

Management of Endometriosis Involving the Urinary Tract

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Semin Reprod Med 2017;35:81–87

Abstract

Endometriosis is a common cause of infertility and disabling pelvic pain in reproductive age women. The most widely accepted theory of its pathogenesis is the retrograde flow of menstrual products, although extra-abdominal and extrapelvic diagnoses have been made. After the pelvic peritoneum and gynecologic structures, the most commonly affected sites are the lower gastrointestinal and urinary tracts. When the urinary tract is involved, the bladder is the predominant site, followed by the ureters. The focus of this seminar will thus be these two anatomic sites. Delayed diagnosis is unfortunately common for endometriosis as a whole, but more so when extrapelvic sites are involved. While the first-line therapy for endometriosis is medical management, urinary tract involvement often represents advanced stage of the disease, thereby requiring surgical intervention. With timely diagnosis and intervention by skilled gynecologic or urologic surgeons, favorable outcomes can be attained.

Keywords

- ▶ urinary tract
- ▶ endometriosis
- ▶ ureter
- ▶ bladder

The presence of endometrial glands and stroma outside the uterus is defined as endometriosis. Endometriosis involving the urinary tract constitutes a small proportion of the overall surgically diagnosed endometriosis, approximately 1 to 2%.^{1–4} While renal and urethral endometriosis are extremely rare presentations of the disease, the urinary bladder is preferentially affected, at a rate of 84%, followed by the ureter at 15%.⁴ Like other sites, involvement can be limited to the peritoneal surfaces or extend deeper than 5 mm into muscularis, that is, deep infiltrating endometriosis.⁵ Although part of the same system, it has been shown that bladder and ureteral endometriosis occur independently.⁶

Patient Presentation

Bladder Endometriosis

Bladder endometriosis is usually symptomatic; however, the symptoms are not specific. Majority of patients will present with typical pain symptoms associated with endometriosis such as dysmenorrhea, dyspareunia, chronic pelvic pain, suprapubic pain, and dysuria.⁷ Urinary symptoms in women with pelvic pain have been shown to correlate with patholog-

ic diagnosis of bladder endometriosis.^{6–8} The frequency of gross hematuria varies from none in some studies up to 19% in others.^{6,7} Absence of microbiologic evidence of urinary infection in a woman with pelvic pain and known or suspected endometriosis should trigger a workup for potential bladder endometriosis, especially if these symptoms have some cyclical disposition.⁹

Ureteral Endometriosis

As ureteral and bladder endometriosis are reported to be uncorrelated, the lower urinary tract symptoms accompanying bladder endometriosis is not a surrogate for ureteral disease. Endometriosis involving the ureter has been described as either extrinsic (80%), which is involvement of the overlying adventitia and submucosa causing external compression, or intrinsic (20%), with muscularis layer involvement.¹⁰ Ureteral involvement is often encountered incidentally during laparoscopy for extensive endometriosis. In the setting of extensive pelvic endometriosis, the left ureter is preferentially affected compared with the right.^{11,12} The distal third of the ureter is more often affected, a distribution thought to be secondary to its relation to the uterosacral

ligaments, a very common site for pelvic endometriosis.⁴ Donnez et al noted that 11.3% of women with rectovaginal nodules measuring greater than 3 cm in size had ureteral endometriosis.¹³ Unilateral or bilateral ureteral obstructions due to endometriosis have been reported, presenting with acute kidney injury or reversible hypertension.^{14,15} Otherwise unexplained ureteral obstruction in a premenopausal woman particularly with chronic pain should raise the suspicion for ureteral involvement. In a patient with chronic pelvic pain and suspected or known endometriosis that presents with cyclic hematuria without bladder symptoms, ureteral luminal involvement should be suspected once thorough evaluation for malignancy has been performed.

Diagnosis

The definitive diagnosis of urinary tract endometriosis is made the same way as other cases of endometriosis, which is with laparoscopy and tissue confirmation. Delayed diagnosis is often the rule rather than exception in endometriosis generally, with a range of 6 to 11 years from symptoms to diagnosis.^{16,17} The incidence of asymptomatic bladder endometriosis is difficult to ascertain, but it is not uncommon to identify superficial bladder peritoneal endometriosis during laparoscopy in patients without overt urinary symptoms. While a thorough and focused physical exam can identify ovarian cysts, rectal nodules, or rectovaginal nodules in endometriosis affecting other pelvic structures, physical exam is largely ineffective in identifying urinary tract endometriosis.

