Endometriosis of the bladder and ureter

AUTHORS: Nicola Berlanda, MD, Paolo Vercellini, MD, Luigi Fedele, MD
SECTION EDITOR: Tommaso Falcone, MD, FRCSC, FACOG
DEPUTY EDITOR: Kristen Eckler, MD, FACOG

All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: **Sep 2023.**
This topic last updated: **Jul 29, 2022.**

INTRODUCTION

Endometriosis is defined as endometrial glands and stroma at extrauterine sites. These ectopic endometrial implants are typically located in the pelvis but can occur throughout the body. Urinary tract endometriosis refers to endometriotic implants of the bladder, ureter, kidney, and urethra. In women with urinary tract endometriosis, the bladder and ureter are most commonly affected.

This topic will review the clinical presentation, diagnosis, and management of endometriosis of the bladder and ureter. General principles of the treatment of endometriosis, as well as endometriosis of the rectovaginal septum, bowel, and thorax, are presented separately.

- (See "Endometriosis: Pathogenesis, epidemiology, and clinical impact".)
- (See "Endometriosis: Treatment of pelvic pain".)
- (See "Endometriosis: Surgical management of pelvic pain".)
- (See "Endometriosis: Clinical manifestations and diagnosis of rectovaginal or bowel disease".)
- (See "Clinical features, diagnostic approach, and treatment of adults with thoracic endometriosis".)

In this topic, when discussing study results, we will use the terms "woman/en" or "patient(s)" as they are used in the studies presented. However, we encourage the reader to consider the specific counseling and treatment needs of transmasculine and gender-expansive individuals.

PATHOGENESIS

The etiology of endometriosis of the urinary tract is not clear. General theories of endometriosis include retrograde menstruation, lymphatic or hematogenous dissemination of endometrial cells, coelomic metaplasia, spread of endometrium-derived stem/progenitor cells, and altered genetic or immune factors [1-7]. Additionally, endometriosis appears to be iatrogenic in some women. (See "Endometriosis: Pathogenesis, epidemiology, and clinical impact", section on 'Pathogenesis' and "Uterine adenomyosis" and 'Special populations' below.)

Anatomic structures of the pelvis may provide sheltered pockets that protect ectopic endometrial cells from the usual peritoneal clearance mechanisms and allow endometrial implants to develop [7]. This shelter effect may explain why bladder endometriosis is not typically seen in women with a retroverted uterus, as these women do not have a protected anterior space to facilitate growth of ectopic endometrial cells. Similarly, the sigmoid colon creates a shelter on the left side of the pelvis, which may explain why ureteral endometriosis is found more frequently on the left [8-10].

PREVALENCE

Determining the prevalence of urinary tract endometriosis (including both bladder and ureteral endometriosis) in the general population is challenging because up to 50 percent of women with endometriosis may be asymptomatic [11]. Of women diagnosed with pelvic endometriosis, approximately 1 percent have urinary tract endometriosis, most commonly bladder endometriosis [7,12]. Endometriosis of the ureter is rare, with an estimated prevalence of 0.1 percent. However, in the subpopulation of women with deeply infiltrating endometriosis, urinary tract endometriosis has been diagnosed in up to 20 to 50 percent [13-19]. These wide ranges may reflect referral patterns rather than true disease prevalence. (See "Endometriosis: Pathogenesis, epidemiology, and clinical impact", section on 'Epidemiology'.)

Among women with urinary tract endometriosis, the prevalence of disease at specific sites is [20-22]:

- Bladder – 85 to 90 percent
- Ureter – 10 percent
- Kidney – 4 percent
- Urethra – 2 percent

BLADDER ENDOMETRIOSIS

Definition — Bladder endometriosis is an endometriotic lesion that infiltrates the detrusor muscle and can be either partial or full thickness [7,23].

Clinical manifestations — Women with bladder endometriosis typically present with bladder pain or dysuria [13,24-26] but may have hematuria, urinary frequency, and urinary tract infection [13,27]. Urinary incontinence is rare (one case reported) [27]. Women are typically diagnosed with endometriosis, including bladder endometriosis, during their reproductive years, with a mean age of diagnosis of 33 years in one study of nearly 700 women with endometriosis (range of 20 to 57 years) [19]. (See "Endometriosis: Clinical features, evaluation, and diagnosis", section on 'Clinical features'.)

The symptom constellation of dysuria, urinary frequency and urgency, bladder infection, and hematuria is suggestive of bladder endometriosis in both women with known endometriosis and those who have not been diagnosed with endometriosis. However, this symptom constellation is more likely to reflect bladder endometriosis in women with known endometriosis compared with women who present with isolated urinary tract complaints. Rarely, bladder endometriosis can be asymptomatic and incidentally diagnosed at the time of a procedure for a different indication. The frequency of incidentally diagnosed bladder endometriosis is not known.

- **Known endometriosis –** In women with previously diagnosed pelvic endometriosis, dysuria is the most common presenting symptom of bladder endometriosis, although urinary frequency and urinary urgency can still occur [28]. In one study of 213 women with deeply infiltrating endometriosis, dysuria occurred in nearly 70 percent of women with confirmed bladder endometriosis but only in 6 percent of women without bladder involvement [19]. Symptoms of bladder endometriosis may worsen with menses. Hematuria is rare, but when present, typically coincides with menses [29].

- **No prior endometriosis –** In women without a history of endometriosis, bladder endometriosis more commonly presents with nonspecific lower urinary tract symptoms including urinary urgency and frequency. The prevalence of previously undiagnosed endometriosis in women who present only with lower urinary tract symptoms is not known.

Diagnostic evaluation — A presumptive clinical diagnosis of bladder endometriosis can be made in women with known endometriosis who present with new symptoms of dysuria, voiding dysfunction, hematuria, and infections. The diagnostic evaluation includes a history, physical examination, limited laboratory testing, imaging, and cystourethroscopy.

- **History and physical examination** – Women with symptoms of bladder endometriosis are evaluated for symptoms and signs of both endometriosis and urinary tract disease. As women with bladder endometriosis often have endometriosis at multiple anatomic sites, the initial history and physical examination is the same for women suspected of having bladder endometriosis as for women with generalized symptoms of endometriosis [19]. (See "Endometriosis: Clinical features, evaluation, and diagnosis", section on 'Diagnosis'.)

- **Laboratory testing** – For women with symptoms of dysuria, urinary urgency and frequency, or bladder pain, we perform a urinalysis to assess for infection or hematuria. Urine culture is done if infection is suspected. Women with hematuria proceed with cystourethroscopy. (See "Diagnostic cystourethroscopy (cystoscopy) for gynecologic conditions", section on 'Indications'.)

- **Imaging** – We perform a pelvic and renal ultrasound as part of the evaluation for bladder endometriosis. A consensus opinion from the International Deep Endometriosis Analysis (IDEA) group suggests specific assessment of the trigone, bladder base, and dome [30]. Although ultrasound cannot definitively diagnose endometriosis [31], findings suggestive of bladder endometriosis include nodules, abnormal adherence of adjacent structures in the vesicouterine pouch, and/or hydronephrosis (image 1) [32]. Bladder ultrasound has been reported to have a bladder endometriosis detection rate as high as 97 percent and may detect partial-thickness lesions not visible with cystoscopy [33-35]. In addition, the examiner can use the ultrasound probe to assess organ immobility and elicited pain, both of which suggest other foci of deeply infiltrating endometriosis [36,37]. (See "Endometriosis: Pathogenesis, epidemiology, and clinical impact".)

  Hydronephrosis is uncommon in women with bladder nodules because the ureteral openings are not typically obstructed. Women who are diagnosed with bladder lesions and hydronephrosis undergo additional radiologic assessment of the ureter. In our practice, we request a computed tomography (CT) urogram. (See "Clinical manifestations and diagnosis of urinary tract obstruction (UTO) and hydronephrosis", section on 'High suspicion for UTO: Diagnostic testing'.)

- **Cystourethroscopy** – For women with a bladder nodule seen on imaging or hematuria, we perform cystourethroscopy to biopsy the lesion, rule out malignancy, and measure the distance from the lesion to the ureteral meatus [38]. (See "Diagnostic cystourethroscopy (cystoscopy) for gynecologic conditions", section on 'Indications'.)

  Typically, vesical endometriosis appears on cystourethroscopy as edematous, bluish submucosal lesions that are located posterior to the trigone or on the dome (picture 1). The lesions can be large and multiple but are often single, averaging

approximately 1 cm in size [29]. Endometriotic bladder nodules up to 5 cm in size have been reported [39].

In addition, we assess the distance of the lesion(s) to the ureteral openings to determine whether removal of the lesion(s) will require ureteral resection and reimplantation with ureteroneocystostomy [38,39]. Women who have undergone prior trigone resection are at increased risk of having nodules in close proximity with the trigone or ureteral orifices. If the caudal border of the endometriotic lesion is less than 2 cm from the interureteric ridge, ureteroneocystostomy is typically performed [7]. (See 'Ureteroneocystostomy' below.)

Lesions that are identified on pelvic ultrasound but not visible at time of cystourethroscopy are presumably intramural and are evaluated with magnetic resonance imaging (MRI) [40-42]. MRI provides information on the extent of disease that aids in surgical planning and counseling of the patient.

