

UPPER TRACT SURGERY REVIEW

Successful management of ureteric endometriosis by laparoscopic ureterolysis – A review and report of three further cases

Deepa Talreja^{a,*}, Vivek Salunke^a, Shinjini Pande^a, Chirag Gupta^b

^a Department of Obstetrics and Gynecology, Oyster Hospital, Mumbai, India

^b Department of Urology, Lilavati Hospital and Research Center, Mumbai, India

Received 16 February 2018, Received in revised form 18 March 2018, Accepted 28 March 2018

Available online 31 May 2018

KEYWORDS

Ureteric endometriosis;
Laparoscopic ureterolysis;
Hydronephrosis

ABBREVIATIONS

PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses;
US, ultrasonography

Abstract Objective: To review articles highlighting the effectiveness of conservative laparoscopic ureterolysis as a primary treatment option in patients with ureteric endometriosis and to report on a further three cases.

Patients and methods: PubMed, EMBASE, Cochrane database were searched to identify articles reporting cases of laparoscopic management of ureteric endometriosis and, in particular management by ureterolysis. We further described three new cases of ureteric endometriosis managed at our institute.

Results: The present study illustrates the significance of laparoscopic ureterolysis in the management of patients with ureteric endometriosis. In our cases, a systematic surgical approach was followed in order to perform complete but careful excision of the all visible endometriotic implants. During follow-up successful treatment was established by relief of hydronephrosis by ultrasonographic evaluation.

Conclusion: Considering the risk of loss of renal function and due to the non-specific symptoms, a prompt clinical suspicion and thorough preoperative assessment can potentially help in the diagnosis. We conclude that laparoscopic ureterolysis is a minimally invasive technique with low complication and recurrence

* Corresponding author at: F-18 Nirmala Colony, St Baptist Road, Bandra West, Mumbai 400050, India.

E-mail address: drdeepa30@gmail.com (D. Talreja).

Peer review under responsibility of Arab Association of Urology.



Production and hosting by Elsevier

rates. It is a suitable option as a primary approach for selected patients with ureteric endometriosis, if done in a systematic step-by-step approach.

© 2018 Production and hosting by Elsevier B.V. on behalf of Arab Association of Urology. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Endometriosis is defined as presence of functional endometrial glands and stroma outside the endometrial cavity. It mainly affects women of childbearing age, with an estimated prevalence of 3–10% for the general female population [1]. Endometriosis outside the reproductive tract is less common, and, particularly, ureteric endometriosis is a rare entity with a reported prevalence of < 1% [2,3].

Ureteric endometriosis can be described as defined by Clement [4] as ‘Endometriotic lesions involving the overlying peritoneum, uterosacral ligament, or ovary resulting in extrinsic compression of the ureteral wall as well as lesions involving the ureteral mucosa and/or muscularis’.

Ureteric endometriosis is usually unilateral, mostly confined to a small segment of distal left ureter. It is often associated with retroperitoneal fibrosis and peri-ureteric cicatrization [5]. Symptoms related to pelvic endometriosis or urinary involvements are often non-specific, most common being dysmenorrhoea, dyspareunia, and chronic pelvic pain. Ureteric obstruction resulting in hydronephrosis is a rare manifestation of ureteric endometriosis, which may result from either of the two major pathological types of ureteric endometriosis: intrinsic and extrinsic.

In cases of intrinsic ureteric endometriosis, ectopic endometrial tissue infiltrates directly the muscularis propria, lamina propria or ureteric lumen. In extrinsic cases, there is invasion of endometriotic tissue within the ureteric adventitia and or surrounding connective tissues only [6]. Extrinsic involvement is approximately four-times more common than intrinsic disease and both can coexist [6].

