

Silent Loss of Kidney Secondary to Ureteral Endometriosis

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ABSTRACT

Background: Ureteral endometriosis is a serious localization of disease burden that can lead to urinary tract obstruction, with subsequent hydronephrosis, hydronephrosis, and potential kidney loss. Diagnosis is elusive and relies heavily on clinical suspicion as ureteral endometriosis can occur with both minimal and extensive disease. Surgical technique to treatment varies, but the goal is to salvage renal function and decrease disease burden.

Case Descriptions: We describe 3 cases in which there was documentation of renal atrophy and function loss with subsequent workup and surgical intervention.

Results: The cases illustrate varying surgical approaches tailored to localization of ureteral endometriosis. All cases were carried out laparoscopically.

Conclusion: Ureteral endometriosis, albeit rare, can be complicated by potential loss of renal function. Clinical suspicion and preoperative assessment may help with diagnosis and allows for a multidisciplinary preconsultation. Laparoscopic surgical approach is based on extent of disease and localization and can be carried out successfully in the hands of a highly experienced laparoscopic surgeon.

Key Words: Ureteral endometriosis, Ureterolysis, Ureteroureterostomy, Ureteroneocystotomy, Nephroureterectomy, Endometriosis, Laparoscopic surgery, Robotic Surgery.

INTRODUCTION

Endometriosis is an estrogen-dependent chronic inflammatory condition affecting 6% to 10% of reproductive-aged women.^{1,2} It is characterized by the presence of endometriallike tissue outside the uterine cavity. Three clinically distinct forms exist: peritoneal endometriosis, ovarian endometriosis, and extragenital endometriotic lesions.^{2,3} Common histologic features include endometrial glands and stroma, chronic bleeding, and signs of inflammation. This inflammatory process leads to neurogenesis and angiogenesis with the overall response favoring the survival of endometriotic tissue.² Solitary lesions can occur, but severe disease results in extensive adhesions and distortion of anatomy that leads to pain and infertility.

Although a relatively common gynecologic condition, localization to areas distinct from the peritoneum, ovary, and rectovaginal septum occurs in up to 12% of women with endometriosis.³ Pelvic endometriosis can infrequently involve the urinary tract system in approximately 1% of cases, which is a prevalence of 3.5 million women worldwide.⁴ The bladder is the most commonly involved site and the urethra the least. Of these localizations of disease, ureteral endometriosis accounts for approximately 10% of genitourinary involvement, which is 350,000 women worldwide.^{4,5} In endometriosis, ureteral involvement is often limited to one ureter, commonly the left, and can potentially lead to urinary tract obstruction, ureterohydronephrosis, and loss of renal function. There are estimates that 30% or nearly a 100,000 women with ureteral endometriosis will have 25% to 50% loss of nephrons at time of diagnosis of ureteral endometriosis, and an unknown number will then have loss of the kidney.⁶ This final insult of complete loss of renal function is exceedingly rare.

CASE DESCRIPTIONS

We report our experience with ureteral endometriosis resulting in unilateral renal cortical loss and subsequent varying surgical interventions. Consent was obtained from patients for inclusion in this review.

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Case 1

A 36-y-old para 0 with a long-standing history of hypertension and infertility underwent an exploratory laparotomy at another institution, which revealed extensive endometriosis that was deemed unresectable. She was subsequently diagnosed with severe left hydroureter and hydronephrosis secondary to left ureteral obstruction resulting in 15% left renal function. Due to the decreased functionality of the kidney and persistent pain, she was offered a nephrectomy. However, she declined and was treated with left renal stent placement and Lupron.

A year later, an ultrasound revealed a new left adnexal mass. A computed tomography (CT) scan revealed a stable left hydroureter and hydronephrosis with cortical thinning of the left kidney. The ureter was dilated to the pelvic brim. Additionally, there was a heterogeneous area extending from the left pelvic sidewall to the uterus, involving the internal and external iliac vessels. Magnetic resonance imaging (MRI) confirmed the previous imaging results. Furthermore, a concurrent renal ultrasound showed no left ureteral jet.

