Ureteral endometriosis: clinical and radiological follow-up after laparoscopic ureterocystoneostomy

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BACKGROUND: Ureteral endometriosis is a rare entity that may lead to progressive hydroureteronephrosis and renal loss. When the localization of ureteral stenosis is close to the ureterovesical junction, ureterocystoneostomy may be required. The aim of the present study was to evaluate post-operative complication rates and clinical outcomes at 1- and 6-month follow-up after laparoscopic ureterocystoneostomy.

METHOD: Twenty patients who underwent ureterocystoneostomy for pelvic endometriosis in our tertiary referral centre for endoscopic surgery during 1 year were studied. A cystography was performed on Day 7 after surgery to verify the integrity of anastomosis and a satisfactory bladder capacity. Follow-up consisted of gynaecological examination and transvaginal ultrasound at 1 and 6 months after surgery. At 6 months, urography and cystography were also performed. Measurements included results of a pre-operative clinical and instrumental assessment, intra- and post-operative complications, post-operative bladder capacity at cystography and improvement of pain, using a visual analogue scale for the main symptoms related to endometriosis and uro-specific pain.

RESULTS: Neither a case of ureteral fistula nor other complications requiring re-intervention were reported. Post-operative transient deficit of bladder voiding occurred in five cases (25%), urinary infection in one and post-operative pyrexia in four (20%) patients. The median time to resuming voiding function was 3 days (range 1–20 days). In six cases, a mild vesico-ureteral reflux at the operated side was observed at 7-day cystography. Post-operative symptomatology was improved significantly (P < 0.05) for all symptoms. Urography and cystography performed at 6 months confirmed good post-operative reconstructions in all cases.

CONCLUSIONS: The objective of surgical treatment of ureteral endometriosis is to remove the stenotic tract and to preserve renal function. In cases of intrinsic ureteral endometriosis, the procedure of laparoscopic ureterocystoneostomy is feasible and has good outcomes at short- and medium-term follow-up.

Key words: hydroureteronephrosis / laparoscopy / ureteral endometriosis / ureterocystoneostomy

Introduction

Ureteral endometriosis is a rare and worrisome localization as it may lead to progressive hydroureteronephrosis and renal loss. The whole urinary tract is affected in 1–6% of cases (Yohannes, 2003; Antonelli et al., 2006) and the most frequently involved organs are the bladder, ureter and kidney, in a proportion of 40:5:1 cases (Jubanyik and Comite, 1997; Comiter, 2002; Abrao, 2009). Usually, ureteral lesions are extensions of retrocervical endometriosis (Vercellini et al., 2000; Donnez et al., 2002). According to the grade of infiltration of the ureteral wall, two types of ureteral endometriosis are distinguished, the intrinsic form (infiltration of the muscularis mucosa and ureoepithelium) and the extrinsic form (endometriosis is found only on the ureteral adventitia and is surrounded by connective tissue) occurring with a 1:4 ratio (Yohannes, 2003). Nevertheless, the two types may co-exist and the most frequent localization is the pelvic tract of the ureter (Yohannes, 2003).

The symptomatology of ureteral endometriosis is not specific. Frequently, the only symptoms are those typically related to endometriosis, such as dysmenorrhoea, dyspareunia or pelvic pain, whereas more indicative symptoms such as renal colic, low back pain (lumbalgia) and...
haematuria (Gustilo-Ashby and Paraiso, 2006) are rare. Even extremely severe cases with complete ureteral stenosis causing progressive hydronephrosis and subsequent loss of renal function may never present urological symptoms (7). The risk of silent renal loss in these patients is as high as 25−50% (Frego et al., 2002; Yohannes, 2003; Nezhat et al., 2004; Abrao, 2009). Some authors suggested evaluating ureters and kidneys if deep infiltrating endometriosis is suspected, and particularly if nodules of >3 cm involve the rectovaginal septum (Donnez et al., 2002).

Different surgical treatments have been proposed according to extrinsic or intrinsic ureteral endometriosis (Nezhat et al., 1996; Donnez et al., 2002; Ghezzi et al., 2006; Frenna et al., 2007; Scioscia et al., 2009). Nevertheless, in our opinion, in patients with hydronephrosis and the localization of the ureteral stenosis close to the viscouretal junction, the appropriate procedure is a ureterocystoneostomy (Mereu et al., 2010; Scioscia et al., 2009). The aim of the present study was to evaluate post-operative complications and clinical outcomes at 1- and 6-month follow-up after laparoscopic ureterocystoneostomy.