For women presenting with typical symptoms of endometriosis with or without urinary symptoms, the first diagnostic imaging modality is usually a pelvic ultrasound. Even with the suspicion of extensive endometriosis, pelvic ultrasound remains a cornerstone of initial patient workup.^{18,19} Guerriero et al performed a systematic review and meta-analysis on the accuracy of ultrasound in detecting deep endometriosis in the uterosacral ligaments, rectovaginal septum, vagina, and bladder. Ultrasound had a pooled sensitivity of 62% (95% CI: 40–80%) and pooled specificity of 100% (95% CI: 97–100%). A testament to the difficulty in accurately predicting bladder involvement and the rarity of this subgroup, the pretest probability of having bladder endometriosis based on symptoms was 5%. This increased to 92% when lesions suggestive of bladder endometriosis were noted on ultrasound.²⁰

Along with conventional two-dimensional (2D) ultrasound, 3D ultrasound and magnetic resonance imaging have been added to the diagnostic armamentarium over time. Several studies have compared these imaging modalities in the aim of determining the optimal noninvasive method for diagnosis.^{21–24} Unlike rectovaginal or rectal deep infiltrative endometriosis, there is a lack of consensus in the ideal imaging technique for evaluating bladder endometriosis, with some studies demonstrating advantages with ultrasound, some showing benefits of MRI, and others yet showing similar diagnostic accuracy.

For patients with pelvic pain and urinary symptoms, a urinalysis is often part of the initial evaluation, more so to rule out urinary tract infections. Indeed, many such patients will often report several negative urinalyses and it is not

uncommon to have been treated empirically for urinary tract infections. Cystoscopic evaluation of the bladder can be performed to evaluate for visible intravesical lesions that can then be biopsied, especially to rule out malignancy. It should be noted that negative biopsies do not necessarily rule out the diagnosis of endometriosis.²⁵ Cystoscopy is also used to assess and exclude painful bladder conditions such as interstitial cystitis.²⁶

Ureteral involvement with endometriosis can often be silent in its presentation, with hydronephrosis incidentally noted on preliminary imaging. Such finding in this patient population, with or without complaint of flank pain, should trigger evaluation of the renal function. Further imaging methods to define the nature of the ureteral obstruction include renal ultrasound, CT scan, and MRI. Advances in technology means that these have mainly supplanted other imaging studies such as retrograde pyelogram and intravenous urogram.^{27–29} With the capability to fully assess the genitourinary tracts, the detail offered by MRI makes it the most common imaging modality obtained for comprehensively assessing the urinary tract for endometriosis (► Fig. 1).

Management

There is a dearth of optimal evidence-based guidance in the preferred management of urinary tract endometriosis, without a clear consensus.³⁰ The breath of options for managing endometriosis generally is the same for urinary endometriosis, namely, medical with hormonal suppression and surgical. Data available

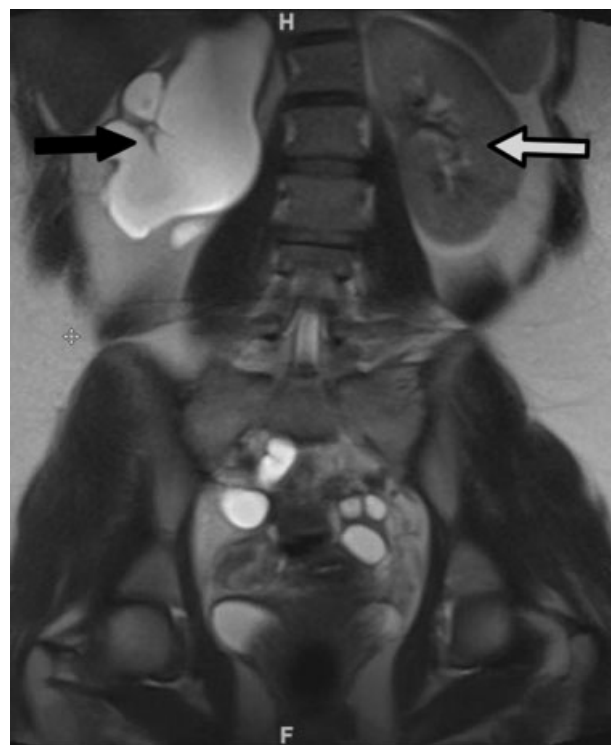


Fig. 1 Right hydronephrosis. MRI of a significantly dilated right collecting system (black arrow) secondary to distal ureteral endometriotic obstructive lesion. No renal tissue is identifiable on the right. Normal appearing left kidney (white arrow).

from either management option are usually small case series or cohort studies. Although several groups have reported medical management of urinary tract endometriosis, the vast majority of cases are surgically managed.