Diagnosis — Endometriosis is a histologic diagnosis of tissue resected during cystoscopy or laparoscopy [43]. Biopsy is also necessary to exclude malignancy.

Differential diagnosis — As the presenting symptoms of urinary tract endometriosis are often nonspecific urinary symptoms, other urinary tract abnormalities are excluded as part of the evaluation. Alternate causes of dysuria, voiding dysfunction, and bladder pain include urinary tract infection, interstitial cystitis/bladder pain syndrome, urinary tract stones, benign growths such as papilloma or angioma, and malignancy [43].

- **Urinary tract infection –** Urinary tract infection is excluded with a negative urine culture. (See "Acute simple cystitis in females".)

- **Interstitial cystitis/bladder pain syndrome (IC/BPS) –** IC/BPS is a clinical diagnosis based upon symptoms such as bladder discomfort associated with bladder filling and pelvic tenderness on examination. IC/BPS is often a diagnosis of exclusion, once etiologies such as bladder endometriosis and malignancy have been ruled out. (See "Interstitial cystitis/bladder pain syndrome: Clinical features and diagnosis".)

- **Urinary tract stones –** Women with urinary tract stones most commonly present with pain that waxes and wanes in severity. Hematuria, gross or microscopic, can be present. Urinary tract stones are typically identified on noncontrast computed tomography or ultrasound studies. (See "Kidney stones in adults: Diagnosis and acute management of suspected nephrolithiasis".)

- **Bladder neoplasm –** Bladder neoplasms can be benign or malignant. Cystoscopy with tissue biopsy can differentiate among papillomas, angiomas, malignancy, and endometriosis. (See "Clinical presentation, diagnosis, and staging of bladder cancer".)

Treatment

Our approach — Treatment of bladder endometriosis is aimed at resolving symptoms; asymptomatic women can be observed [7]. We begin with medical therapy, since this approach avoids the risk of surgical complications and treats pain symptoms associated with pelvic endometriosis. The disadvantages of medical therapy are that it must be continued until menopause (when endometriosis typically regresses) and that it is not effective in all women. We reserve surgery for women who have failed medical therapy, cannot receive medical therapy, or who wish to avoid chronic medical treatment. (See "Endometriosis: Treatment of pelvic pain", section on 'Medical treatment options'.)

The data comparing medical and surgical therapy are limited. One cohort study of women with deep dyspareunia from deeply infiltrating endometriosis (urinary and rectovaginal) reported that 60 percent of women treated medically were satisfied but nearly one-third of women had an inadequate response to medical therapy and required surgical management [44].

One exception to the above approach is the patient with both bladder endometriosis and hydronephrosis. We perform surgery as the primary treatment to prevent subsequent renal damage, similar to women with ureteral endometriosis. (See 'Ureteral endometriosis' below.)

Medical — For women with vesical endometriosis, combined estrogen-progestin contraceptives, progestins, and gonadotropin releasing hormone agonists have all been associated with symptom reduction [29,45]. (See "Endometriosis: Treatment of pelvic pain", section on 'Medical treatment options'.)

We typically treat bladder endometriosis with combined hormonal contraceptives because they are easy to use, easy to obtain, low cost, and low risk [46]. We begin with a cyclic regimen of combined estrogen-progestin oral contraceptives (ie, three weeks of therapy followed by a placebo week). If perimenstrual symptoms do not resolve within 3 to 6 months of starting a cyclic regimen, we then switch to a continuous schedule for menstrual suppression. For women who prefer continuous menstrual suppression, we begin treatment with a continuous regimen rather than the cyclic regimen.

Women who are not candidates for or do not want estrogen-containing medications are treated with progestin-only methods such as pills, injection, implant, or intrauterine device. Patients select the method that best meets their dosing, contraceptive, and cost needs. (See "Endometriosis: Treatment of pelvic pain", section on 'Progestins'.)

Women who cannot use or do not respond to estrogen-progestin or progestin-only methods are offered a trial of gonadotropin releasing hormone agonists. These medications can be

used with or without estrogen-progestin add-back therapy. (See "Endometriosis: Long-term treatment with gonadotropin-releasing hormone agonists".)

Women whose symptoms improve with medical management continue the treatment until they desire pregnancy or reach menopause. For women whose symptoms do not respond to medical management within six months, we offer surgical treatment. (See 'Surgical' below.)

Surgical — Surgical procedures for treatment of bladder endometriosis include laparoscopic shaving of serosal lesions and full thickness resection of deeply infiltrating lesions [23,28,43,47-51]. Most surgeries are performed laparoscopically, including with robotic assistance. Laparotomy can be required for women with extensive disease that cannot be optimally managed laparoscopically [7]. Nerve-sparing surgical approach is discussed in a related topic. (See "Endometriosis: Treatment of rectovaginal and bowel disease", section on 'Nerve-sparing technique'.)

- **Ureteral stent placement –** First, we perform cystourethroscopy to evaluate the location of the ureteral orifices relative to the endometriosis lesions and place ureteral stents if there is a distance of less than 2 cm between the inferior border of the lesion and the interureteric ridge. While trial data do not support routine use of ureteral catheters for gynecologic surgery, we find them helpful in women who have lesions close to the ureteric orifice, a history of prior bladder surgery, or significant anatomic distortion. (See "Placement and management of indwelling ureteral stents", section on 'Prophylactic'.)

- **Lesion dissection and excision –** Next, we perform operative laparoscopy to shave superficial serosal lesions off the bladder. To remove full thickness bladder lesions, we perform partial cystectomy to remove the entire nodule and prevent recurrence [11,38,46]. If the nodule is located on the bladder dome, preliminary dissection to fully access the lesion is not typically required. In contrast, if the lesion involves the posterior bladder or the vesical base, we dissect the vesicouterine space to mobilize the bladder from the uterus (picture 2). We continue the dissection below the caudal margin of the nodule to facilitate complete resection. The lesion is then excised with cold scissors or cautery (picture 3). An alternative technique is to perform the cystotomy and nodule resection through an operative cystoscope and then suture the bladder via conventional or robot-assisted laparoscopy [52-55].

  In addition to dissection of the vesicouterine space, resection of the underlying myometrium appears to prevent recurrent symptoms when the bladder is coapted to the uterus. In a series of 33 women with endometriotic lesions at the bladder base, the recurrence rate was significantly lower in women who had concomitant myometrial resection compared with those who did not (7 versus 37 percent) [56].

- **Ureter reimplantation** – For women with bladder lesions that are less than 2 cm away from the interureteric ridge, we perform ureteroneocystostomy to prevent ureteral obstruction or stricture. This procedure is typically done laparoscopically or robotically. (See 'Ureteroneocystostomy' below.)

- **Resection of all endometriosis** – At the time of resection of bladder endometriosis, we inspect the entire pelvis and abdomen and resect all other endometriosis lesions. In one study of 75 women with deeply infiltrating bladder endometriosis, nearly two-thirds had additional deep lesions in the posterior pelvis [11]. (See "Endometriosis: Surgical management of pelvic pain".)

- **Bladder closure** – The bladder incision (from nodule resection or ureteroneocystostomy) is closed with two layers of transverse sutures (picture 3). In our practice, we use a double layer of running 2-0 polyglactin 910 sutures. At the end of the procedure, the bladder is backfilled to confirm that the closure is watertight. Postoperatively, we leave a bladder catheter in place for 7 to 10 days to prevent fistula formation. (See "Urinary tract injury in gynecologic surgery: Identification and management", section on 'Bladder injury'.)

Complications — Potential complications of bladder resection include vesical hematoma and vesicovaginal fistula [39]. Although urogenital fistula formation is uncommon after gynecologic surgery (less than 1 percent), surgical resection of endometriosis is a risk factor for formation. In one case series of 41 women who presented with vesicovaginal fistula following gynecologic surgery, 15 percent had undergone surgery for treatment of endometriosis [57]. (See "Urogenital tract fistulas in females" and "Diagnostic cystourethroscopy (cystoscopy) for gynecologic conditions".)

General complications of gynecologic surgery are presented separately. (See "Complications of gynecologic surgery" and "Complications of laparoscopic surgery".)

Prognosis — Complete surgical removal of bladder endometriosis is associated with long-term control of symptoms [39,56,58]. In the largest case series of 75 women surgically treated for deeply infiltrating endometriosis of the bladder, none required repeat surgery, all women reported an improvement in pain symptoms, and 77 percent reported the pain improvement as "excellent" during mean follow-up of five years [39]. Complications included one vesicovaginal hematoma and one vesicovaginal fistula. As discussed above (see 'Surgical' above), complete resection of all residual disease minimizes the risk of recurrence [56].

URETERAL ENDOMETRIOSIS

Definition — Ureteral endometriosis is endometriotic involvement of the ureter that can be either intrinsic or extrinsic. Intrinsic ureteral endometriosis is defined as an endometriosis lesion that develops within the ureter wall and results in fibrosis and proliferation of the ureteral muscularis. Rarely, the mucosa can also be involved, with a polypoid mass projecting into the lumen. Extrinsic ureteral endometriosis occurs when endometriosis involves the peritoneum overlying the ureter and causes compression of the ureteral wall. Both forms can cause ureteral stenosis and obstruction.