A couple of months later, placement of another ureteral stent did not improve the left hydronephrosis. The patient presented to our clinic with increasing pain and swelling of the left lower extremity while on heparin treatment, which prompted a laparoscopic treatment of endometriosis. Intraoperatively, there was evidence of extensive endometriosis, involving the left common iliac, internal iliac, external iliac vessels, superior and inferior hypogastric plexus, and narrowing of the distal ureter from extrinsic endometriosis. Careful but complete laparoscopic resection of all visible endometriosis was undertaken with a nephroureterectomy. Such surgical intervention was undertaken in light of her persistent pain, recurrent urinary tract infections, and the unlikelihood that any intervention could result in restored left renal function. Pathology showed widespread endometriosis and chronic obstructive pyelonephritis of the left kidney. She recovered well and spontaneously conceived and delivered after this surgical intervention.

Case 2

A 35-y-old para 1 with a history of an abdominal myomectomy, a laparoscopic treatment of endometriosis, and a cesarean delivery presented to us with persistent pelvic pain refractory to medical treatment. Abdominal and pelvic CT revealed prominent right hydronephrosis. Renal ultrasound showed right renal cortical thinning and functionality of only 21% in the right and 71% in the left

kidney. A confirmatory CT scan revealed similar right hydronephrosis and hydroureter with obstruction of the right ureter and atrophy of the right kidney, likely from chronic obstruction. A right ureteral stent was placed by urology without subsequent improvement of obstruction on renal scan and the recommendation was for resection of the obstructed ureter to salvage the kidney.

Operative laparoscopy revealed deep infiltrative disease of both the right and left hemipelvis, complete obstruction of the right ureter, and the left ureter encircled with fibrosis and endometriosis. A right ureteroneocystostomy and extensive left ureterolysis was performed.

Pathology was consistent with intrinsic endometriosis of the right ureter. The patient had an uneventful postoperative course.

Case 3

A 30-y old para 0 presented with pelvic pain, menorrhagia, and infertility. Earlier in the year, she had an abdominal CT that showed left hydroureter, and chronic left renal obstruction with renal atrophy most likely secondary to distal obstruction from endometriosis.

The patient underwent an operative laparoscopy that revealed a pelvis completely obliterated with adhesions and endometriosis. The left ureter was entirely encased in fibrosis and endometriosis, and a cystoscopy confirmed the absence of a left ureteral jet. Additionally, a large rectosigmoid endometriotic lesion located 10cm from the anal verge was observed. Extensive lysis of adhesions, treatment of endometriosis, left ureterolysis, and resection of a 5-cm rectosigmoid endometriotic lesion was performed. The kidney was not resected because it appeared that relief of the extensive pelvic disease would allow for amelioration of constriction. Pathology was consistent with endometriosis, and the patient recovered well.

DISCUSSION

Although endometriosis was described as early as 1690 by Shroen, a German physician, and a year later, Ruysch, a Dutch anatomist, proposed an early version of retrograde menstruation, its pathogenesis remains elusive.⁷ After modifications of the 17th century hypothesis by Sampson in the 1920s, the theory of retrograde menstrual endometrium implanting on peritoneal surfaces and persisting is a plausible explanation for most lesions and is most widely accepted.⁸ However, it does not address that most women have an element of retrograde menstruation, but only a limited number of them will have endometriosis. Coelo-

mic metaplasia has been shown to be an alternative theory with the differentiation of mesothelial cells into endometriumlike tissue.⁹ Additionally, lymphatic and venous spread is proposed to potentially fill the gaps of ectopic endometrium.¹⁰ Where these theories have failed, stem cells have been linked to the pathogenesis of disease.¹¹ None of the proposed theories independently elucidate the exact mechanism of development of endometriosis.