Medical Management

The aim of management of ureteral endometriosis is to alleviate the obstruction and reverse renal malfunction or prevent its occurrence. Several groups have reported single to handful patient response to Danazol, Progestin, or gonadotropin-releasing hormone agonist (GnRH-a) therapy for relieving ureteral obstruction in biopsy-proven endometriosis.^{31–37} GnRH-a was used in subset of patients to reduce lesion size prior to operative management.³⁸ On the other hand, there have also been reports of treatment failure with attempted hormonal management, with persistent radiographic obstruction and renal dysfunction.^{39,40} Likewise, a handful of case reports and series have shown inconsistent benefits of hormonal management of bladder endometriosis.^{41–43} The lack of efficacy of medical management may, in part, be due to the extensive amount of

fibrosis that has developed over the course of several years. As most available description of urinary tract endometriosis management is surgical, most authorities will recommend surgery especially with signs of renal dysfunction.

Surgical Management

When ureteral endometriosis is diagnosed preoperatively or encountered incidentally intraoperatively, surgical resection should be performed to alleviate or prevent obstruction. Ureteral endometriosis most commonly involves the lower third of the ureter. With the majority of ureteral lesions classified as extrinsic, studies have evaluated the utility of relieving the external compression by ureterolysis, without disrupting the integrity of the ureter.^{2,13,44,45} Extrinsic ureteral endometriosis is considered to be mainly secondary to fibrosis and scarring. These studies demonstrate a high success rate with ureterolysis and it is the preferred and recommended surgical approach for extrinsic ureteral endometriosis. With a postoperative follow-up period ranging from 6 to 54 months, only two studies showed recurrence rates, 33 and 7%.^{2,45}

