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Laparoscopic Management of Ureteral Endometriosis: The Stanford University Hospital Experience With 96 Consecutive Cases

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Purpose: We report the clinical characteristics and the principles of laparoscopic management of ureteral endometriosis at our institution.

Materials and Methods: We retrospectively reviewed the charts of patients with ureteral endometriosis.

Results: Preoperatively 97% of patients complained of pain but only a third had urinary symptoms. The left ureter was affected in 64% of cases and disease was bilateral in 10%. Four patients had hydroureter and 2 had hydronephrosis.

Conclusions: To our knowledge this report represents the largest series of laparoscopically treated, pathologically confirmed ureteral endometriotic cases to date. It confirms that laparoscopic diagnosis and management of ureteral endometriosis are safe and efficient. All patients who undergo laparoscopy for endometriosis should be evaluated for possible ureteral involvement regardless of the presence or absence of urinary symptoms, or prior radiological evaluation since undiagnosed ureteral disease may result in loss of renal function.

Key Words: ureter, endometriosis, ureteral obstruction, pain, laparoscopy

URINARY tract involvement occurs in 1% to 2% of women with symptomatic endometriosis.[1] Ureteral involvement occurs in 0.1% to 0.4% of endometriotic cases.[2–5] Most commonly it affects the distal ureter, less commonly the mid ureter and rarely the proximal ureter.[3–5] The ratio of extrinsic to intrinsic involvement is reported to be between 3:1 and 4:1 with the left ureter more commonly involved than the right ureter.[3,4,6] The patient may present with symptoms of renal colic, hematuria or silent urinary obstruction with loss of renal function,[5,7] resulting in subsequent nephrectomy.[8]

MATERIALS AND METHODS

In a retrospective chart review we identified 96 women with ureteral endometriosis between January 2002 and October 2008. The diagnosis of ureteral endometriosis was based on characteristic lesions, as defined in Blaustein's Pathology of the Female Genital Tract,[9] observed during laparoscopy and on histopathological confirmation in pathology reports of resected tissue.

Establishment of pneumoperitoneum and introduction of the trocars, ureterolysis and ureteroneocystostomy were performed in a routine manner, as previously described.[10–13] Figure 1 lists lesions that failed to elevate off the ureteral surface with hydrodissection and were suspicious for deeper involvement. The determination of whether to proceed with conservative techniques (shaving or ablating lesions) as opposed to more aggressive therapy (resection of diseased ureteral segments) was made at primary surgeon discretion. Decisions were based on whether ureteral function appeared com-

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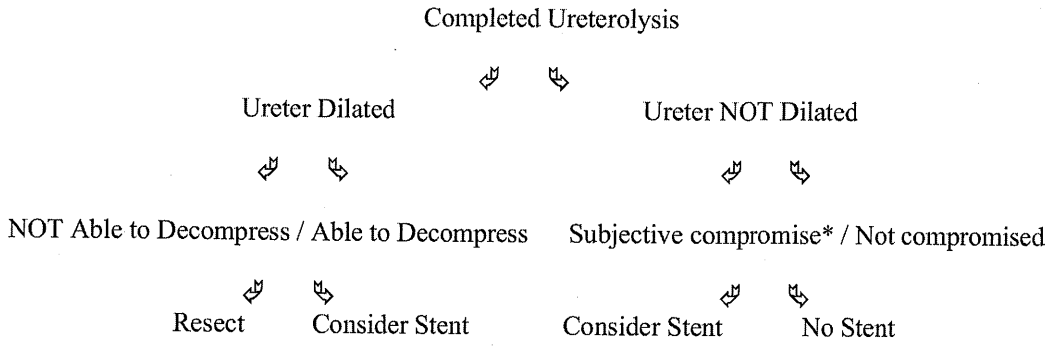

Figure 1. Asterisk indicates evidence of subjective compromise, including dusky ureteral color, poor peristaltic activity and devascularized serosa.

promised. Persistent proximal dilatation with or without visible stricture after ureterolysis suggested ureteral compromise and indicated resection.[11,13]

Resection was required in 2 patients with severe stricture of the distal ureter. Segmental resection was followed by ureteroneocystostomy to reimplant the ureter into the bladder dome. A psoas hitch was added to release tension on the anastomosis.[11,13–15]

RESULTS

The study included 96 patients with surgically diagnosed, histologically confirmed ureteral endometriosis. Median patient age was 34 years (range 19 to 52). Median BMI, which was available in 64% of patients, was 23 kg/m^2 (range 17 to 36). Of the patients 74 (77%) were nulliparous and 45 (47%) had undergone previous surgery for endometriosis. Tables 1 and 2 list patient characteristics.