Ureteral endometriosis is a serious localization of disease burden. Asymmetric involvement of endometriosis, with the left pelvis more commonly involved than the right, is readily explained by anatomic differences of the pelvis.¹² The distal segment of the ureters and bladder are the more frequently involved locations due to the proximity of the reproductive organs.¹³ Additionally, ureteral endometriosis is more likely to be associated with rectosigmoid lesions as opposed to bladder involvement.¹⁴ Two major pathological types exist: extrinsic and intrinsic ureteral endometriosis. In the extrinsic type, which is the most common, endometrial glandular and stromal tissue involve only the adventitia of the ureter or surrounding connective tissues, whereas the intrinsic type involves the muscularis propria, lamina propria, or ureteral lumen.¹⁵

Ureteral involvement can potentially lead to urinary tract obstruction with subsequent hydronephrosis and hydronephrosis. These sequelae can occur in both minimal and extensive disease. It has been reported that as many as 25% to 50% of nephrons are lost when there is evidence of ureteral endometriosis, and 30% of patients will have reduced kidney function at the time of diagnosis that may result in silent kidney loss.⁶ Case 2 is the only case where there was evidence of intrinsic endometriosis. The other 2 cases were consistent with extrinsic endometriosis. None of our patients had a change in their creatinine, because there was one fully functioning kidney remaining.

Overall an uncommon pathologic finding, ureteral endometriosis can be a silent cause of unilateral or bilateral renal atrophy in an undefined number of patients. The clinical manifestations of genitourinary endometriosis are quite variable. Progressive ureteral obstruction can be insidious and can ultimately lead to renal failure if there is bilateral compromise. However, in most instances the disease is clinically silent.¹⁶ One-third of patients will have nonspecific symptoms consistent with pelvic endometriosis, and some patients will have symptoms of urgency, frequency, suprapubic and flank pain, hematuria, and dysuria.^{17–20} Specific genitourinary symptoms, as listed previously, in most instances, are related to endometriosis of the bladder and are seldom seen with ureteral involve-

ment, thus making the diagnosis difficult. Cases 1, 2, and 3 did not have any genitourinary symptoms. However, all 3 cases had symptoms of pelvic pain, dysmenorrhea, and vague back pain.

Diagnosis of genitourinary endometriosis relies heavily on clinical suspicion. As noted previously, ureteral endometriosis occurs in conjunction with pelvic endometriosis; thus, symptoms consistent with pelvic endometriosis may aid in the differential diagnosis. However, this diagnosis is extremely elusive. With the potential of silent loss of kidney function, clinical suspicion may prompt preoperative investigation in patients in which there is a high likelihood of genitourinary endometriosis, either based on symptoms or severity of disease. Additionally, ureteral involvement should be kept in mind when the uterosacral ligaments are clinically involved. We recommend that when there is evidence of infiltrative endometriosis that imaging be used, either pelvic ultrasound, intravenous pyelography, ureteroscopy, CT, or MRI to facilitate diagnosis.^{20,21} However, preoperative diagnosis is difficult, and ultimately, final diagnosis requires demonstration of deeply infiltrative disease on laparoscopy or endometrial tissue on a pathology specimen. It is clear that there are multiple imaging modalities utilized and each giving varying information. Intravenous urography and CT scan are often used for their ability to localize laterality and level of ureteral constriction. Ureteroscopy is important in the diagnosis of intrinsic endometriosis. Magnetic resonance imaging has the ability to differentiate between intrinsic and extrinsic forms of ureteral endometriosis and has high specificity for bladder and renal lesions.²² Laparoscopy and cystoscopy allow for direct visualization and then potential treatment.²³

The best treatment approach for ureteral endometriosis is still contentious. Treatment is generally aimed at relieving symptoms and ureteral obstruction and rescuing the involved kidney. A multidisciplinary team approach, including a skilled, advanced laparoscopic gynecologist, urologist, and colorectal surgeon play key roles in the successful treatment of extensive disease. Although it is true that medical treatment has long been considered the first Step in the management of symptoms, it is expensive, recurrence is high with discontinuation, and the potential risk of renal function loss is an indication for surgical intervention.