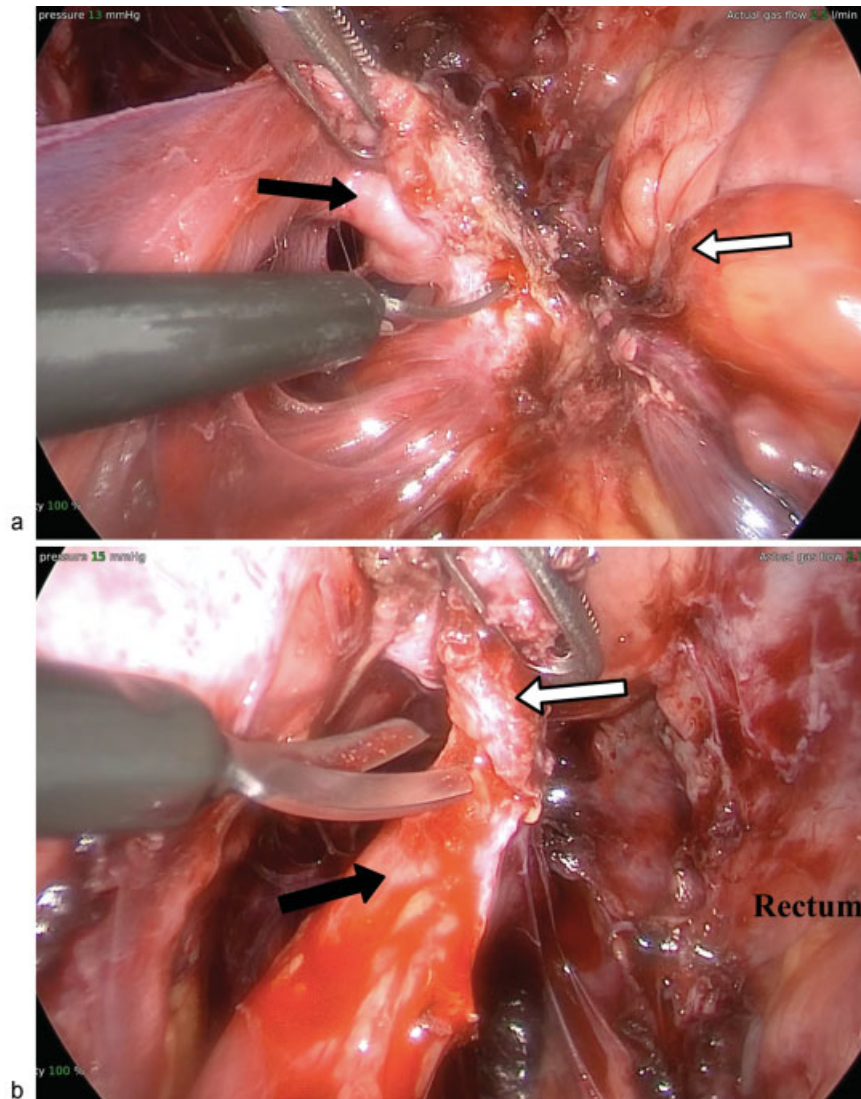


Fig. 2 (a) Left ureterolysis. Adhesiolysis of the left ureter (black arrow). The rectum is adherent to the ureter (white arrow). (b) Left ureterolysis. Left ureter (black arrow). Extrinsic endometriotic nodule/fibrosis (white arrow).

For ureteral lesions causing complete ureteral obstruction, segmental resection is required. Soriano et al advocated for a multidisciplinary team when performing extensive ureteral endometriosis.⁴⁶ In their prospective trial of 45 women undergoing surgery specifically to address endometriosis involving the ureter, 4 patients required segmental resection. The lesions were all confined to the lower third of the ureter and thus reimplantation was performed. In the event of undue stretch or tension on the reimplantation, laparoscopic psoas hitch procedure has been performed. When the mid-ureter is involved, resection followed by end-to-end anastomosis is performed.⁴⁷

The technique for resection of ureteral endometriosis depends on the segment of ureter involved as well as the amount of compression or obstruction caused. The surgeon

should be adequately skilled in extensive dissection of the pelvis and have superb knowledge of anatomy. Consultation with a urologic surgeon should be sought if needed.

The ureter is identified at the pelvic brim where it is typically uninvolved. Ureteral stents can be placed prior to commencing with surgery, especially if segmental resection is anticipated. The overlying peritoneum is incised and the course of the ureter is followed and delineated until it passes beneath the ipsilateral uterine artery. With extrinsic ureteral endometriosis, the preference and lower morbidity procedure is ureterolysis and removal of the encasing fibrotic tissue (→ Fig. 2a, b). Care must be taken to avoid devascularization of the ureter, which can lead to delayed defect or fistula formation.

If a segmental resection is to be performed, a stent should be in place. After examination of the extent of involvement