Materials and Methods

Twenty patients who underwent ureterocystoneostomy for endometriosis in our tertiary referral centre for endoscopic surgery between January and December 2008 were studied. In the same period, we performed 2608 surgical procedures, 1201 thereof for endometriosis (46.1%) and 39 among these (3.2%) involving the urinary tract. All patients with suspected deep endometriosis (1201 cases) underwent ultrasonography of the urinary tract (Mereu et al., 2010) which, in all the study cases, revealed the presence of hydronephrosis.

Indication for surgery on the urinary tract was hydronephrosis due to ureteral endometriosis, and in two cases it was associated with bladder localization. Ethical committee approval was not necessary because of the retrospective nature of the study.

Pre-operative evaluation included a detailed history with the assessment of pain using a visual analogue scale (10-point rating scale: 0 = absent, 10 = unbearable) for five components of endometriosis-related pain: dysmenorrhoea, non-menstrual pelvic pain, dysuria, dyspareunia and dyschezia. Particular attention was given to urological symptomatology such as dysuria, back pain or renal colic. Clinical and surgical data of all patients were prospectively recorded in a computerized database (EGES, Mitcom, Mantova, Italy). No hormonal treatment was given for at least 4 months before surgery. In all cases, ultrasonography of the urinary tract had revealed the presence of hydronephrosis.

Urinary tract involvement was studied further with cystography, endovenous or retrograde uroangiography, and in some cases also uro-CT or uro-MRI and renal scintigraphy. According to the entity of hydronephrosis, we distinguished three grades: mild (<10 mm), moderate (between 10 and 20 mm) and severe (>20 mm). Disease stage was defined according to the revised American Fertility Society Classification (1996).

In all cases, a double-J ureteral catheter was inserted at least 1 month before surgery in order to preserve renal function and to facilitate ureteral surgery (Minelli et al., 2009). Prior to surgery, all patients were counselled regarding the potential risks and benefits of this intervention and signed informed consent was received.

All procedures were performed laparoscopically and endometriosis excision was carried out using 5-mm bipolar scissors working retroperitoneally in healthy tissue, for a complete excision of all visible endometriotic lesions as previously described by our group (Mereu et al., 2007, 2008; Minelli et al., 2009; Scioscia et al., 2009). To perform ureterocystoneostomy (Harrow, 1968; Scioscia et al., 2009; Mathews and Marshall, 1997), both ureters were isolated to visualize their surface and the affected one was dissected. A dissection of the bladder peritoneum and an incision on the anterior bladder wall for ~2 cm was made up to the mucosa layer. After exposure of the mucosa, it was opened for 1 cm. The cut end of the ureter was anchored to the detrusor muscle and mucosa with five sutures applied at the 12, 2, 4, 8 and 10 o’clock points, using a 4-0 polydioxanone suture. To create a submucosal tunnel around the ureter, the muscular layers were approximated over the pouch of Douglas.

Four days after surgery, the integrity of the anastomosis was verified with an intravenous methylene blue test and the test was considered positive if the blue fluid appeared in the drainage tube. If the test was negative, the drainage was removed. The Foley catheter was removed 7 days after surgery, after a cystography to measure bladder capacity and to verify integrity of the anastomosis. Bladder function was then assessed by measurements of residual urine volume (obtained by catheterization) after spontaneous voiding, and it was considered normal if it was consistently lower than 100 ml in three consecutive evaluations. Before discharge, an ultrasound scan of the urinary tract was performed. A double-J ureteral catheter was positioned and removed 1 month after surgery.

All patients underwent follow-up controls (gynaecological examination and combined transvaginal/transabdominal ultrasound) at 1 and 6 months after surgery. At 6 months, urography and cystography were also performed. The grade of vesicoureteral reflux was evaluated in voiding cystourethrography and classified according to the five grade system of the International Reflux Study Committee (1985).