Diagnosis and management of ureteric endometriosis remains a challenge. Early diagnosis is crucial for the prognosis, as delay in diagnosing the disease may lead to serious complications such as stenosis with hydrourter and hydronephrosis, and consequently loss of renal function [7,8]. There are various diagnostic modalities available that can help to identify the presence of ureteric endometriosis, e.g. abdominal ultrasonography (US), IVU, CT, and MRI. Ureteroscopy is a valuable tool in diagnosing intrinsic endometriosis. Other modalities in the form of laparoscopy and cystoscopy allow for direct visualisation, and thus help in diagnosis and treatment [9].

Surgery is the ‘gold standard’ for treating patients with deep infiltrating endometriosis. The treatment of ureteric endometriosis should be directed at relieving ureteric obstruction from all endometriotic tissue, to avoid disease recurrence, allowing normal function and minimising the morbidity associated with demolitive surgery. However, it may not be possible that a conservative approach in the form of ureterolysis is sufficient in all cases; rather other invasive methods such as ureteric resection and re-anastomosis, ureterocystoneostomy etc., may be needed depending on the severity of the case. Although optimal surgical approach to deal with a clinically significant ureteric obstruction has yet to be defined, many recent studies have shown satisfactory results with conservative ureterolysis.

The aim of the present review is to highlight the effectiveness of conservative laparoscopic ureterolysis as a primary treatment option in patients with ureteric endometriosis presenting with a moderate/severe hydronephrosis.

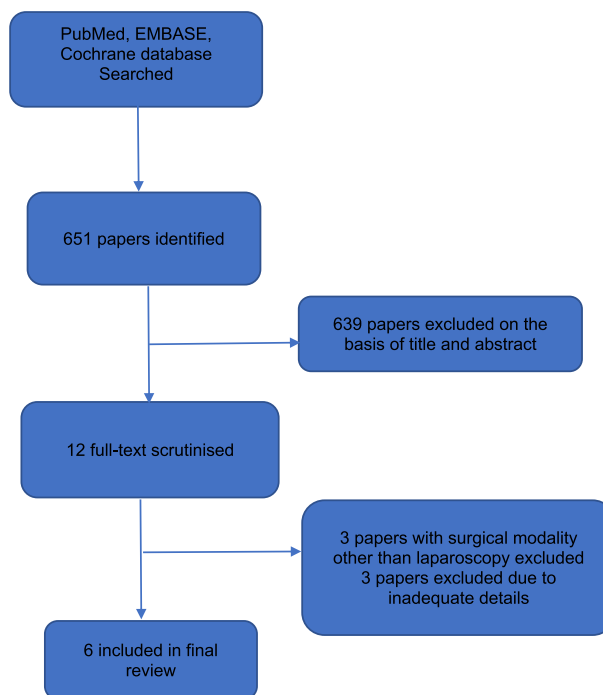


Fig. 1 PRISMA flow chart of literature search.

Table 1 Summary of some of the previous reports included in this review.

Year	Author	Number of cases with ureteric involvement	Site of ureteric involvement			Presence of hydronephrosis	Mode of surgical intervention, <i>n</i>	
			Bilateral, <i>n</i>	Unilateral, <i>n</i>			Laparoscopy	Laparotomy
				Left	Right			
2006	Ghezzi et al. [14]	33	4	24	5	All patients	Ureterolysis 31 Ureteric resection 1	Resection with vesicopsoas hitch 1
2009	Bosev et al. [16]	96	10	61	45	4 patients with hydroureter 2 patients with hydronephrosis	Ureterolysis 96	–
2010	Mereu et al. [2]	56	6	37	13	All patients (including 18 with severe ureterohydronephrosis, 2 with no residual renal function)	Ureterolysis 35 end-to-end ureteric anastomosis 17	Ureteroneocystostomy 2 Nephrectomy 2
2010	Smith and Cooper [5]	13	1	7	5	All patients	Ureterolysis 10	Segmental ureteric resection 3
2014	Uccella et al. [17]	109	NR	NR	NR	66 cases	Ureterolysis 109	–
2015	Knabben et al. [18]	106 (out of 213 patients with histologically confirmed DIE)	37	54	15	15 cases	Ureterolysis 106 (2 converted to ureterocystostomy)	Ureterocystostomy 2 (patients in whom ureterolysis did not lead to sufficient kidney drainage)

NR, not reported; DIE, deep infiltrating endometriosis.