Clinical manifestations — While up to 50 percent of women with ureteral endometriosis are asymptomatic, approximately 25 percent present with colicky flank pain and up to 15 percent present with gross hematuria [48]. Additional nonspecific symptoms include dysmenorrhea and deep dyspareunia [59]. For asymptomatic women, the diagnosis is typically made at the time of pelvic surgery or imaging for other indications or when medical complications such as unexplained hypertension or renal failure develop [16,60-62].

Diagnostic evaluation — Women suspected of having ureteral endometriosis undergo a detailed history and physical examination, laboratory tests for renal function, and ultrasound evaluation of the urinary tract. For women with abnormal ultrasound findings, additional imaging can be needed.

- **History and physical examination** – Women with ureteral endometriosis often have diffuse disease. Thus, the history and physical examination of women with suspected ureteral endometriosis in the same as for women suspected of having generalized endometriosis.

- **Laboratory testing** – Renal function may be impaired in women with ureteral endometriosis due to ureteral stenosis, hydroureter and hydronephrosis [16,19,60-62]. In one small retrospective study of women with surgically diagnosed, deeply infiltrating endometriosis, 43 percent (12 of 28 women) had decreased renal function, although the methods used to assess renal function were not specified [63]. For women with flank pain and/or hematuria, we also perform a urinalysis to exclude infection. Urine culture is done if infection is suspected. Women with hematuria proceed with cystoscopy. (See "Diagnostic approach to adult patients with subacute kidney injury in an outpatient setting", section on 'Evaluation'.)

- **Imaging** – Pelvic and renal ultrasounds are performed to identify ureteral lesions, hydroureter, and hydronephrosis [64]. The ureter can be visualized from the renal pelvis to the anterior parametrium [38]. If hydronephrosis is present, the degree is graded based upon the appearance of the calices and renal pelvis and the thickness of renal parenchyma [65].

Diagnosing ureteral endometriosis with ultrasound requires a high index of suspicion because ureteral disease is not common, even among women with endometriosis, and women can be asymptomatic. As an example, one study of 750 women with endometriosis undergoing routine renal ultrasound reported ureterohydronephrosis in 23 women (3 percent), half of whom had no symptoms [66].

In women with hydroureter or hydronephrosis, additional radiologic studies such as intravenous pyelography, computed tomography (CT) and magnetic resonance imaging can help identify the sites of stenosis and endometriosis lesions and thus aid surgical planning. In our practice, we order a urologic CT scan for all women with hydroureter or hydronephrosis because we find this test most helpful for surgical planning. (See "Clinical manifestations and diagnosis of urinary tract obstruction (UTO) and hydronephrosis".)

For women diagnosed with severe ureteral stenosis or obstruction on imaging, we perform preoperative renography to determine if the kidney is salvageable [7]. While the ability of renography to predict postoperative renal function is imperfect, renal function is expected to stabilize or improve if the preoperative glomerular filtration rate is ≥10 percent of the total normal glomerular filtration rate (ie, approximately ≥10 mL/minute) [67].

- **Cystourethroscopy** – Women with suspected ureteral endometriosis lesions are also evaluated for bladder lesions as described above. (See 'Diagnostic evaluation' above.)

Diagnosis — Tissue biopsy and histologic confirmation is the gold standard for diagnosing ureteral endometriosis. Histologic evaluation can further differentiate between intrinsic or extrinsic ureteral endometriosis. While this distinction has pathogenetic significance, it does not impact clinical management because the difference cannot be determined preoperatively. In a study of 29 women with ureteral endometriosis, nearly 40 percent of lesions were intrinsic and approximately 60 percent were extrinsic [68].

Differential diagnosis — The differential diagnosis of women with colicky flank pain and hematuria includes urinary tract infection, urinary tract stones, and neoplasms in addition to ureteral endometriosis. Steps to exclude these entities are presented above. (See 'Differential diagnosis' above.)

For women with asymptomatic hydronephrosis who are suspected of having ureteral endometriosis, the differential diagnosis includes all causes of acute or chronic kidney injury and is presented separately. (See "Clinical manifestations and diagnosis of urinary tract obstruction (UTO) and hydronephrosis", section on 'Differential diagnosis'.)

Surgery

Choice of procedure — Treatment of ureteral endometriosis (intrinsic and extrinsic) is primarily surgical [7]. Although cases of successful medical management of ureteral endometriosis have been reported [69-71], medical treatment does not typically resolve the fibrotic component of the lesion, which is largely responsible for the anatomic distortion and obstruction [72,73]. Additionally, the risks of poor medical response include worsened obstruction and decreased renal function. Therefore, in our practice, we treat the ureteral obstruction surgically as soon as the diagnosis is made (picture 4).

The goals of surgical treatment are to remove the endometriotic lesion(s), restore ureteral anatomy, and prevent loss of renal function [16,39,74]. Nerve-sparing surgical approach is discussed in a related topic. (See "Endometriosis: Treatment of rectovaginal and bowel disease", section on 'Nerve-sparing technique'.)

The main procedures include:

- **Ureterolysis –** Surgical dissection of ureter from surrounding tissue, including fibrosis. This dissection is performed in a nerve-sparing manner whenever possible. (See "Endometriosis: Treatment of rectovaginal and bowel disease", section on 'Nerve-sparing technique'.)
- **Ureterectomy with ureteroureteral anastomosis –** Removal of stenotic segment (ureterectomy) and reattachment of proximal and distal cut ureteral ends to each other (ureteroureteral anastomosis) (figure 1).
- **Ureteroneocystostomy –** Resection of stenotic segment followed by reimplantation of the proximal ureter into the bladder dome (figure 2).
- **Excision of all other endometriosis lesions.**

The stenotic portion of ureter can be managed by either ureterolysis alone, ureterolysis followed by resection with anastomosis (ureterectomy with ureteroureteral anastomosis), or ureterolysis, resection, and ureteroneocystostomy. The choice of procedure(s) is determined by the severity and location of disease (picture 4). Women with less extensive disease undergo more conservative surgery consisting of ureterolysis and resection of all other endometriosis implants. Although ureterolysis appears to have a higher restenosis rate compared with ureteroneocystostomy (8 versus 3 percent), the data are limited and do not justify performing a more morbid surgery when a less invasive procedure will restore renal function for more than 90 percent of women [14,17,49,74-80]. Women with moderate to severe disease often require radical surgery, including segmental ureterectomy with reanastomosis or ureteroneocystostomy, to remove advanced disease and restore normal anatomy [81]. For most women, surgery is performed laparoscopically, with or without robotic assistance, because of faster recovery compared with laparotomy [8,59,75,76,82]. We

insert a ureteral stent any time we are operating directly on the ureter to minimize the risk of postoperative kinking and fistula formation.

Women who cannot undergo immediate surgical resection are at risk for continued renal injury. Therefore, we treat women whose surgery must be delayed with suppressive medical therapy (eg, hormonal suppression) and insert a ureteral stent. In such cases, we closely monitor renal function with ultrasound to assess the degree of hydronephrosis until definitive surgical resection can be performed.

Ureterolysis — Ureterolysis is the first step of all ureteral procedures as it removes the endometriotic fibrotic tissue involving the ureter, mobilizes the ureter, and relieves the obstruction (picture 4) [7]. The peritoneum overlying the ureter is opened at the level of the pelvic brim, where both the ureter and peritoneum are rarely affected by endometriotic disease or associated fibrosis. The ureter is then exposed down to the level of the cardinal ligament. In women with healthy retroperitoneal tissue, this is done by blunt dissection. If endometriosis is present, we use cold or electrosurgical scissors to excise adjacent endometrial lesions. Removal of lesions can be difficult to achieve since endometriotic nodules can infiltrate the ureteral wall and often have no clear cleavage planes in relation to surrounding structures. Despite the challenge, we remove all lesions, rather than ablate them, because ablation increases the risk of ureteral fistula. We employ a nerve-sparing technique for the dissection. (See "Endometriosis: Treatment of rectovaginal and bowel disease", section on 'Nerve-sparing technique'.)

If endometriosis invades the ureteral adventitia (outer layer), more aggressive ureterolysis is necessary. This consists of cutting the adventitial sheath and removing the fibrosed surface while leaving the muscular layer intact. During the procedure, unintentional perforations of the ureteral lumen can be repaired with interrupted 4-0 polydioxanone sutures [83]. Of note, incisions in the ureteral adventitia can compromise the periureteral vascular supply and increase the risk of postoperative ureteral fistula [8].

Ureterectomy — For women with documented ureteral stenosis and significant hydronephrosis, we perform ureterectomy of the affected segment after completion of ureterolysis. For ureters with lesions in the middle or upper third, we perform an ureteroureteral anastomosis (figure 1). When the ureteral lesion is in the distal third of the ureter, we perform ureteral resection and reimplantation (ureteroneocystostomy) (figure 2). (See 'Ureteroneocystostomy' below.)

As intraoperative criteria that predict restenosis have not been identified, the decision to perform the more invasive ureterectomy versus ureterolysis only is subjective, which makes comparison of study results difficult [8]. We believe that resection of the stenosed ureteral segment, with ureteroneocystostomy if indicated, minimizes the risk of stenosis recurrence [49,77]. This surgical decision is typically made with input from urologists as well.

Ureteroneocystostomy — Since most ureteral lesions are located in the distal ureter, 3 to 4 cm above the vesicoureteral junction [78], ureteral resection with ureteroneocystostomy is typically performed to remove the stenotic segment and safely reimplant the ureter. In this technique, the ureter is incised proximal to the stricture and is reimplanted into the bladder, typically at the dome (figure 2). A bladder-psoas hitch can be required to achieve a tension-free anastomosis. An antireflux plasty of the bladder valve is performed to avoid ascending infections [77,84].