Results

Patient characteristics and pre-operative findings are reported in Table I. Most patients (75%) had previous surgery for endometriosis. Previous surgery of the urinary tract was performed in seven cases (35%) and it consisted of: nephrostomy for ureteral obstruction in three patients, homolateral ureterolysis in two cases, one homolateral dilatation of ureteral stenosis and one contralateral laparotomic ureterocystoneostomy. Only one patient (5%) reported severe urinary symptoms (recurrent renal colic and an episode of anuria). There were four patients (30%) who experienced lower back pain on the side of the ureter involved. Dysuria was reported by six patients (30%). Half of the patients (50%) had no symptoms suggestive of urinary tract involvement. The most frequent symptoms were dysmenorrhoea (90%) and dyspareunia (85%). Pre-operative ultrasound revealed hydrourteronephrosis in all study cases, 13 (65%) of them with evidence of severe dilatation and 7 with moderate hydronephrosis. In 10 cases (50%) the left ureter was involved, in 9 (45%) it was the right one and in one case both ureters were affected. The pre-operative study of the urinary tract consisted of abdominal ultrasound in all cases and at least one additional examination such as uro-CT, uro-MRI, endovenous or retrograde scintigraphy. The decision regarding performing additional examinations was not standardized as many patients were prescribed those radiological examinations by their GP before being referred to our centre.
Uro-TAC was performed in six patients (four with severe and two with moderate hydronephrosis) and confirmed the presence of hydronephrosis and ureteral dilatation up to the pelvic tract. Six patients (five severe and one moderate hydronephrosis) underwent pre-operative uro-MRI that revealed a prevesical obstruction. Endovascular uropielography was performed in seven patients (three severe and four moderate hydronephrosis) and it showed the presence of ureteral obstruction at 3–4 cm from the bladder ureteral meatus. In seven cases (six severe and one moderate hydronephrosis), a retrograde uropielography was performed and found ureteral stenosis of 2–4 cm length at 2–5 cm from the uretero-vescical junction. Only two patients (both with moderate hydronephrosis) underwent scintigraphy which revealed, in both cases, a normal percentage contribution of each kidney to total renal function, but it was associated with a delayed washout of radioactivity on the affected side.

In all patients, a pre-operative cystoscopy was performed, and in two cases, bladder endometriosis was also found. A double-J ureteral stent was placed before surgery, with a median of 81 days before surgery (range 30–160 days).

Intraoperative findings and associated surgical procedures are reported in Table II. According to AFS staging (14), in most cases (80%), severe endometriosis was present. In nine cases (45%), a concomitant colorectal segmental resection was performed for bowel endometriosis, with temporary ileostomy. In 19 cases (95%), all endometriosis nodules were removed, while in one patient who had previous contralateral ureterocystoneostomy endometriotic lesions on the left parametrium were not resected to avoid complete bladder denervation.

Post-operative complications are reported in Table III. There were no cases of bowel or ureteral fistula or other complications requiring re-intervention. Blood loss causing anaemia (≥ 3 g ΔHb) occurred in three cases; one of them had a blood transfusion. Transient deficit in bladder voiding occurred in five cases (25%) and post-operative pyrexia in four patients (20%). The median time to resuming voiding function (calculated as the number of days with self-catheterization) was 3 days (range 1–20 days). Cystography on Day 7 confirmed in all cases the integrity of the anastomosis and good bladder capacity.
In six cases, a vescico-ureteral reflux (Grade I in three and Grade II in three patients) at the operated side was observed. Ultrasonographic control of the urinary tract performed at discharge from hospital revealed mild/moderate pyelectasis in five cases. The median hospital stay was 10 days (range 7–17 days).

During the first month, there were six cases of symptomatic cystitis and two cases of cystocelepsitis; all of them treated successfully with adequate antibiotic therapy. At 1 month, the double-J stent was removed and at a follow-up ultrasound, six mild/moderate cases of hydronephrosis were observed; these cases were temporary and mild in comparison with before surgery. In a patient who developed severe ureteropyelectasis, a stenosis of the operated ureter was confirmed by retrograde ureterography at 2 cm from the anastomotic level. A ureteral stent was then replaced for 30 days with satisfactory subsequent controls after removal of the stent and during follow-up.

There were 12 patients who participated in the clinical/instrumental follow-up at 6 months after surgery. At the 6-month follow-up, two patients were lost and the other six patients, two of them pregnant, participated only in the telephone follow-up reporting symptomatology and faxing their recent ultrasonography report. Urography revealed mild hydronephrosis at the operated ureter in three cases. At cystography, three cases of vescico-ureteral reflux (Grade I in two patients and Grade II in one patient) were visualized at the side of the ureterocystoneostomy. Post-operative symptomatology was improved (P < 0.05) for all symptoms (Table IV). There were three patients (15%) who reported hypoaesthesis/paraesthesia of the inguinal region and external genitalia radiating to the internal coxal region at the side of the ureterocystoneostomy (this was already reported in one of these cases before surgery). Stress incontinence was diagnosed in two cases.

**Discussion**

Our findings confirm that endometriosis of the urinary tract is often devoid of uro-specific symptoms. In this series of cases that required ureterocystoneostomy, good clinical and surgical outcomes on medium-term follow-up were reported.