Method

An extensive computer search of PubMed database was performed using keywords and medical subject heading (MeSH) phrases: ‘ureteric endometriosis’, ‘deep infiltrative endometriosis’, ‘laparoscopic ureterolysis’, to identify review articles and articles reporting cases of laparoscopic management of ureteric endometriosis and in particular management by ureterolysis. Fig. 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart of the literature search. After review of titles and abstracts, references were limited to the original paper(s) and case series describing the preoperative findings and surgical interventions (Table 1 [2,5,14,16–18]). We also describe three new cases of ureteric endometriosis managed at our institute.

Cases description

The present cases describe our experience with ureteric endometriosis, subsequent varying surgical interventions and follow-up of these cases, highlighting the favourability of conservative ureterolysis in terms of decrease in parameters of hydronephrosis.

Case 1

A 36-year-old P1L1 (one pregnancy and one child) with a history of infertility (secondary) was diagnosed to have recurrent endometriosis during her infertility evaluation. She had a history of prior laparoscopic surgery for left ovarian endometrioma. On further evaluation moderate left hydroureter and hydronephrosis were also diagnosed, secondary to left ureteric obstruction. MRI revealed a left adnexal cystic lesion of $\sim 50 \times 38 \times 34$ mm, with moderate left hydroureter with dilatation up to the level of the left adnexal mass with significant narrowing at this level and moderate proximal hydronephrosis.

The patient was planned for laparoscopic ureterolysis after placement of a ureteric stent. Intraoperatively there was evidence of extensive endometriosis. The left ovary with the endometriotic cyst was found densely adhered to the sub-ovarian fossa (Fig. 2a) with intense fibrosis, retraction, and induration of the peritoneum at this region, and with an indrawing of the left uterosacral ligament in this fibrotic zone. A significantly enlarged ureter was noted above this area of fibrosis.

Adhesiolysis was started after identification of anatomical landmarks and adequate exposure. The left