Resection of all endometriosis — We remove all endometriotic foci that are in the vicinity of the ureters to prevent disease progression, future ureteral stenosis, and renal damage [85]. This includes lesions that are found incidentally at time of surgery and are proximal to, but do not directly impinge upon, the ureters. All other areas of endometriosis are treated as well. In a retrospective study of 96 women with histologically confirmed ureteral endometriosis, more than two-thirds had concomitant endometriosis of the ipsilateral ovary [8]. (See "Endometriosis: Surgical management of pelvic pain".)

Complications — In a review of 243 women treated for ureteral endometriosis, the cumulative surgical complication rate was 9 percent [7]. Procedures performed included ureterolysis (176 women), ureteral anastomosis (28 women), and ureteroneocystostomy (39 women). Major complications included persistence or recurrence of ureteral stenosis requiring repeat surgery (7.4 percent), ureteral or ureterovaginal fistula (1.6 percent), and hemoperitoneum (0.4 percent). For comparison, in the United States, estimates of urogenital fistula formation after gynecologic surgery range from less than 0.5 percent after simple hysterectomy to 10 percent after radical hysterectomy [86-88].

General complications of gynecologic surgery are presented separately. (See "Complications of gynecologic surgery" and "Complications of laparoscopic surgery".)

Prognosis — The rate of persistent or recurrent ureteral stenosis appears to vary by type of surgical procedure. Compilation of ten case studies calculated the following cumulative ureteral restenosis rates by procedure [14,17,49,74-80]:

- Ureterolysis alone – 8 percent (14 of 176)
- Ureterectomy with ureteroureteral anastomosis – 11 percent (3 of 28)
- Ureteroneocystostomy – 3 percent (1 of 39)

While the data suggest that ureterolysis alone and ureteroureteral anastomosis are associated with higher rates of persistent or recurrent stenosis compared with ureteroneocystostomy, definitive conclusions are limited by the small numbers of patients and the lack of comparative trial data.

SPECIAL POPULATIONS

Combined bladder and ureteral endometriosis — Women with both bladder and ureteral endometriosis are treated surgically to prevent renal injury resulting from ureteral involvement. However, small studies suggest the two processes do not typically occur in the same woman. As an example, in a group of 43 women with urinary tract endometriosis undergoing surgery at a specialty center, only 3 women (7 percent) had both bladder and ureteral involvement [13].

Iatrogenic bladder endometriosis — In some women, bladder endometriosis appears to be iatrogenic. Surgeries that disrupt the endometrium, such as cesarean delivery or transmural myomectomy, may spread endometrial tissue or include endometrial tissue in the closure [3,89]. In contrast to women with spontaneous endometriosis, women with iatrogenic endometriosis typically have isolated foci of endometriosis, often in the surgical scar [7]. Women with bladder endometriosis are managed as reviewed above, regardless of the cause. (See 'Treatment' above and "Cesarean birth: Postoperative care, complications, and long-term sequelae", section on 'Scar complications'.)

Incidental endometriosis — We perform ureterolysis in women whose ureteral disease is incidentally discovered during other surgery. However, we defer more extensive ureteral procedures (eg, cutting of the ureteral adventitia or ureteral resection) if appropriate informed consent has not been obtained because of the increased risks of complications from more advanced dissection.

Pregnancy — The removal of bladder endometriosis is contraindicated in pregnant women because the increased pelvic blood flow during pregnancy increases the risk of hemorrhage. Although the relative position of the uterus to the bladder shifts during pregnancy, the gravid uterus does not facilitate development of tissue planes and resection of endometriotic lesions because these lesions are typically adherent to the surrounding tissue [90].

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Endometriosis".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th

grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Endometriosis (The Basics)")
- Beyond the Basics topics (see "Patient education: Endometriosis (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- **Etiology –** General theories of endometriosis include retrograde menstruation, lymphatic or hematogenous dissemination of endometrial cells, coelomic metaplasia, spread of endometrium-derived stem/progenitor cells, and altered genetic or immune factors. In addition, anatomic structures (eg, anteverted uterine fundus, sigmoid colon) of the pelvis may provide sheltered pockets that protect ectopic endometrial cells from the usual peritoneal clearance mechanisms and allow endometrial implants to develop. (See 'Pathogenesis' above.)
- **Prevalence of urinary tract endometriosis –** Of patients diagnosed with pelvic endometriosis, approximately 1 percent have urinary tract endometriosis, most commonly bladder endometriosis. Endometriosis of the ureter occurs in approximately 0.1 percent of women. However, in the subpopulation of women with deeply infiltrating endometriosis, urinary tract endometriosis has been diagnosed in up to 20 to 50 percent. These wide ranges may reflect referral patterns rather than true disease prevalence. (See 'Prevalence' above.)
- **Bladder endometriosis –** Bladder endometriosis is an endometriotic lesion that infiltrates the detrusor muscle and can be either partial or full thickness. Women with bladder endometriosis typically present with dysuria or with lower urinary tract symptoms such as urinary urgency and frequency.
    - **Evaluation –** The diagnostic evaluation of women with suspected bladder endometriosis includes a history, physical examination, limited laboratory testing to exclude infection, imaging to evaluate for bladder lesions and hydronephrosis, and

cystourethroscopy to assess for lesions and location relative to the ureteral orifices. (See 'Diagnostic evaluation' above.)

- **Diagnosis –** Bladder endometriosis is diagnosed by biopsy of lesions and/or visualization of lesions. Biopsy is typically necessary to exclude malignancy. (See 'Definition' above and 'Clinical manifestations' above and 'Diagnostic evaluation' above.)

- **Treatment options and selection –** Treatment of bladder endometriosis is aimed at resolving symptoms; asymptomatic women can be observed. For most women with symptomatic bladder endometriosis, we suggest medical rather than surgical treatment (**Grade 2C**). We reserve surgery for women who have failed or have contraindications to medical therapy, who wish to avoid chronic medical treatment, or who have hydronephrosis. (See 'Treatment' above.)

- **Ureteral endometriosis –** Ureteral endometriosis may be either within the ureteral wall (intrinsic) or involve the overlying peritoneum (extrinsic). More than one-half of women with ureteral endometriosis are asymptomatic; others present with colicky flank pain or gross hematuria. Both forms can cause ureteral stenosis and obstruction. Hydronephrosis in asymptomatic patients may result in silent loss of renal function. (See 'Definition' above and 'Clinical manifestations' above.)

  - The diagnostic evaluation of women with suspected ureteral endometriosis includes a history, physical examination, laboratory testing to assess renal function and exclude urinary tract infection, and pelvic and renal ultrasounds to evaluate for ureteral lesions, hydroureter, and hydronephrosis. Cystourethroscopy is performed to exclude bladder lesions. Ureteral endometriosis is diagnosed by visualization and/or biopsy of lesions. (See 'Diagnostic evaluation' above.)

  - Treatment of ureteral endometriosis is surgical, since medical therapy has not been proven effective at relieving ureteral obstruction. For women with hydronephrosis in whom surgery must be delayed, we suggest a combination of medical therapy and insertion of a ureteral stent rather than either treatment alone or no treatment (**Grade 2C**). (See 'Choice of procedure' above.)

  - The first step in surgical treatment of ureteral endometriosis is ureterolysis. Subsequent surgical management can include resection of a segment (ureterectomy) with anastomosis (ureteroureteral anastomosis (figure 1)) or with ureteral implantation into the bladder (ureteroneocystostomy (figure 2)). Lesions of the lower third of the ureter typically require ureteroneocystostomy. (See 'Ureterolysis' above and 'Ureterectomy' above and 'Ureteroneocystostomy' above.)

- The cumulative surgical complication rate after treatment of ureteral endometriosis has been reported as 9 percent. The most complications include persistence or recurrence of ureteral stenosis requiring repeat surgery (7.4 percent), ureteral or ureterovaginal fistula (1.6 percent), and hemoperitoneum (0.4 percent). (See 'Complications' above.)

- The rate of restenosis appears to vary by ureteral procedure, but definitive conclusions are limited by the small sample size and lack of comparative trials. (See 'Prognosis' above.)

REFERENCES

1. Donnez J, Spada F, Squifflet J, Nisolle M. Bladder endometriosis must be considered as bladder adenomyosis. Fertil Steril 2000; 74:1175.
2. Fedele L, Piazzola E, Raffaelli R, Bianchi S. Bladder endometriosis: deep infiltrating endometriosis or adenomyosis? Fertil Steril 1998; 69:972.
3. Buka NJ. Vesical endometriosis after cesarean section. Am J Obstet Gynecol 1988; 158:1117.
4. Cruz Guerra NA, Linares Quevedo A, Cuesta Roca C, et al. [Bladder endometriosis in a patient with cesarean history]. Arch Esp Urol 2002; 55:194.
5. Vercellini P, Frontino G, Pisacreta A, et al. The pathogenesis of bladder detrusor endometriosis. Am J Obstet Gynecol 2002; 187:538.
6. Tosti C, Pinzauti S, Santulli P, et al. Pathogenetic Mechanisms of Deep Infiltrating Endometriosis. Reprod Sci 2015; 22:1053.
7. Berlanda N, Vercellini P, Carmignani L, et al. Ureteral and vesical endometriosis. Two different clinical entities sharing the same pathogenesis. Obstet Gynecol Surv 2009; 64:830.
8. Bosev D, Nicoll LM, Bhagan L, et al. Laparoscopic management of ureteral endometriosis: the Stanford University hospital experience with 96 consecutive cases. J Urol 2009; 182:2748.
9. Vercellini P, Pisacreta A, Pesole A, et al. Is ureteral endometriosis an asymmetric disease? BJOG 2000; 107:559.
10. Vercellini P, Eskenazi B, Consonni D, et al. Oral contraceptives and risk of endometriosis: a systematic review and meta-analysis. Hum Reprod Update 2011; 17:159.
11. Seracchioli R, Mabrouk M, Montanari G, et al. Conservative laparoscopic management of urinary tract endometriosis (UTE): surgical outcome and long-term follow-up. Fertil Steril

2010; 94:856.

