systematic approach to the obliterated cul-de-sac and excision of rectovaginal endometriosis.

Joining Dr. Pasic as coauthors for this Master Class are Dr. Jessica A. Shepherd and Dr. Joseph L. Hudgens, the current clinical fellows in the division of gynecologic endoscopy at the University of Louisville.

Dr. Shepherd obtained her medical degree from Ross University in Roseau, Dominica, in 2005 and then completed her internship and residency at Drexel University in Philadelphia. In addition to her current involvement as a fellow in gynecologic endoscopy, Dr.

Shepherd is also completing her MBA at the University of Louisville. She is currently a member of the AAGL and serves on the ad hoc review committee for the Journal of Minimally Invasive Gynecology.

Dr. Hudgens obtained his medical degree from the University of Arkansas, Little Rock, in 2005. He completed his residency training in ob.gyn. at the University of Louisville in 2009. Dr. Hudgens recently completed a fellowship in minimally invasive gynecology in 2010 and has joined the Center for Women's Health at Owensboro Medical Health System in Owensboro, Ky. Dr. Hudgens also is currently an active member of the AAGL and serves as a member of the ad hoc review committee for the Journal of Minimally Invasive Gynecology. ■

DR. MILLER is clinical associate professor at the University of Chicago and the University of Illinois at Chicago, and vice president of the International Society for Gynecologic Endoscopy. He is a reproductive endocrinologist in private practice in Schaumburg, Ill., and Naperville, Ill.; the director of minimally invasive gynecologic surgery at Lutheran General Hospital in Park Ridge, Ill.; and the medical editor of this column. He said he had no relevant conflicts of interest.

Obliterated Cul-de-Sac Dissection



BY RESAD PASIC, M.D., PH.D.

Endometriosis affects about 2.5%-3.3% of reproductive-aged women and is characterized by extrauterine growth of endometrial tissue consisting of endometrial glands and stroma. Its depth ranges from superficial to deep infiltration.

When described as deep infiltrating endometriosis (DIE), the disease involves lesions that are invasive and that extend into areas or organs that are in direct contact with already affected areas. Although the theory of migration of endometrial glands may help to explain endometriosis in general and superficial disease in particular, the prevailing opinion currently is that DIE may result from metaplasia of remnants of Müllerian tissue.

DIE lesions penetrate greater than 5 mm under the peritoneal surface and can cause severe pelvic pain. The lesions are mainly composed of smooth muscle with active glandular epithelium, which causes fibrosis and eventually their nodular characteristics.

In cases in which the DIE lesions affect areas such as the rectovaginal space (as well as the uterosacral ligaments and the rectocervical area), treatment is more successful with a surgical approach.

Although rectovaginal lesions are eventually diagnosed through surgical methods, clinical examinations and imaging should be performed to support the surgical approach.

On medical history, many of these patients present with pelvic pain, dysmenorrhea, dyspareunia, or infertility.

Clinical examination must be done to help appreciate the location of the nodular lesion. The size of the nodule may be

palpated on bimanual exam and can involve uterosacral ligaments, the posterior or vaginal wall, the anterior rectal wall, and the posterior fornix.

Preoperative imaging, especially transvaginal and transrectal ultrasound and MRI, will establish the distribution and depth of the deep lesions.

The presence of deeply infiltrative endometriosis and the resulting alteration of normal anatomical planes make this one of the most challenging surgical cases that gynecologists encounter. Laparoscopic treatment requires an intimate understanding and application of pelvic anatomy, and the surgical fundamentals of visualization and traction-countertraction, as well as electrosurgery.

Pathophysiology

The presence of deep endometriotic lesions in the posterior cul-de-sac is, again, likely a consequence of metaplasia of Müllerian rests, and the nodules are composed of smooth muscle proliferation and fibrosis, which is a result of infiltration.

The endometriotic foci migrate to the rectovaginal area, where hyperplasia of smooth muscle incites an inflammatory response; this evolves into retraction, which then leads to pelvic fibrosis and a subsequent reduction in uterine mobility and distortion of the pelvic anatomy.

DIE lesions have been classified through studies by Dr. Philippe Koninckx and his colleagues into three types based on their depth of invasion and location.