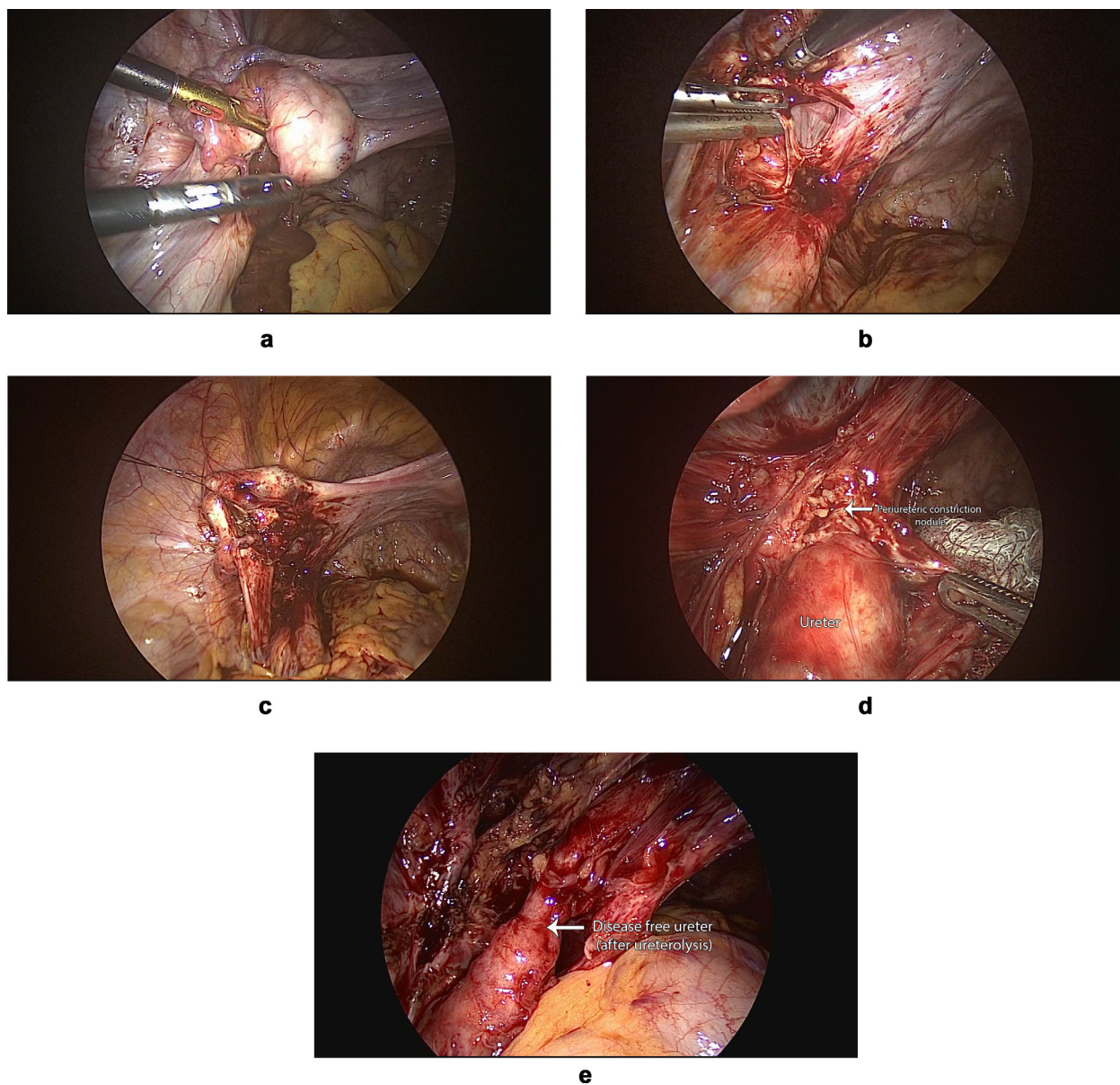


Fig. 2 (a) Adherence of left ovary containing endometriotic cyst to sub ovarian fossa. (b) Release of ovary from sub-ovarian fossa. (c) Temporary hitching up of ovary to create adequate exposure. (d) Encasement of ureter by endometriotic fibrotic nodule. (e) Complete release of ureter from endometriotic lesions.

ovary was released from the ovarian fossa (Fig. 2b), followed by excision of the endometriotic cyst, and the ovary was temporarily hitched up for exposure of the peri-ureteric area (Fig. 2c). The left ureter was approached via a retroperitoneal approach at the pelvic brim following development of the retroperitoneal spaces. The aim was to access the normal ureter first, well above the level of obstruction. Then careful dissection was started using minimal bipolar electro-energy and cold scissors, down to the level of the obstruction, which usually correlates with the level of the crossing of the uterine artery to the ureter.

An area of dense fibrosis of $\sim 2 \times 2$ cm was noted, forming a peri-ureteric constriction ring (Fig. 2d) and

involving the surrounding vascular tree as well. Dense fibrosis of the perivascular parametria was released meticulously, mobilising the ureter away from the vascular structures. This was followed by the careful dissection of ureteric nodule, with all precautions taken to preserve the peri-ureteric blood vessels. Careful but complete laparoscopic resection of all visible endometriosis was performed. After complete excision, the constriction free ureter was visualised along the entire length (Fig. 2e). Postoperative recovery of the patient was uneventful, except for the one episode of fever that responded to medical treatment and resolved within 3 days. The ureteric stent was removed 6 weeks after surgery. US at 6 weeks after surgery