12. Donnez J, Brosens I. Definition of ureteral endometriosis? Fertil Steril 1997; 68:178.
13. Gabriel B, Nassif J, Trompoukis P, et al. Prevalence and management of urinary tract endometriosis: a clinical case series. Urology 2011; 78:1269.
14. Schneider A, Touloupidis S, Papatsoris AG, et al. Endometriosis of the urinary tract in women of reproductive age. Int J Urol 2006; 13:902.
15. Maccagnano C, Pellucchi F, Rocchini L, et al. Ureteral endometriosis: proposal for a diagnostic and therapeutic algorithm with a review of the literature. Urol Int 2013; 91:1.
16. Muñoz JL, Jiménez JS, Tejerizo A, et al. Rectosigmoid deep infiltrating endometriosis and ureteral involvement with loss of renal function. Eur J Obstet Gynecol Reprod Biol 2012; 162:121.
17. Donnez J, Nisolle M, Squifflet J. Ureteral endometriosis: a complication of rectovaginal endometriotic (adenomyotic) nodules. Fertil Steril 2002; 77:32.
18. Setälä M, Kössi J, Silventoinen S, Mäkinen J. The impact of deep disease on surgical treatment of endometriosis. Eur J Obstet Gynecol Reprod Biol 2011; 158:289.
19. Knabben L, Imboden S, Fellmann B, et al. Urinary tract endometriosis in patients with deep infiltrating endometriosis: prevalence, symptoms, management, and proposal for a new clinical classification. Fertil Steril 2015; 103:147.
20. ABESHOUSE BS, ABESHOUSE G. Endometriosis of the urinary tract: a review of the literature and a report of four cases of vesical endometriosis. J Int Coll Surg 1960; 34:43.
21. Yohannes P. Ureteral endometriosis. J Urol 2003; 170:20.
22. Dénes FT, Pompeo AC, Montelatto NI, Lopes RN. Ureteral endometriosis. Int Urol Nephrol 1980; 12:205.
23. Kovoor E, Nassif J, Miranda-Mendoza I, Wattiez A. Endometriosis of bladder: outcomes after laparoscopic surgery. J Minim Invasive Gynecol 2010; 17:600.
24. Sinaii N, Plumb K, Cotton L, et al. Differences in characteristics among 1,000 women with endometriosis based on extent of disease. Fertil Steril 2008; 89:538.
25. Hickey M, Ballard K, Farquhar C. Endometriosis. BMJ 2014; 348:g1752.
26. Vercellini P, Viganò P, Somigliana E, Fedele L. Endometriosis: pathogenesis and treatment. Nat Rev Endocrinol 2014; 10:261.
27. Leone Roberti Maggiore U, Ferrero S, Salvatore S. Urinary incontinence and bladder endometriosis: conservative management. Int Urogynecol J 2015; 26:159.
28. STANLEY KE Jr, UTZ DC, DOCKERTY MB. CLINICALLY SIGNIFICANT ENDOMETRIOSIS OF THE URINARY TRACT. Surg Gynecol Obstet 1965; 120:491.
29. Westney OL, Amundsen CL, McGuire EJ. Bladder endometriosis: conservative

management. J Urol 2000; 163:1814.

30. Guerriero S, Condous G, van den Bosch T, et al. Systematic approach to sonographic evaluation of the pelvis in women with suspected endometriosis, including terms, definitions and measurements: a consensus opinion from the International Deep Endometriosis Analysis (IDEA) group. Ultrasound Obstet Gynecol 2016; 48:318.
31. Bennett GL, Slywotzky CM, Cantera M, Hecht EM. Unusual manifestations and complications of endometriosis--spectrum of imaging findings: pictorial review. AJR Am J Roentgenol 2010; 194:WS34.
32. Goncalves MO, Dias JA Jr, Podgaec S, et al. Transvaginal ultrasound for diagnosis of deeply infiltrating endometriosis. Int J Gynaecol Obstet 2009; 104:156.
33. Exacoustos C, Malzoni M, Di Giovanni A, et al. Ultrasound mapping system for the surgical management of deep infiltrating endometriosis. Fertil Steril 2014; 102:143.
34. Hudelist G, Tammaa A, Aas-Eng MK, et al. Outcome of sonography-based minimally invasive surgery for deep infiltrating endometriosis of the ureter and urinary bladder - a retrospective cohort study. Acta Obstet Gynecol Scand 2018; 97:277.
35. Ros C, de Guirior C, Rius M, et al. Accuracy of Transvaginal Ultrasound Compared to Cystoscopy in the Diagnosis of Bladder Endometriosis Nodules. J Ultrasound Med 2021; 40:1571.
36. Guerriero S, Ajossa S, Gerada M, et al. Diagnostic value of transvaginal 'tenderness-guided' ultrasonography for the prediction of location of deep endometriosis. Hum Reprod 2008; 23:2452.
37. Reid S, Lu C, Casikar I, et al. Prediction of pouch of Douglas obliteration in women with suspected endometriosis using a new real-time dynamic transvaginal ultrasound technique: the sliding sign. Ultrasound Obstet Gynecol 2013; 41:685.
38. Berlanda N, Somigliana E, Frattaruolo MP, et al. Surgery versus hormonal therapy for deep endometriosis: is it a choice of the physician? Eur J Obstet Gynecol Reprod Biol 2017; 209:67.
39. Chapron C, Bourret A, Chopin N, et al. Surgery for bladder endometriosis: long-term results and concomitant management of associated posterior deep lesions. Hum Reprod 2010; 25:884.
40. Chamié LP, Blasbalg R, Gonçalves MO, et al. Accuracy of magnetic resonance imaging for diagnosis and preoperative assessment of deeply infiltrating endometriosis. Int J Gynaecol Obstet 2009; 106:198.
41. Grasso RF, Di Giacomo V, Sedati P, et al. Diagnosis of deep infiltrating endometriosis: accuracy of magnetic resonance imaging and transvaginal 3D ultrasonography. Abdom Imaging 2010; 35:716.

42. Busard MP, Mijatovic V, van Kuijk C, et al. Magnetic resonance imaging in the evaluation of (deep infiltrating) endometriosis: the value of diffusion-weighted imaging. J Magn Reson Imaging 2010; 32:1003.
43. Nezhat CH, Malik S, Osias J, et al. Laparoscopic management of 15 patients with infiltrating endometriosis of the bladder and a case of primary intravesical endometrioid adenosarcoma. Fertil Steril 2002; 78:872.
44. Vercellini P, Somigliana E, Consonni D, et al. Surgical versus medical treatment for endometriosis-associated severe deep dyspareunia: I. Effect on pain during intercourse and patient satisfaction. Hum Reprod 2012; 27:3450.
45. Fedele L, Bianchi S, Montefusco S, et al. A gonadotropin-releasing hormone agonist versus a continuous oral contraceptive pill in the treatment of bladder endometriosis. Fertil Steril 2008; 90:183.
46. Leone Roberti Maggiore U, Ferrero S, Candiani M, et al. Bladder Endometriosis: A Systematic Review of Pathogenesis, Diagnosis, Treatment, Impact on Fertility, and Risk of Malignant Transformation. Eur Urol 2017; 71:790.
47. Chapron C, Dubuisson JB. Laparoscopic management of bladder endometriosis. Acta Obstet Gynecol Scand 1999; 78:887.
48. Comiter CV. Endometriosis of the urinary tract. Urol Clin North Am 2002; 29:625.
49. Antonelli A, Simeone C, Zani D, et al. Clinical aspects and surgical treatment of urinary tract endometriosis: our experience with 31 cases. Eur Urol 2006; 49:1093.
50. Pastor-Navarro H, Giménez-Bachs JM, Donate-Moreno MJ, et al. Update on the diagnosis and treatment of bladder endometriosis. Int Urogynecol J Pelvic Floor Dysfunct 2007; 18:949.
51. Lousquy R, Borghese B, Chapron C. [Deep bladder endometriosis: how do I...to perform a laparoscopic partial cystectomy?]. Gynecol Obstet Fertil 2010; 38:697.
52. Seracchioli R, Mannini D, Colombo FM, et al. Cystoscopy-assisted laparoscopic resection of extramucosal bladder endometriosis. J Endourol 2002; 16:663.
53. Sener A, Chew BH, Duvdevani M, et al. Combined transurethral and laparoscopic partial cystectomy and robot-assisted bladder repair for the treatment of bladder endometrioma. J Minim Invasive Gynecol 2006; 13:245.
54. Pang ST, Chao A, Wang CJ, et al. Transurethral partial cystectomy and laparoscopic reconstruction for the management of bladder endometriosis. Fertil Steril 2008; 90:2014.e1.
55. Nerli RB, Reddy M, Koura AC, et al. Cystoscopy-assisted laparoscopic partial cystectomy. J Endourol 2008; 22:83.