Type I lesions are conically shaped rectovaginal septum nodules and are located between the posterior and anterior walls of the vaginal mucosa and rectal muscularis, respectively. Lesions categorized as type II are deeply located and form from the posterior fornix to the rectovaginal region. They are typically covered by extensive adhesions causing retraction. The most severe lesions—type III—are com-

posed of spherical nodules. The largest dimension of these lesions is located under the peritoneal fold of the rectouterine pouch of Douglas. The cranial movement of these posterior fornix lesions eventually causes the nodules to join the anterior rectal wall and creates an "hourglass"-like appearance.

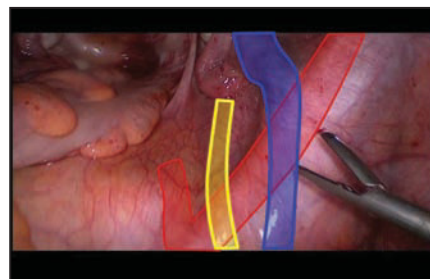
Anatomy

It is important to appreciate the relationships of the avascular spaces and their relevance to the dissection of the obliterated cul-de-sac and excision of rectovaginal endometriosis. Also remember that the ureter enters the pelvis over the bifurcation of the common iliac and medial to the infundibulopelvic ligament (see photo below).

The pararectal space is bordered laterally by the pelvic sidewall, anterolaterally by the cardinal ligament, and medially by the rectal pillars. The ureter courses beneath the peritoneum and through the rectal pillar.

The rectovaginal space is bordered laterally by the uterosacral ligaments, anteriorly by the vaginal fascia, and posteriorly by the rectal fascia.

The potential surgical space between the ureter and uterosacral ligament is utilized to transect the uterosacral liga-



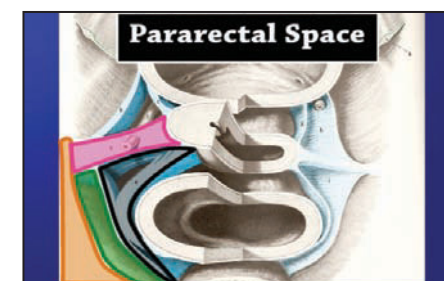
The yellow-shaded region represents the ureter, the blue represents the infundibulopelvic ligament, and the red represents the bifurcation of the right common iliac artery.

ment, which provides a means of access from the pararectal space into the rectovaginal space.

Instrumentation and Process

Surgical management of DIE is essential for restoring pelvic anatomy, relieving

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The rectovaginal space is bordered by the uterosacral ligaments, the vaginal fascia, and the rectal fascia.



The space between the ureter and uterosacral ligament is utilized to transect the uterosacral ligament.

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debilitating pelvic pain, and eliminating endometriotic nodular foci. Laparoscopic surgery provides magnified views of the posterior cul-de-sac and its pathology, and results in less postoperative pain and decreased recurrence of adhesions.

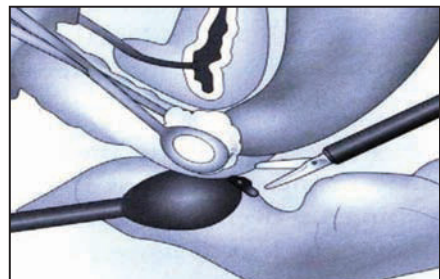
Instruments typically utilized during these procedures include monopolar scissors, bipolar coagulation, and the Harmonic scalpel.

Energy sources that provide the least amount of lateral spread are key in these procedures as the relationships of the pelvic organs, ureters, and rectum are exceptionally close.

The systematic approach of resecting these nodules entails restoring the normal anatomic relationships of the adnexa and sigmoid, then dissecting the obliterated cul-de-sac and performing a thorough excision of the rectovaginal endometriotic lesions.

We have divided the procedure into four parts: ureterolysis, dissection of the rectovaginal septum, excision of the rectovaginal nodule, and reconstruction.

When the ureters and bowel are involved with the disease process, the surgical approach should take into account the importance of restoring normal anatomy. The use of uterine manipulators with a colpotomy cup can help delineate the posterior vaginal fornix and



Use of a rectal probe and vaginal tenaculum allows for proper plane appreciation when dissecting lesions in the rectovaginal space.

the rectum. The introduction of rectal and vaginal probes during the surgery will improve the exposition and excision of the lesions (see figure above).