Operative Findings

Endometriosis affected only the left ureter in 53% of cases, only the right ureter in 36% and each ureter in 10%. We found concomitant involvement of the ipsilateral ovary in more than two-thirds of the patients.

All patients underwent ureterolysis with endometriotic excision or ablation. Two patients underwent resection and ureteroneocystostomy with a psoas hitch because of extensive involvement and obstruction of the distal part of the left or right ureter (figs. 2 to 4).[11,13,14] In 6 patients a Double-J® stent was placed intraoperatively after extensive ureterolysis to prevent ureteral obstruction or leakage. External stents were never used. The decision of whether to place a stent was made at surgeon discretion.

Postoperative Findings

Complications were infrequent and included only 2 patients requiring readmission to the hospital. One patient had septic pelvic thrombosis.[16] The second complication occurred in a patient who had undergone ureteroneocystostomy. Partial stricture of the right ureter was diagnosed during routine surveillance 3 months after surgery. Second look laparoscopy revealed that the ureter was open but became kinked when the bladder was full. Therefore, the stricture was noted to be positional. The ureter was dilated with subsequent Double-J stent placement. Final cystoscopy confirmed that each ureter was patent. During the 2 to 50-month followup no patient had recurrent urinary tract involvement.

DISCUSSION

The fact that ureteral endometriosis is relatively uncommon[1,8,11,17] is underscored by our identification of only 96 patients with ureteral endometriosis

Table 1. *Preoperative findings*

	No. Pts (%)
Reported symptoms:	
Pain	93 (97)
Dysmenorrhea	73 (76)
Dyspareunia	32 (33)
Post-coital bleeding	10 (10)
Metrorrhagia	21 (22)
Infertility*	24 (32)
Pain intensity:	
Mild	3 (3)
Moderate	27 (28)
Severe	57 (60)
Pain radiation:	
Rt lower abdomen	47 (49)
Lt lower abdomen	48 (50)
Back	11 (11)
Legs	6 (6)
Urinary signs + symptoms:	
Dysuria	12 (13)
Hematuria	2 (2)
Urgency	21 (22)
Hydroureter	4 (4)
Hydronephrosis	2 (2)
None	67 (70)

* Data available on 78% of patients.

Table 2. *Intraoperative findings*

	No. Pts (%)
Ureteral involvement:	
Rt	45 (47)
Lt	61 (64)
Bilat	10 (10)
Concomitant endometriosis lesions:	
Peritoneum	96 (100)
Rt ovary	70 (73)
Lt ovary	73 (76)
Bladder	45 (47)
Bowel	41 (43)
Rectovaginal septum	56 (58)
Uterosacral ligaments	50 (52)
Endometriosis stage:	
I (minimal)	13 (14)
II (mild)	21 (22)
III (moderate)	21 (22)
IV (severe)	41 (43)
Procedures:	
Ureterolysis + excision or ablation	96 (100)
Ureteroneocystostomy + psoas hitch	2 (2)
Ureteral stent placement	6 (6)

during 6 years in a practice in which more than 300 new patients with endometriosis are seen per year. This number is likely to be an underestimation of the actual number of cases of ureteral endometriosis in our practice since we excluded cases that lacked histopathological confirmation.

Our decision to adhere to these stringent criteria would certainly exclude patients in whom endometriosis was strongly suspected based on subjective findings. It is widely believed that the trained eye of a surgeon familiar with endometriosis can easily identify a lesion as characteristic of endometriosis without the need for biopsy. Therefore, some patients may have undergone surgery for ureteral endometriosis, including ureterolysis and ablation, without biopsy and would not have been included in this analysis.

It is worth noting that during the same period 3 additional patients underwent ureteroneocystostomy for clinically evident ureteral endometriosis diagnosed at laparoscopy. We suspect that these patients likely had intrinsic ureteral endometriosis but we excluded them from analysis since we had no available pathological reports to authenticate the diagnosis or confirm the extrinsic or intrinsic nature of the lesions. All 3 women had an uncomplicated postoperative course and required no further surgery during followup.

Because our institution is a referral center whose patients have often undergone prior therapies for endometriosis, it is also reasonable to posit that the prevalence of ureteral endometriosis may be underestimated in our population due to partial regression of some endometriotic lesions in response to medical therapy. Since to our knowledge no studies are yet available to evaluate the likelihood of this phenomenon, we can neither support nor exclude this possibility.