56. Fedele L, Bianchi S, Zanconato G, et al. Long-term follow-up after conservative surgery for bladder endometriosis. Fertil Steril 2005; 83:1729.
57. Reisenauer C. Vesicovaginal fistulas: a gynecological experience in 41 cases at a German pelvic floor center. Arch Gynecol Obstet 2015; 292:245.
58. Schonman R, Dotan Z, Weintraub AY, et al. Deep endometriosis inflicting the bladder: long-term outcomes of surgical management. Arch Gynecol Obstet 2013; 288:1323.
59. Seracchioli R, Raimondo D, Di Donato N, et al. Histological evaluation of ureteral involvement in women with deep infiltrating endometriosis: analysis of a large series. Hum Reprod 2015; 30:833.
60. Choi JI, Yoo JG, Kim SJ, et al. Acute Renal Failure due to Obstructive Uropathy Secondary to Ureteral Endometriosis. Case Rep Obstet Gynecol 2015; 2015:761348.
61. Arrieta Bretón S, López Carrasco A, Hernández Gutiérrez A, et al. Complete loss of unilateral renal function secondary to endometriosis: a report of three cases. Eur J Obstet Gynecol Reprod Biol 2013; 171:132.
62. Spinelli A, Contri S, Savino A, et al. Unexpected hypertension associated to silent renal failure in a "healthy" young woman. Intern Emerg Med 2014; 9:115.
63. Freire MJ, Dinis PJ, Medeiros R, et al. Deep Infiltrating Endometriosis-Urinary Tract Involvement and Predictive Factors for Major Surgery. Urology 2017; 108:65.
64. Pateman K, Holland TK, Knez J, et al. Should a detailed ultrasound examination of the complete urinary tract be routinely performed in women with suspected pelvic endometriosis? Hum Reprod 2015; 30:2802.
65. Fernbach SK, Maizels M, Conway JJ. Ultrasound grading of hydronephrosis: introduction to the system used by the Society for Fetal Urology. Pediatr Radiol 1993; 23:478.
66. Carmignani L, Vercellini P, Spinelli M, et al. Pelvic endometriosis and hydroureteronephrosis. Fertil Steril 2010; 93:1741.
67. Shokeir AA, Provoost AP, Nijman RJ. Recoverability of renal function after relief of chronic partial upper urinary tract obstruction. BJU Int 1999; 83:11.
68. Chapron C, Chiodo I, Leconte M, et al. Severe ureteral endometriosis: the intrinsic type is not so rare after complete surgical exeresis of deep endometriotic lesions. Fertil Steril 2010; 93:2115.
69. Rivlin ME, Krueger RP, Wiser WL. Danazol in the management of ureteral obstruction secondary to endometriosis. Fertil Steril 1985; 44:274.
70. Matsuura K, Kawasaki N, Oka M, et al. Treatment with danazol of ureteral obstruction caused by endometriosis. Acta Obstet Gynecol Scand 1985; 64:339.
71. Gantt PA, Hunt JB, McDonough PG. Progestin reversal of ureteral endometriosis. Obstet Gynecol 1981; 57:665.

72. Maccagnano C, Pellucchi F, Rocchini L, et al. Diagnosis and treatment of bladder endometriosis: state of the art. Urol Int 2012; 89:249.

73. Vercellini P, Crosignani PG, Somigliana E, et al. Medical treatment for rectovaginal endometriosis: what is the evidence? Hum Reprod 2009; 24:2504.

74. Seracchioli R, Mabrouk M, Manuzzi L, et al. Importance of retroperitoneal ureteric evaluation in cases of deep infiltrating endometriosis. J Minim Invasive Gynecol 2008; 15:435.

75. Ghezzi F, Cromi A, Bergamini V, et al. Outcome of laparoscopic ureterolysis for ureteral endometriosis. Fertil Steril 2006; 86:418.

76. Mereu L, Gagliardi ML, Clarizia R, et al. Laparoscopic management of ureteral endometriosis in case of moderate-severe hydroureteronephrosis. Fertil Steril 2010; 93:46.

77. Carmignani L, Ronchetti A, Amicarelli F, et al. Bladder psoas hitch in hydronephrosis due to pelvic endometriosis: outcome of urodynamic parameters. Fertil Steril 2009; 92:35.

78. Pérez-Utrilla Pérez M, Aguilera Bazán A, Alonso Dorrego JM, et al. Urinary tract endometriosis: clinical, diagnostic, and therapeutic aspects. Urology 2009; 73:47.

79. Nezhat C, Nezhat F, Nezhat CH, et al. Urinary tract endometriosis treated by laparoscopy. Fertil Steril 1996; 66:920.

80. Frenna V, Santos L, Ohana E, et al. Laparoscopic management of ureteral endometriosis: our experience. J Minim Invasive Gynecol 2007; 14:169.

81. Seracchioli R, Manuzzi L, Mabrouk M, et al. A multidisciplinary, minimally invasive approach for complicated deep infiltrating endometriosis. Fertil Steril 2010; 93:1007.e1.

82. Isac W, Kaouk J, Altunrende F, et al. Robot-assisted ureteroneocystostomy: technique and comparative outcomes. J Endourol 2013; 27:318.

83. Scioscia M, Molon A, Grosso G, Minelli L. Laparoscopic management of ureteral endometriosis. Curr Opin Obstet Gynecol 2009; 21:325.

84. Ahn M, Loughlin KR. Psoas hitch ureteral reimplantation in adults--analysis of a modified technique and timing of repair. Urology 2001; 58:184.

85. Fedele L, Bianchi S, Zanconato G, et al. Is rectovaginal endometriosis a progressive disease? Am J Obstet Gynecol 2004; 191:1539.

86. Mann WJ, Arato M, Patsner B, Stone ML. Ureteral injuries in an obstetrics and gynecology training program: etiology and management. Obstet Gynecol 1988; 72:82.

87. Kobayashi E, Nagase T, Fujiwara K, et al. Total laparoscopic hysterectomy in 1253 patients using an early ureteral identification technique. J Obstet Gynaecol Res 2012; 38:1194.

88. Magrina JF, Kho RM, Weaver AL, et al. Robotic radical hysterectomy: comparison with laparoscopy and laparotomy. Gynecol Oncol 2008; 109:86.

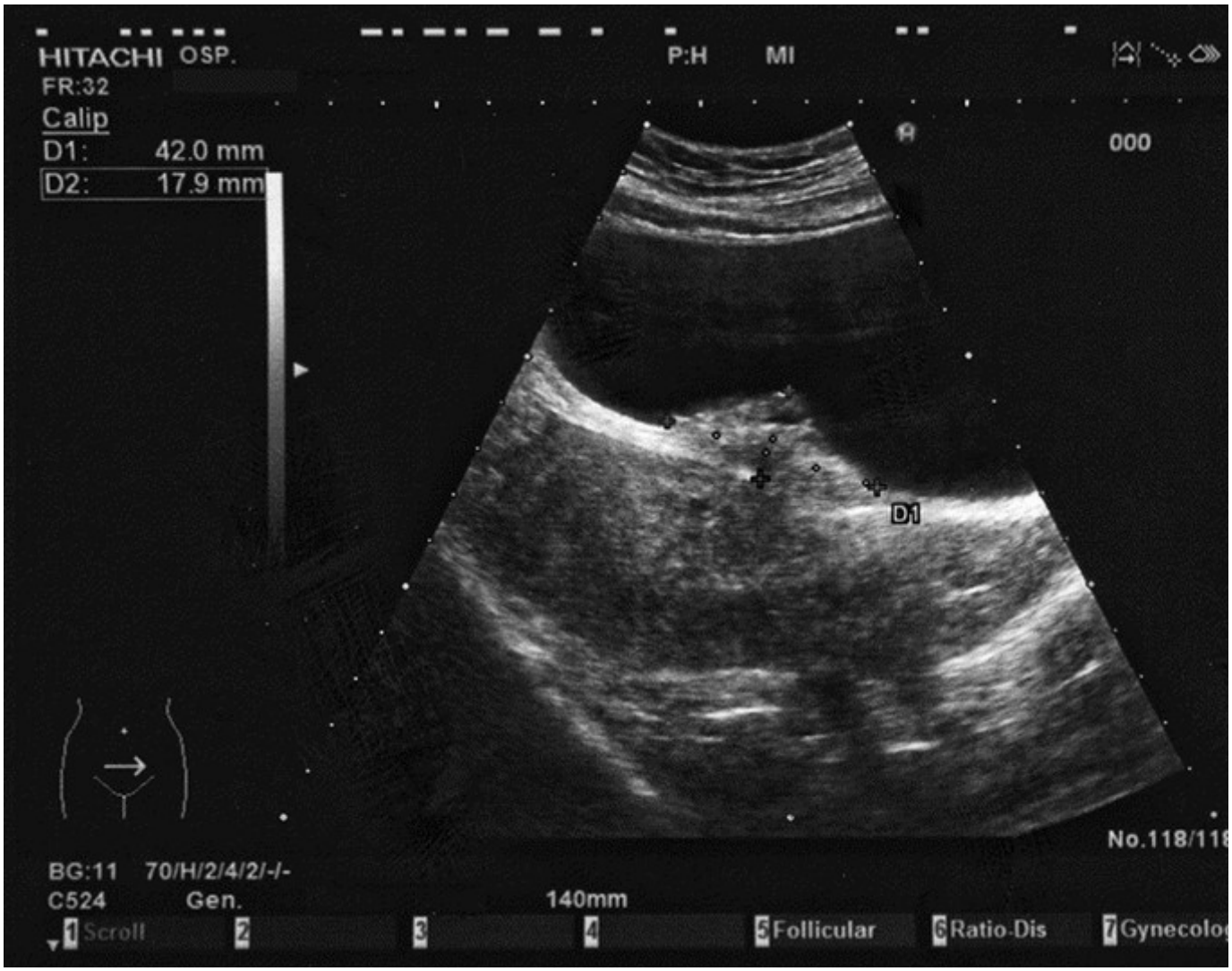
89. Vercellini P, Meschia M, De Giorgi O, et al. Bladder detrusor endometriosis: clinical and pathogenetic implications. J Urol 1996; 155:84.