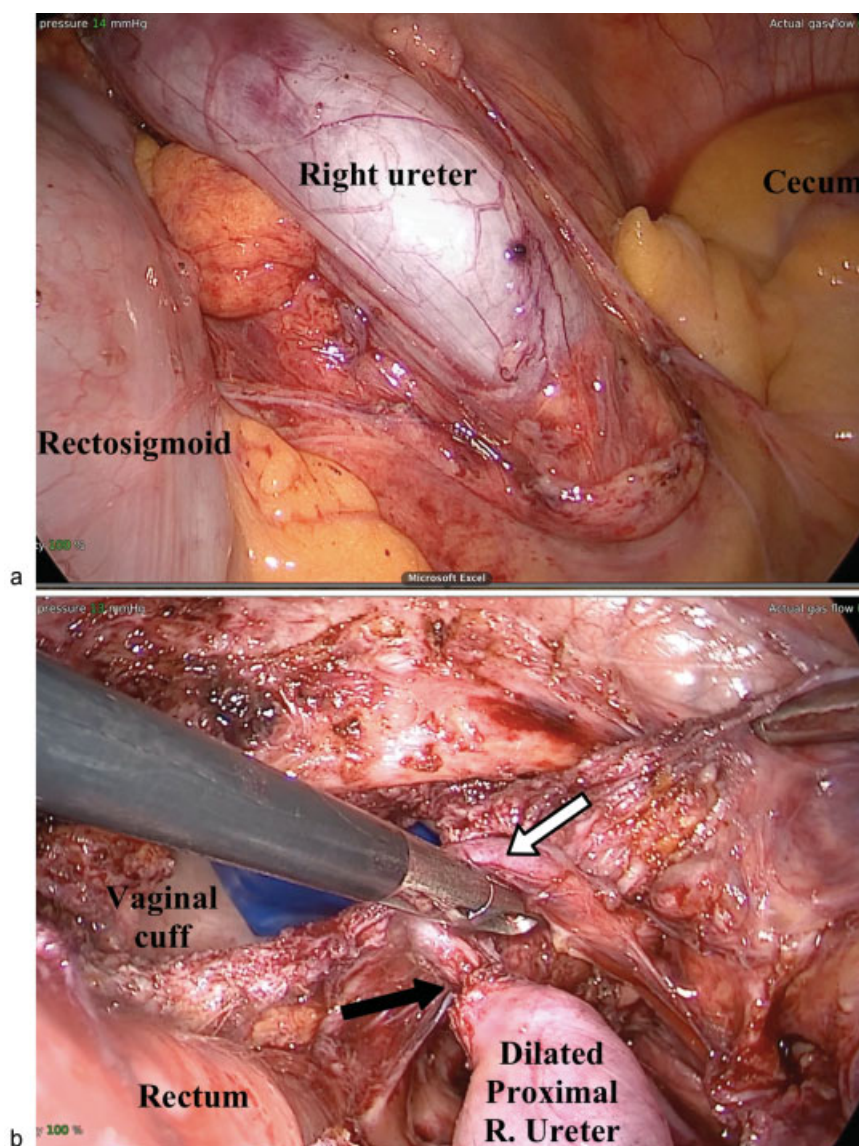


Fig. 3 (a) Dilated proximal right ureter at the pelvic brim. (b) Dilated proximal right ureter at the pelvic brim. Stricture/occlusion (black arrow). Normal caliber distal ureter (white arrow). Vaginal cuff shown with blue glove for temporary pneumo-occlusion. (c) Dilated stented right ureter. Intraoperative cystoscopy with stent placement (right image). The left image shows the dilated right ureter with the outline of the stent (arrows). (d) Anastomosis. Repaired right ureter with suture line (black arrow), proximal ureter (long white arrow), and distal ureter (short white arrow).

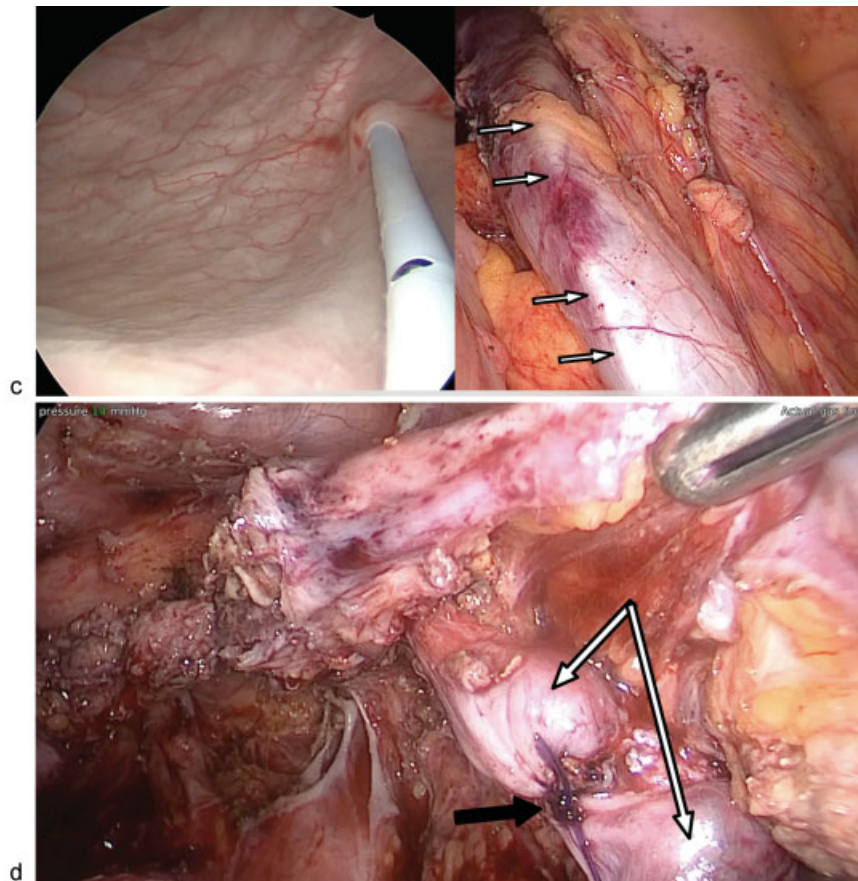


Fig. 3 (Continued)