After pneumoperitoneum is established and maintained at 15 mm Hg, we have used a standard technique of placing a 10-mm trocar in the umbilicus for the laparoscope and three 5-mm ancillary trocars. One 5-mm trocar is placed to the right at 10 cm lateral to the umbilicus, and two 5-mm trocars are placed to the left (10 cm lateral to the umbilicus and in the left lower quadrant).

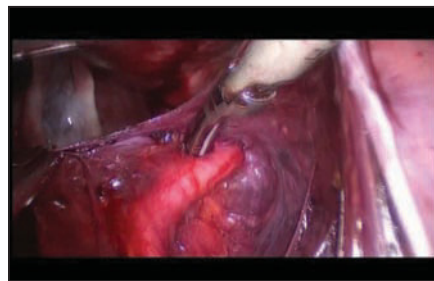
A thorough examination of the abdomen and pelvis should be performed to assess the disease and degree of dissection needed to successfully access the rectovaginal space. To excise the lesions, we have used the bipolar RoBi forceps (Karl Storz), monopolar scissors, and the Harmonic scalpel.

Ureterolysis

In all of our cases thus far, ureterolysis was performed before resection of any DIE nodules. The ureter crosses the pelvic brim close to the bifurcation of the common iliac artery, at which point it be-

comes the pelvic ureter. It continues on the pelvic sidewall medial to the infundibulopelvic ligament as it crosses the external iliac artery. Branches of the internal iliac artery supply the descending portion of the ureter and move along the course of the ureter from the lateral aspect.

The dissection of the ureter begins at the pelvic brim where the anatomy is normal. The peritoneum superior to the ureter is grasped and entered, and the incision is extended. Medial traction is placed on the inferior edge of the peritoneal incision, and dissection is contin-

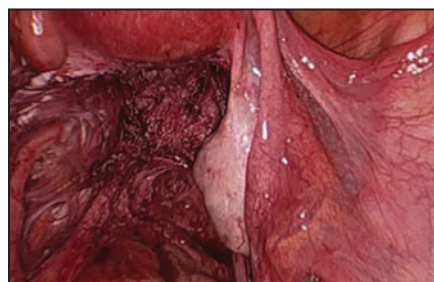


The right ureter is seen here on the medial aspect of the peritoneum. Ureterolysis can be done bluntly with the graspers and scissors, or with the Harmonic scalpel as shown here.

ued in the fat/nonfat interface until the ureter is identified.

The ureter is surrounded by a layer of loose areolar tissue; this layer is entered by using a blunt dissector to dissect parallel to the ureter. Small vessels should be coagulated in the process to ensure visibility. The ureterolysis is directed toward the uterosacral ligaments and continued until the ureter enters the cardinal ligament (see photo above).

When complete obliteration of the cul-de-sac is present and the uterosacral ligaments are obscured bilaterally, ureterolysis is carried out on the opposite side to improve pelvic anatomic restoration. The dissection is sufficient when both ureters are mobilized com-



Bilateral ureterolysis is done before dissection of the rectovaginal septum.

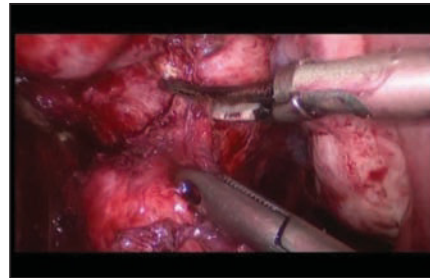
pletely and when each can be traced from the pelvic brim to its insertion into the bladder (see photo above).

Dissection of Rectovaginal Septum

The next step is to enter and dissect the rectovaginal septum. Prior to excision of the nodule, the pouch of Douglas is first accessed by freeing the area from any adhesions or ovarian endometriomas.

After the successful bilateral ureterolysis, the ureters can be identified and the posterior fornix can be delineated with the rectal probe and colpotomizer.

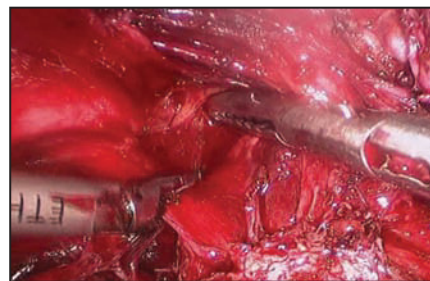
The posterior fornix is then pushed upward, and a transverse incision is made over the posterior cervix superior to the rectum—an area also known as



To transect the rectovaginal septum, place the uterus on stretch in the anteverted position. The rectal probe is placed in the rectum and the uterosacral septum is identified and transected with the harmonic scalpel.

the prerectal fascia (see photo above).