90. Berlanda N, Vercellini P. Endometriosis I. Surgery for endometriosis associated with pai n. In: Reconstructive and Reproductive Surgery in Gynecology, 2nd ed, Munro MG, Gom el V (Eds), CRC Press, London Vol 2, p.579.

Topic 14190 Version 31.0

GRAPHICS

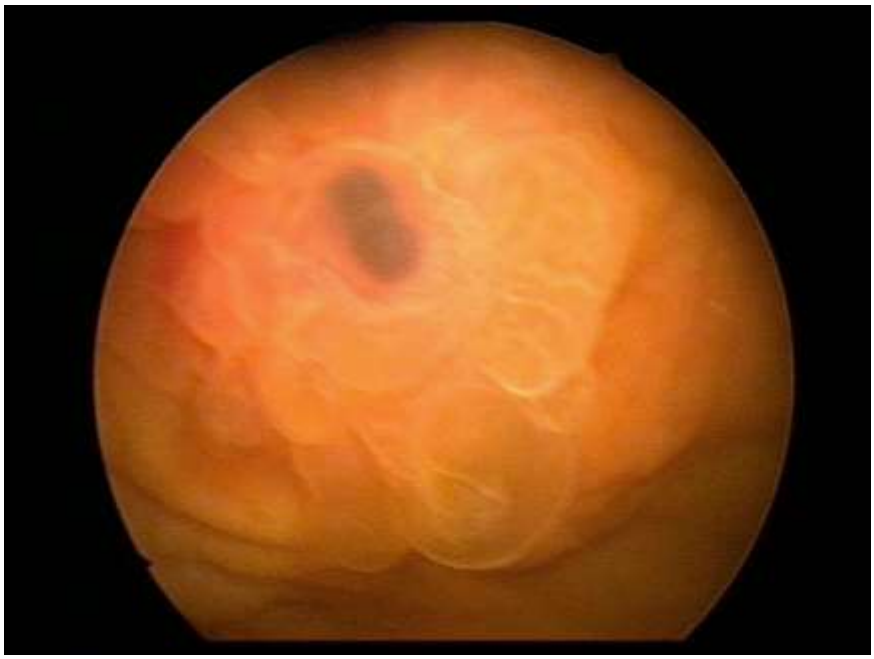
Transabdominal ultrasound image of bladder endometriosis



Transabdominal sagittal pelvic ultrasonography showing a heterogeneous endometriotic nodule protruding from the posterior wall of the bladder into the vesical lumen.

Graphic 105235 Version 3.0

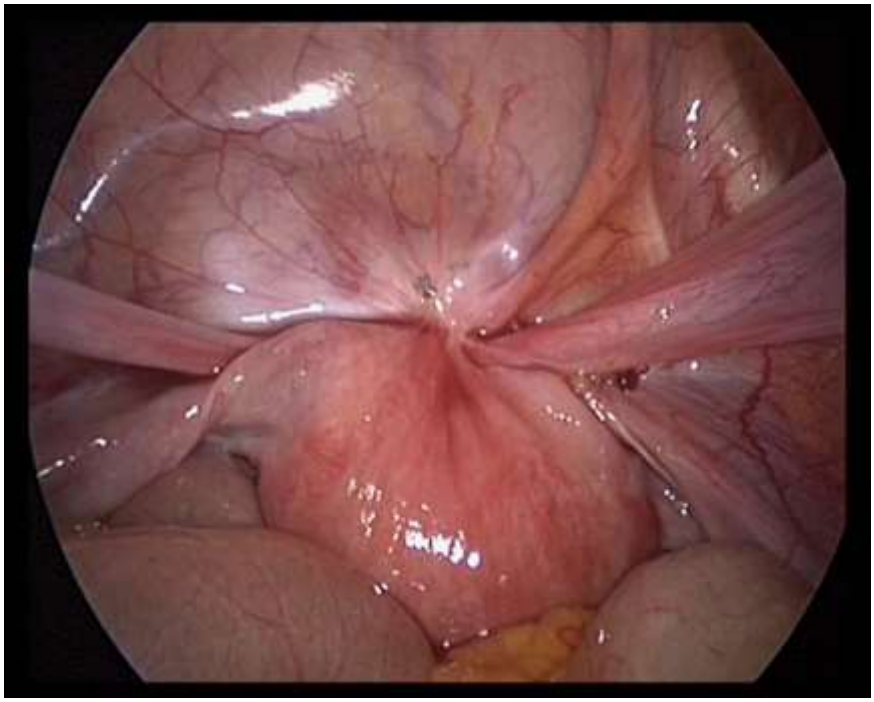
Bladder endometriosis: Cystoscopic image



Cystoscopic appearance of an endometriotic nodule on the posterior bladder wall.

Graphic 70190 Version 1.0

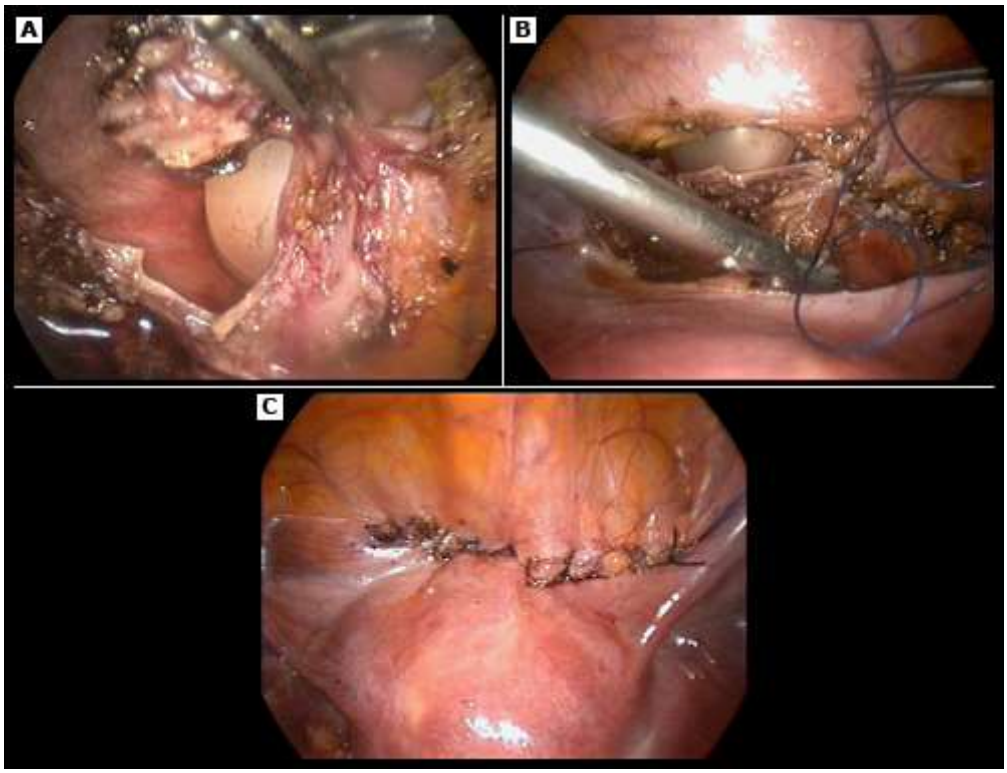
Bladder endometriosis: Laparoscopic view of obliteration of the vesicouterine space



Laparoscopic view of an obliterated vesicouterine space due to bladder endometriosis.

Graphic 79226 Version 1.0

Bladder endometriosis: Resection of nodule



(A) Laparoscopic excision of the endometriotic nodule. The bladder catheter is visible inside the bladder.

(B) Laparoscopic closure of the bladder.

(C) Laparoscopic ties at the end of the procedure.