intraoperatively, one should ascertain if the repair will be primary end-to-end (ureteroureterostomy) anastomosis or reimplantation. A ureterolysis is performed in the same manner as described earlier. To minimize thermal injury, cold scissors rather than an energy source should be used to resect the abnormal segment. The ureteral end is spatulated and the anastomosis is then performed with interrupted 4-0 polydioxanone sutures circumferentially at 3, 6, 9, and 12 o'clock positions^{48,49} (→ Fig. 3a-d). If ureteral involvement is occurring in the distal third, reimplantation of the ureter into a new site in the anterior wall of the bladder is often required, as it is difficult to adequately mobilize the two ends of the ureter in this location. Once the abnormal segment is excised, the ureteral end is spatulated. With cystoscopic guidance, a cystotomy is made for the future anastomotic site of the ureteroneocystostomy. A guide-wire is passed from the bladder into the ureter. The reimplantation is then performed with four to five interrupted 4-0 polydioxanone sutures circumferentially. The bladder is backfilled to assess for leakage at the anastomotic site. A double J ureteral stent is left in place for up to 6 to 8 weeks. A psoas hitch can be performed if undue tension is noted with the anastomosis.^{47,49,50}

Management of bladder endometriosis can be approached cystoscopically, laparoscopically, or combined. In patients with typical endometriosis symptoms also presenting with urinary symptoms, especially in the setting of negative workup for urinary tract infections, cystoscopy is a recom-

mended part of the evaluation. Any lesions noted should be biopsied to rule out malignancy. Laparoscopic partial cystectomy for treatment of bladder endometriosis has been described by various groups.⁵¹⁻⁵⁶ In one of the larger series, Seracchioli et al reported on 74 cases of laparoscopically managed urinary tract endometriosis.⁵⁶ Forty-one of these patients had bladder involvement, with the lesions occurring at the base of the bladder in 18/41 (43.9%) and 23/41 (56.1%) occurring at the dome. All patients underwent a laparoscopic partial cystectomy, with pathologic confirmation of endometriosis in all resected specimens. No bladder endometriosis recurred in the mean follow-up period of 55 months.

The techniques for excision of bladder endometriotic lesions have been well described. If a lesion is confined to the serosal and muscularis layers without compromise of the bladder mucosa, a cystoscopic-assisted laparoscopic excision can be performed without entering the bladder.⁵² For partial cystectomy, the lesion is resected with the goal of negative margins by visual inspection. The defect is then closed either in one or two layers and a catheter is left in place for up to 2 weeks.^{50,56} Care must be taken that the repair is watertight at the end of the surgery. If the bladder lesion extends to the trigonal area, stents are required and in very rare cases, ureteral reimplantation is required as well.

Endometriosis involving the urinary tract is exceedingly rare. With the possibility of obstruction and subsequent renal dysfunction and nonfunctioning kidney, patients must be thoroughly

evaluated to avoid such often-preventable sequelae. Although medical management has been utilized, surgical excision remains the mainstay of treatment and appears to have favorable effect.