The rectovaginal septum extends laterally from the posterior cervix and uterosacral ligaments to the pelvic sidewall, where it then courses caudally to insert in the perineal body. This area is dissected inferiorly until the uterosacral ligaments (also known as the medial rectal pillars) are identified. At this stage, the ureter, the pararectal space, the lateral rectal pillar with associated nerves, and the medial rectal pillar are seen. The rectal probe will then help identify the rectum and the dissected uterosacral



Transection of the uterosacral ligament is done after ureterolysis is completed. (Ureter is visible in the left upper portion; rectum is in lower right corner.)

ligaments in their respective planes.

The potential space medial to the ureter is used to transect the uterosacral ligament and thus enter the rectovaginal space from the lateral aspect to medial. The uterosacral ligament is again transected, and the rectovaginal space entered (see photo above).

If the dissection is continued too superiorly, the prerectal fascia is transected and the vagina may be entered. If this occurs, then the fascia is retracted superiorly and the rectum is retracted inferiorly to help identify the correct dissection plane.

By understanding the anatomic principle that fat belongs to the rectum, one can identify the fat/nonfat interface; this facilitates dissection superior to this plane. It is also important to maintain the integrity of the vaginal and rectal spaces as much as possible to decrease the risk of bowel perforation. The dissection is continued until the space is fully developed.

Excision of the Nodule

When the uterosacral ligament is transected, this permits a closer inspection of the posterior vaginal wall and the ability to assess the need for further rectal dissection. The posterior fornix is then incised along the rectovaginal margin, allowing the space to be opened. The nodule is then excised by

continuing along the original shape (triangular) of the pouch of Douglas (see photo at bottom of column).

One might find that the nodule extends into the pararectal fascia, the muscularis layer of the rectum, the posterior vagina, or the rectal wall. The rectal probe is used to help delineate the rectum from the remaining lesion. Such lesions can often be dissected with sharp scissors or may require excision with a Harmonic scalpel.

Reconstruction

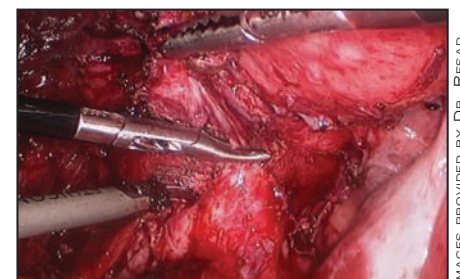
The last step is the reconstruction of any structures that were compromised during the dissection. The patient is given IV indigo carmine to ensure the ureters are not compromised, and a cystoscopy is performed at the conclusion of the case to confirm function. The rectal wall integrity is confirmed with the injection of dilute indigo carmine through an 18 french foley catheter placed in the rectum or via an air leak test performed with the aide of a proctoscope.

Because the fibers of rectovaginal septum run vertically and blend with the muscular wall of the vagina, some deep-infiltrating lesions are part of the vaginal wall, and in these cases excision of the affected area of the vagina is necessary. Once these lesions are fully resected, the vagina is reattached to the cervix by means of an interrupted figure of eight suture, and the anterior rectal wall is also reinforced with sutures. The pneumoperitoneum can be maintained by using a blue suction bulb in the vagina.

Once the reconstruction is completed, the restoration of the pelvic anatomy should be apparent and additional attention should be paid to defects to ensure proper closure.

The surgical management of rectovaginal endometriosis nodules can be technically demanding as it can include the repair of the vagina, bowel, bladder, and ureters. A systematic approach and adequate endoscopic experience, however, can significantly decrease the risk of injury. Taking the time to perform the ureterolysis before the beginning of the case, moreover, is beneficial in providing landmarks and protecting the integrity of the ureters. Although long-term experience is forthcoming, the surgical intervention of DIE has proven to be beneficial in the short term by decreasing patients' pain and improving their quality of lifestyle. ■

DR. PASIC is a consultant for Ethicon Endo-Surgery Inc., Terumo Medical Corporation, and CooperSurgical Inc. He also has a grant from Karl Storz Endoscopy-America Inc.



The rectal nodule is grasped and placed on tension. The rectal probe is used to help delineate the rectal borders.