Nevertheless, the prevalence of ureteral endometriosis in our patient population may be higher than that experienced by practitioners in the general population, again due to the position of our institution as a referral center specializing in treatment for endometriosis. Therefore, it is likely that our population represents a demographic with a higher likelihood of severe endometriosis than would be encountered in a typical community setting.

Although even in a referral setting ureteral involvement with endometriosis is relatively uncommon, it can be clinically significant.[1,8,11,17] Most patients with ureteral endometriosis have no symptoms specific to the urinary tract. Because late diagnosis of urinary tract endometriosis may lead to renal function loss, it is imperative for the clinician to be vigilant. When ureteral endometriosis is suspected intraoperatively, definitive diagnosis requires surgical exploration of the ureter and may require biopsy.

Urinalysis with cytological examination, urography, intravenous pyelogram and computerized tomography have limited usefulness for diagnosing urinary tract endometriosis.[18] Of available imaging modalities pelvic magnetic resonance imaging is the most useful examination in patients with endometriosis.[19]

On an etymological note, controversy exists as to whether we can define endometriosis of the peritoneum overlying the ureter as ureteral endometriosis. The definition that we used is from Blaustein's Pathology of the Female Genital Tract.[9] Accordingly the term ureteral endometriosis includes endometriosis lesions involving "the overlying peritoneum, ureterosacral ligament or ovary resulting in extrinsic compression of the ureteral wall" as well as lesions involving the ureteral mucosa and/or muscularis.[9] We similarly consid-

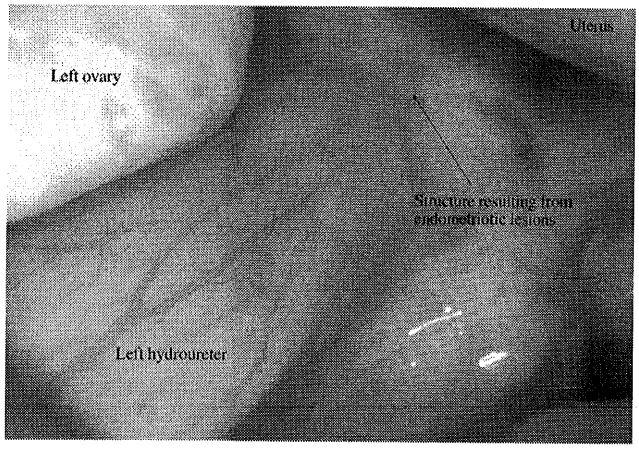

Figure 2. Laparoscopic view of left hydroureter and stricture

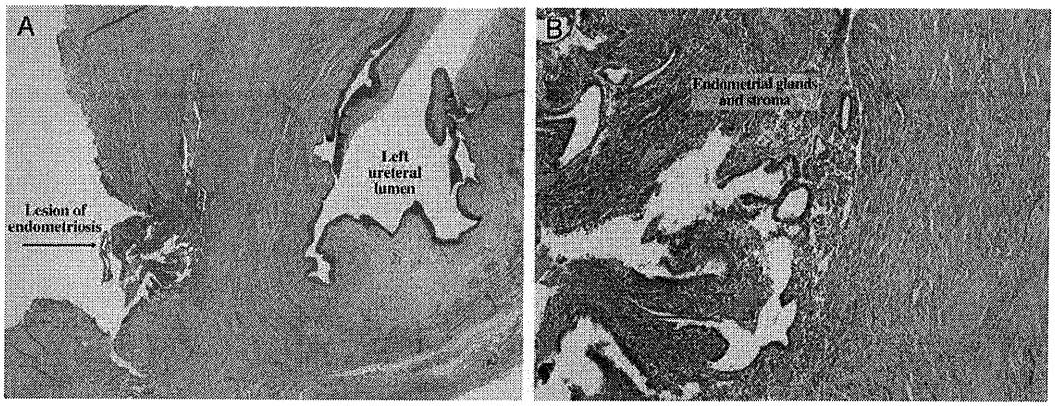

Figure 3. Extrinsic ureteral endometriosis. *A*, reduced from ×20. *B*, endometrial glands and stroma invading ureteral serosa. Reduced from ×100.

ered endometriosis involving the peritoneum overlying the bladder when determining whether disease involved the urinary tract. Any time that endometriosis causes compression or distortion of the anatomy of the ureteral wall, even when hydronephrosis is not yet present, thorough diagnosis and aggressive treatment are justified to prevent this complication in the presence of progressive disease.