References

- 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;34:43–63
- 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(6):1093–1097, discussion 1097–1098
- Nezhat C, Nezhat F, Nezhat CH, Nasserbakht F, Rosati M, Seidman DS. Urinary tract endometriosis treated by laparoscopy. *Fertil Steril* 1996;66(6):920–924
- Shook TE, Nyberg LM. Endometriosis of the urinary tract. *Urology* 1988;31(1):1–6
- Koninckx PR, Meuleman C, Demeyere S, Lesaffre E, Cornillie FJ. Suggestive evidence that pelvic endometriosis is a progressive disease, whereas deeply infiltrating endometriosis is associated with pelvic pain. *Fertil Steril* 1991;55(4):759–765
- Abrao MS, Dias JA Jr, Bellelis P, Podgaec S, Bautzer CR, Gromatsky C. Endometriosis of the ureter and bladder are not associated diseases. *Fertil Steril* 2009;91(5):1662–1667
- Knabben L, Imboden S, Fellmann B, Nirgianakis K, Kuhn A, Mueller MD. Urinary tract endometriosis in patients with deep infiltrating endometriosis: prevalence, symptoms, management, and proposal for a new clinical classification. *Fertil Steril* 2015;103(1):147–152
- Fauconnier A, Chapron C, Dubuisson JB, Vieira M, Dousset B, Bréart G. Relation between pain symptoms and the anatomic location of deep infiltrating endometriosis. *Fertil Steril* 2002;78(4):719–726
- Akpınar S, Yılmaz G, Çelebioğlu E. A rare cyclic recurrent hematuria case; bladder endometriosis. *Quant Imaging Med Surg* 2015; 5(3):485–487
- Clement P. Disease of the peritoneum. In: Kurman R, ed. *Blaustein's Pathology of the Female Genital Tract*. New York: Springer Verlag; 1994:647–703
- Yohannes P. Ureteral endometriosis. *J Urol* 2003;170(1):20–25
- Vercellini P, Pisacreta A, Pesole A, Vicentini S, Stellato G, Crosignani PG. Is ureteral endometriosis an asymmetric disease? *BJOG* 2000; 107(4):559–561
- Donnez J, Nisolle M, Squifflet J. Ureteral endometriosis: a complication of rectovaginal endometriotic (adenomyotic) nodules. *Fertil Steril* 2002;77(1):32–37
- Ponticelli C, Graziani G, Montanari E. Ureteral endometriosis: a rare and underdiagnosed cause of kidney dysfunction. *Nephron Clin Pract* 2010;114(2):c89–c93
- Khong SY, Lam A, Coombes G, Ford S. Surgical management of recurrent ureteric endometriosis causing recurrent hypertension in a postmenopausal woman. *J Minim Invasive Gynecol* 2010; 17(1):100–103
- Husby GK, Haugen RS, Moen MH. Diagnostic delay in women with pain and endometriosis. *Acta Obstet Gynecol Scand* 2003;82(7): 649–653
- Hadfield R, Mardon H, Barlow D, Kennedy S. Delay in the diagnosis of endometriosis: a survey of women from the USA and the UK. *Hum Reprod* 1996;11(4):878–880
- Piketty M, Chopin N, Dousset B, et al. Preoperative work-up for patients with deeply infiltrating endometriosis: transvaginal ultrasonography must definitely be the first-line imaging examination. *Hum Reprod* 2009;24(3):602–607
- Benacerraf BR, Groszmann Y. Sonography should be the first imaging examination done to evaluate patients with suspected endometriosis. *J Ultrasound Med* 2012;31(4):651–653
- Guerriero S, Ajossa S, Minguez JA, et al. Accuracy of transvaginal ultrasound for diagnosis of deep endometriosis in uterosacral ligaments, rectovaginal septum, vagina and bladder: systematic review and meta-analysis. *Ultrasound Obstet Gynecol* 2015;46(5): 534–545
- Fedele L, Bianchi S, Raffaelli R, Portuese A. Pre-operative assessment of bladder endometriosis. *Hum Reprod* 1997;12(11): 2519–2522
- Balleyguier C, Chapron C, Dubuisson JB, et al. Comparison of magnetic resonance imaging and transvaginal ultrasonography in diagnosing bladder endometriosis. *J Am Assoc Gynecol Laparosc* 2002;9(1):15–23
- Thonnon C, Philip CA, Fassi-Fehri H, et al. Three-dimensional ultrasound in the management of bladder endometriosis. *J Minim Invasive Gynecol* 2015;22(3):403–409
- 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(6):716–725
- Vercellini P, Meschia M, De Giorgi O, Panazza S, Cortesi I, Crosignani PG. Bladder detrusor endometriosis: clinical and pathogenetic implications. *J Urol* 1996;155(1):84–86
- Sircus SI, Sant GR, Ucci AA Jr. Bladder detrusor endometriosis mimicking interstitial cystitis. *Urology* 1988;32(4):339–342
- Nasu K, Narahara H, Hayata T, et al. Ureteral obstruction caused by endometriosis. *Gynecol Obstet Invest* 1995;40(3):215–216
- Pollack HM, Wills JS. Radiographic features of ureteral endometriosis. *AJR Am J Roentgenol* 1978;131(4):627–631
- Watanabe Y, Ozawa H, Uematsu K, Kawasaki K, Nishi H, Kobashi Y. Hydronephrosis due to ureteral endometriosis treated by transperitoneal laparoscopic ureterolysis. *Int J Urol* 2004;11(7):560–562
- Ghezzi F, Cromi A, Bergamini V, Bolis P. Management of ureteral endometriosis: areas of controversy. *Curr Opin Obstet Gynecol* 2007;19(4):319–324
- Klein RS, Cattolica EV. Ureteral endometriosis. *Urology* 1979; 13(5):477–482
- Lavelle KJ, Melman AW, Cleary RE. Ureteral obstruction owing to endometriosis: reversal with synthetic progestin. *J Urol* 1976; 116(5):665–666
- Gantt PA, Hunt JB, McDonough PG. Progestin reversal of ureteral endometriosis. *Obstet Gynecol* 1981;57(5):665–667
- Vilos GA, Marks-Adams JL, Vilos AG, Oraif A, Abu-Rafea B, Casper RF. Medical treatment of ureteral obstruction associated with ovarian remnants and/or endometriosis: report of three cases and review of the literature. *J Minim Invasive Gynecol* 2015;22(3): 462–468
- Gardner B, Whitaker RH. The use of danazol for ureteral obstruction caused by endometriosis. *J Urol* 1981;125(1):117–118
- Matsuura K, Kawasaki N, Oka M, Ii H, Maeyama M. Treatment with danazol of ureteral obstruction caused by endometriosis. *Acta Obstet Gynecol Scand* 1985;64(4):339–343
- Rivlin ME, Krueger RP, Wiser WL. Danazol in the management of ureteral obstruction secondary to endometriosis. *Fertil Steril* 1985;44(2):274–276
- Donnez J, Spada F, Squifflet J, Nisolle M. Bladder endometriosis must be considered as bladder adenomyosis. *Fertil Steril* 2000; 74(6):1175–1181
- Bohrer J, Chen CC, Falcone T. Persistent bilateral ureteral obstruction secondary to endometriosis despite treatment with an aromatase inhibitor. *Fertil Steril* 2008;90(5):2004.e7–2004.e9
- Jepsen JM, Hansen KB. Danazol in the treatment of ureteral endometriosis. *J Urol* 1988;139(5):1045–1046
- Price DT, Maloney KE, Ibrahim GK, Cundiff GW, Leder RA, Anderson EE. Vesical endometriosis: report of two cases and review of the literature. *Urology* 1996;48(4):639–643
- Efe E, Bakacak M, Serin S, Kolus E, Ercan O, Resim S. Hormonal treatment for severe hydronephrosis caused by bladder endometriosis. *Case Rep Urol* 2014;2014:891295
- Westney OL, Amundsen CL, McGuire EJ. Bladder endometriosis: conservative management. *J Urol* 2000;163(6):1814–1817