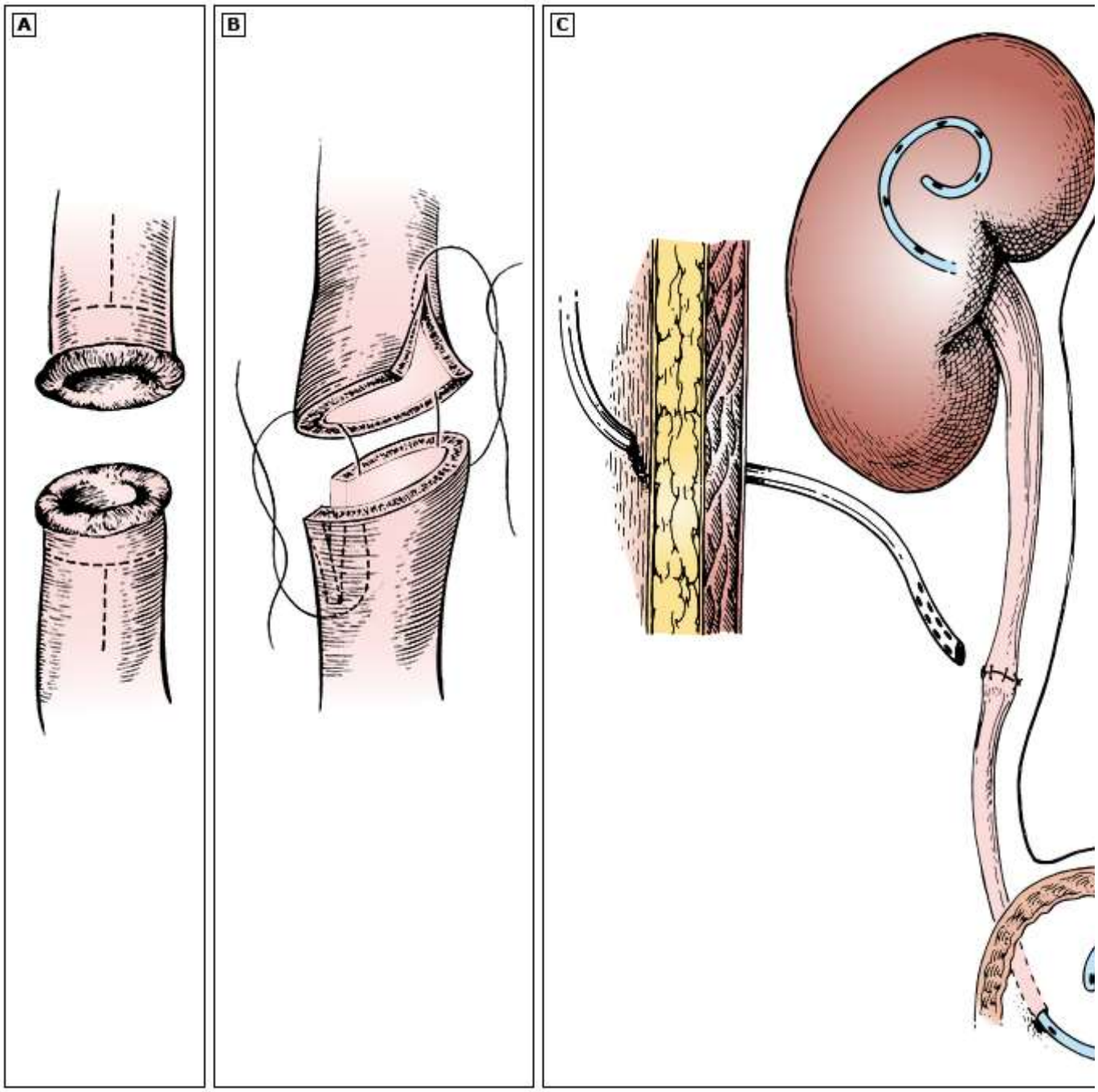
Graphic 76479 Version 2.0

Ureteral endometriosis

View of hydroureter prior to resection and ureteroneocystostomy.

Graphic 54395 Version 3.0

Ureteral anastomosis in gynecologic surgery



Ureteral anastomosis.

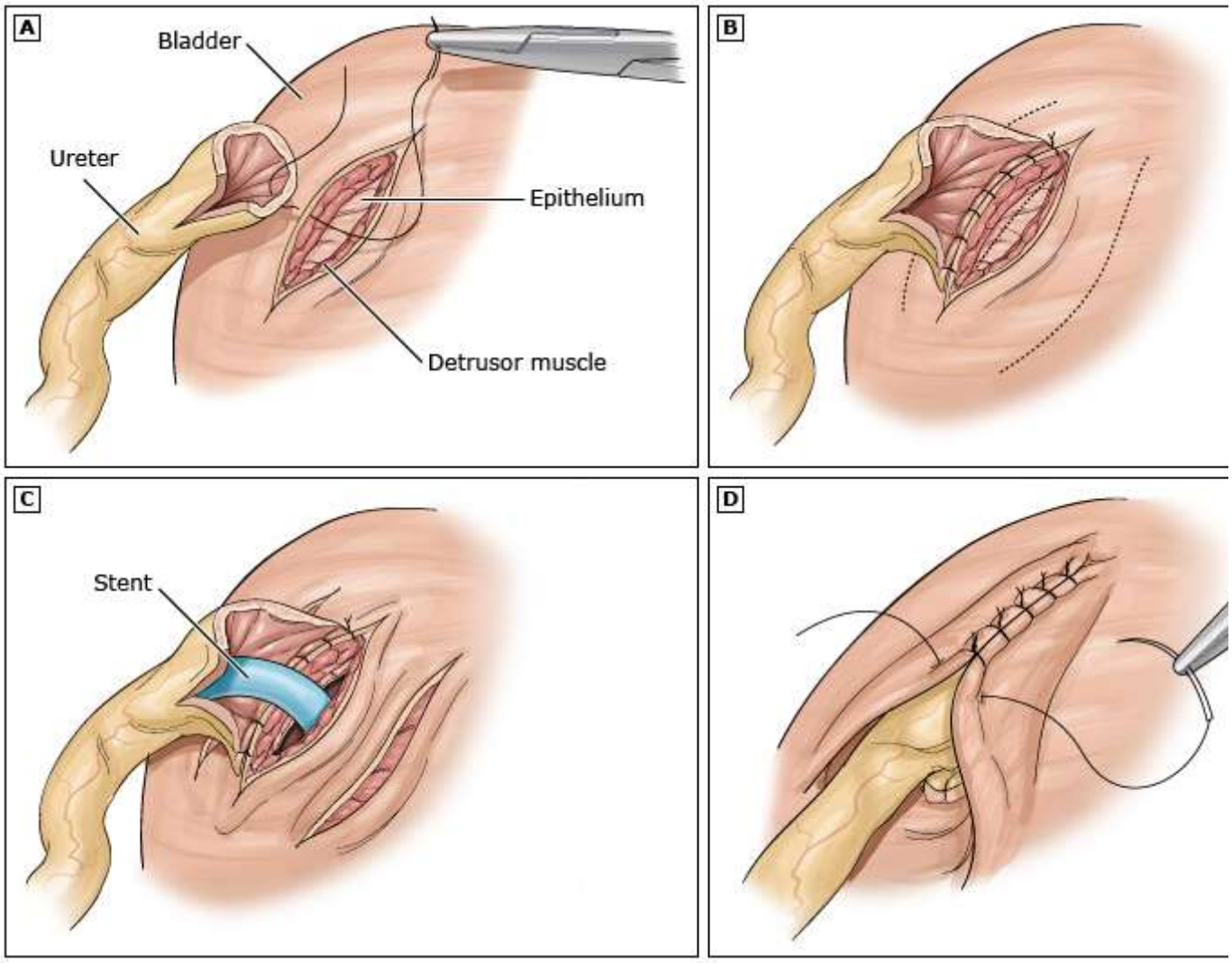
(A) The ends of the ureters are trimmed obliquely and spatulated.

(B) Fine delayed absorbable sutures are used to approximate the ends of the ureter.

(C) The anastomosis is done over a double-J or pigtail stent. A suction catheter is placed retroperitoneally site of anastomosis.

Graphic 110222 Version 7.0

Ureteroneocystostomy in gynecologic surgery



Extravesical technique for ureteroneocystostomy.

(A) The distal ureter is freshened and spatulated for 1 cm. The detrusor muscle is incised for 1 to 2 cm or posterolateral aspect of the bladder to expose the epithelium.

(B) The lateral aspect of the anastomosis is completed before incising the urothelium.

(C) The epithelium is incised and a stent introduced across the anastomosis.

(D) The ureteral anastomosis is completed and the serosa is closed over the ureter.

Contributor Disclosures

Nicola Berlanda, MD No relevant financial relationship(s) with ineligible companies to disclose. **Paolo Vercellini, MD** No relevant financial relationship(s) with ineligible companies to disclose. **Luigi Fedele, MD** No relevant financial relationship(s) with ineligible companies to disclose. **Tommaso Falcone, MD, FRCSC, FACOG** Speaker's Bureau: Gedeon Richter [Honoraria for lecture given at ESHRE on endometriosis and another symposia]. All of the relevant financial relationships listed have been mitigated. **Kristen Eckler, MD, FACOG** No relevant financial relationship(s) with ineligible companies to disclose.

Contributor disclosures are reviewed for conflicts of interest by the editorial group. When found, these are addressed by vetting through a multi-level review process, and through requirements for references to be provided to support the content. Appropriately referenced content is required of all authors and must conform to UpToDate standards of evidence.

Conflict of interest policy

→