It has been suggested that ureteral endometriosis often arises from preexisting foci of pelvic endometriosis.[20] In our series 53% of endometriotic ureteral lesions were on the left side, 36% were on the right side and 10% were bilateral. Similar findings in regard to laterality were reported in previous studies.[2,3,12,21] The implications of these findings remain unclear. However, the fact that in this series ureteral endometriosis usually involved the distal third of the ureter suggests the theory of Sampson that pelvic endometriosis is due to retrograde menstrual flow and peritoneal implantation.[20] On the other hand, the theory that endometriosis results from metaplasia of the coelomic epithelium is suggested by our findings that ureteral endometriosis develops more often on the side with concomitant ovarian endometriomas. To our knowledge this association is a new finding in the literature on ureteral endometriosis and may have exciting implications for future investigation.

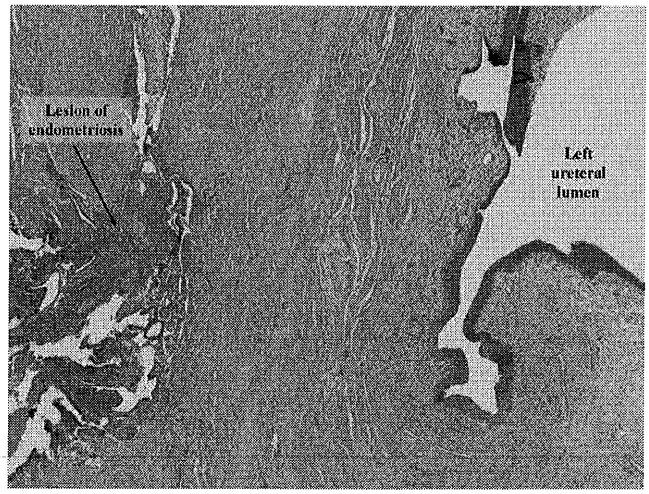

Figure 4. Intrinsic ureteral endometriosis. Reduced from ×40.

Treatment for endometriosis of the genitourinary and gastrointestinal systems by laparoscopy was first reported in 1989 by Nezhat and Nezhat.[12] Our technique of laparoscopic ureteroneocystostomy with or without a psoas hitch has also been published and widely adopted.[11,12,13,16] To our knowledge our current report represents the largest series of laparoscopically treated, pathologically confirmed ureteral endometriosis to date.

Hormonal therapy is palliative as opposed to curative.[22] Laparoscopic treatment for ureteral endometriosis can be performed safely and effectively, as demonstrated in several series.[11,13,17,23] An important note must be made in regard to preserving the periureteral vascular supply during ureterolysis and ureteral surgery. The blood supply to the distal ureter typically comes laterally from the iliac artery, whereas for the mid and proximal ureter it comes medially from the aorta. Also, a fine network of vessels travels along the length of the ureter. Thus, ureterolysis must preserve the peritoneal tissue and adventitia of the ureter.[14] When the ureter is strictured or its function is otherwise compromised, treatment should include segmental resection followed by the reconstitution of urinary continuity, as described. Rarely a vesical flap or an ileal ureter may also be needed to replace the entire ureter.[3,14] However, our experience shows that the need for such radical surgery is rare.

Traditionally hysterectomy and bilateral salpingo-oophorectomy have been recommended in patients

with ureteral endometriosis who do not desire future pregnancy.[13] These procedures alone do not correct ureteral fibrosis and their benefit to the patient is unclear. Moreover, a more conservative fertility sparing approach can offer these patients relief of symptoms without compromising reproductive goals. This is especially important, given our finding of infertility in a third of patients with ureteral endometriosis.

Our results confirm the safety and efficacy of a more conservative laparoscopic approach to surgical management for ureteral endometriosis.[11,13,17,23] We agree with others that laparoscopic ureterolysis represents an effective treatment option in most cases that can be safely accomplished even in cases of moderate or severe hydroureteronephrosis.[24] Short-term and long-term followup in patients who undergo laparoscopic ureterolysis confirms the adequacy of the technique as a surgical option in most patients with ureteral endometriosis.[11,20] The decision for ureteral stenting or resection depends largely on the apparent viability of the affected segment.

CONCLUSIONS

Laparoscopic diagnosis and management of ureteral endometriosis is safe and efficient. The aim of treatment should be to remove all endometriotic lesions, relieve ureteral compression and avoid recurrence while minimizing the morbidity associated with radical surgery.[7,20]

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