- 44 Camanni M, Bonino L, Delpiano EM, et al. Laparoscopic conservative management of ureteral endometriosis: a survey of eighty patients submitted to ureterolysis. *Reprod Biol Endocrinol* 2009;7:109
- 45 Frenna V, Santos L, Ohana E, Bailey C, Wattiez A. Laparoscopic management of ureteral endometriosis: our experience. *J Minim Invasive Gynecol* 2007;14(2):169–171
- 46 Soriano D, Schonman R, Nadu A, et al. Multidisciplinary team approach to management of severe endometriosis affecting the ureter: long-term outcome data and treatment algorithm. *J Minim Invasive Gynecol* 2011;18(4):483–488
- 47 Nezhat CH, Malik S, Nezhat F, Nezhat C. Laparoscopic ureteroneocystostomy and vesicopsoas hitch for infiltrative endometriosis. *JLS* 2004;8(1):3–7
- 48 Mereu L, Gagliardi ML, Clarizia R, Mainardi P, Landi S, Minelli L. Laparoscopic management of ureteral endometriosis in case of moderate-severe hydronephrosis. *Fertil Steril* 2010;93(1):46–51
- 49 Scioscia M, Molon A, Grosso G, Minelli L. Laparoscopic management of ureteral endometriosis. *Curr Opin Obstet Gynecol* 2009;21(4):325–328
- 50 Nezhat CH, Nezhat FR, Freiha F, Nezhat CR. Laparoscopic vesicopsoas hitch for infiltrative ureteral endometriosis. *Fertil Steril* 1999;71(2):376–379
- 51 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(4):884–889
- 52 Seracchioli R, Mannini D, Colombo FM, Vianello F, Reggiani A, Venturoli S. Cystoscopy-assisted laparoscopic resection of extramucosal bladder endometriosis. *J Endourol* 2002;16(9):663–666
- 53 Vitagliano G, Villetta M, Castillo O. Laparoscopic partial cystectomy in the management of bladder endometriosis: report of two cases. *J Endourol* 2006;20(12):1072–1074
- 54 Litta P, Saccardi C, D'Agostino G, Florio P, De Zorzi L, Bianco MD. Combined transurethral approach with Versapoint(®) and laparoscopic treatment in the management of bladder endometriosis: technique and 12 months follow-up. *Surg Endosc* 2012;26(9):2446–2450
- 55 Nezhat CH, Malik S, Osias J, Nezhat F, Nezhat C. Laparoscopic management of 15 patients with infiltrating endometriosis of the bladder and a case of primary intravesical endometrioid adenocarcinoma. *Fertil Steril* 2002;78(4):872–875
- 56 Seracchioli R, Mabrouk M, Montanari G, Manuzzi L, Concetti S, Venturoli S. Conservative laparoscopic management of urinary tract endometriosis (UTE): surgical outcome and long-term follow-up. *Fertil Steril* 2010;94(3):856–861