Laparoscopy is the gold standard for definitive diagnosis and surgical treatment of endometriosis. The advent of video laparoscopy has changed how endometriosis is approached and treated.^{24,25} Laparoscopy offers many advantages over conventional laparotomy, namely a magnified view of the

pelvis and greater exposure that allows for close examination and visualization of endometriotic implants. Larger implants or deep endometriotic nodules are best treated with resection. Careful destruction of all endometriotic implants is important to prevent recurrence.^{24,26}

Surgical excision of all endometriosis has been proven to be the most effective method for symptom relief, and advanced laparoscopy has replaced laparotomy as the mode of choice.^{24,25,27,28} Surgical interventions for relief of obstructive uropathy include ureterolysis, ureteroureterostomy, distal ureterectomy, and ureteral reimplantation or interposition of ileal segment between the ureter and bladder.^{20,28} Nephroureterectomy is a successful treatment alternative in refractory cases. Additionally, this is performed if there are recurrent urinary tract infections or persistent flank pain. All surgical approaches begin with identification of the ureter. Ureterolysis is carried out starting proximal to the diseased area, at a level of healthy tissue unaffected by endometriosis. Careful dissection proceeds down to the level of damage. A decision is made at this point, based on extent and localization of disease, as to whether ureterolysis will be adequate to relieve obstruction. Ureterolysis is often acceptable in cases of extrinsic, nonobstructive disease.^{20,23,28–30} Additionally, instruments are used to appreciate the consistency of any endometriosis surrounding the ureters. It is not easy at the time of surgery to differentiate intrinsic extrinsic disease. However, any evidence of obstruction will dictate surgical intervention. Highlighting the importance of preoperative imaging that can delineate stenosis, or if an MRI image is attained, actual differentiation between extrinsic and intrinsic is made. Often if stenosis is noted only at the time of surgery, and there is a question of whether the process is intrinsic or debate ensues as to conservative excisional procedure, a ureteroscopy can be performed. However, if there is any evidence of obstruction, then an excisional procedure should be done regardless.³¹ If stenosis is evident but limited to the ovarian fossa and distal ureter can be preserved, then ureteral resection and end-to-end anastomosis can be performed over a ureteral stent.^{16,20,23,28,32,33} Surgical approach is changed if the ureteral stenosis is close to the vesicoureteral junction and is extensive. The ureter is resected before the area of disease, and the proximal end is reimplanted into the bladder.^{20,23,28,29,34,35} Our cases showcase 3 different surgical management options for treatment of ureteral endometriosis. In case 1, the decision was made in a multidisciplinary setting for a nephroureterectomy based on the patient's persistent symptoms and unlikelihood that the kidney could be salvaged. In case 2, the only case with intrinsic ureteral endometri-

osis, a right ureteral resection and ureteroneocystostomy was performed secondary to the distal location of diseased ureteral segment. In this case, it was thought that if the obstruction could be ameliorated, then renal function would be restored. In the final case, extensive ureterolysis was performed, along with a rectosigmoid resection of a 5-cm endometriotic lesion, in order to completely resect all endometriotic implants to decrease disease burden. These cases illustrate that the approach to this rare form of the disease is multifaceted. Surgery is tailored to the specifics of localization of the disease and also the likelihood of recovery of renal function.

CONCLUSION

Endometriosis is a progressive and elusive disease. The key to treatment rests with recognition of symptoms and directed intervention. Ureteral endometriosis, albeit rare, is further complicated by the potential to result in renal atrophy and functional loss. Preoperative assessment with a thorough history, physical examination, and imaging can potentially help in the diagnosis. Evidence consistent with involvement of the genitourinary system allows for appropriate preconsultation with urology and colorectal surgeons. However, in the event that a preoperative diagnosis is not made, which is often the case, thorough examination of pelvic pathology should be undertaken along with complete destruction and excision of endometriosis. The surgical approach varies, but the goal is to salvage the renal system and decrease disease burden. In the hands of an experienced, advanced laparoscopic surgeon, ureteral endometriosis can be treated effectively through minimally invasive techniques. The limiting factors in effectively treating even extensive disease is the skill of the surgeon and the availability of proper instrumentation.

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