It is our experience that when the site of ureteral endometriosis is close to the bladder and the muscularis propria is infiltrated, the pivotal procedure is ureterocystoneostomy that can be performed laparoscopically (Nezhat et al., 2004). Ureterolysis is indicated only in cases of ureteral extrinsic endometriosis, involving a short ureteral tract. In fact, we have previously reported the persistence of ureteral stenosis in 12 and 20% of patients who underwent ureteroureterostomy and ureterolysis, respectively (Mereu et al., 2010). As it is impossible to differentiate intrinsic and extrinsic ureteral endometriosis pre-operatively, we believe that the indication for ureterocystoneostomy should be the presence of moderate/severe hydronephrosis due to ureteral stenosis. When ureteral endometriosis does not cause stenosis and hydronephrosis, ureterolysis might be considered.

The ureterocystoneostomy allows removal of intrinsic endometriosis with a long stenotic tract and, in association with a vescicopsoas hitch, places the ureter away from the pelvis, the frequent site of recurrence (Antonelli et al., 2006). To reduce the risk of post-operative recurrence of stenosis and hydronephrosis, the anastomotic tract should be tension-free (Nezhat et al., 2004). Ureterocystoneostomy modifies the anatomy of the urinary tract, but does not change the urodynamic parameters (Carmignani et al., 2009). The first procedures were performed with a laparotomic approach (Harrow, 1968), with good results at follow-up (Mathews and Marshall, 1997). Laparoscopic surgery offers a higher magnification of the image and helps to find the balance between radicality and preservation of healthy tissue. This kind of surgery is not free of complications and requires specific surgical skills.

Only two patients in the present study suffered from co-existing bladder endometriosis. In fact, the ureteral and bladder endometriosis seem to be two different entities, as they usually present separately and have a different etiopathogenesis (Abrao, 2009).

In this study, no major complication was reported. A temporary ileostomy was routinely performed when bowel resection was

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-interventions</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Blood loss with anaemia</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Transient deficit bladder voiding</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Haematuria</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Dysuria</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Urinary infection</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Post-operative fever</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Haemoproteinuria</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bowel anastomotic fistula</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ureteral fistula</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table IV** Pain symptomatology before surgery and at 6-month follow-up.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Pre-operative symptomatology</th>
<th>Post-operative symptomatology</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Dysmenorrhoea</td>
<td>8</td>
<td>3.31</td>
<td>1</td>
</tr>
<tr>
<td>Dyspareunia</td>
<td>6</td>
<td>3.06</td>
<td>2</td>
</tr>
<tr>
<td>Dysuria</td>
<td>3</td>
<td>3.44</td>
<td>1</td>
</tr>
<tr>
<td>Dyschezia</td>
<td>6</td>
<td>3.58</td>
<td>1</td>
</tr>
</tbody>
</table>
associated with avoid bowel fistulas that may complicate ureteral surgery leading to a decrease in the complication rates. Besides, it is important to highlight that temporary ileostomy has specific indications in colorectal surgery for endometriosis and normally is seldom performed (Minelli et al., 2009, 2010; Stepniewska et al., 2010; Ruffo et al., 2010).

Peripheral hypoesthesia/paraesthesia was confirmed to be linked to the surgical procedure in one case only (of the three patients who reported this symptom) after a study of the genitofemoral nerve. In that case, a psoas-hitch suspension of the ureter was performed and this is known to be a possible cause of such a complication (Kowalczyk et al., 1996). A spontaneous remission of symptoms was reported by the patient after a few months.

Previous reports of small study populations on surgical treatment of ureteral endometriosis requiring ureterocystoneostomy presented inconsistent findings (Gustilo-Ashby and Paraiso, 2006; Ghezzi et al., 2007). To the best of our knowledge, this is the largest study on laparoscopic ureterocystoneostomy for pelvic endometriosis and has the strength of a single-centre study with a systematic follow-up. This provides homogenous data related to both the surgical procedure (same surgical team) and the clinical/instrumental follow-up.

Given the non-specific symptomatology of ureteral endometriosis, a simple instrumental renal evaluation such as abdominal ultrasonography in all patients with clinical/instrumental evidence of deep endometriosis seems mandatory before surgery. The pre-operative evaluation is important to determine the level of ureteral stenosis and the grade of hydroureteronephrosis, in order to counsel the patient and to plan a multi-disciplinary surgical approach (gynaecologist/urologist/general surgeon). In conclusion, the aim of surgery for ureteral endometriosis is to resolve the stenosis and to preserve renal function. In cases of intrinsic ureteral endometriosis, laparoscopic ureterocystoneostomy is feasible and has good outcomes at short- and medium-term follow-up.

References

Review.