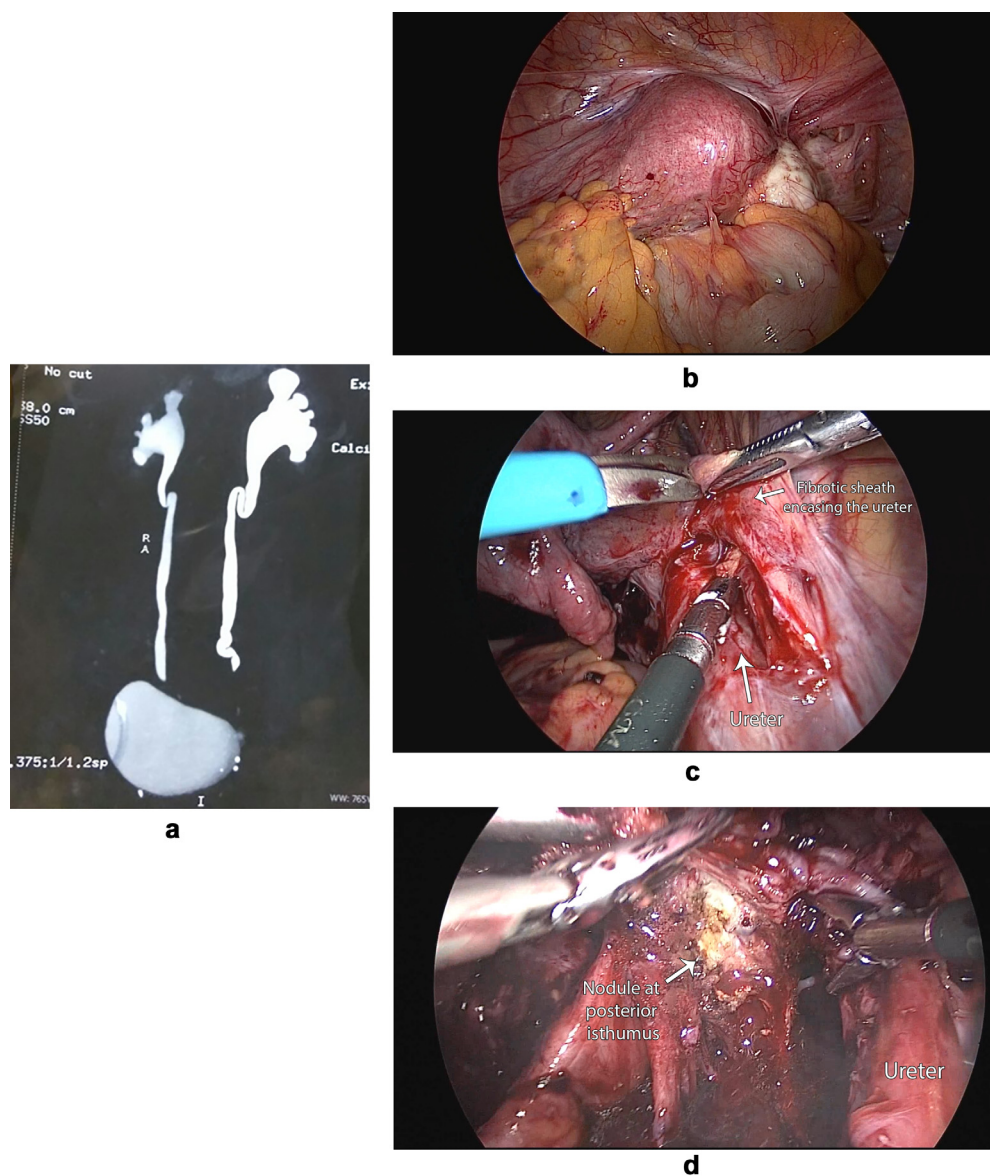


Fig. 3 (a) CT urogram showing bilateral hydroureter and hydronephrosis. (b) Complete obliteration of bilateral hemipelvis. (c) Ureterolysis including release of ureter from surrounding fibrotic sheath. (d) Resection of fibrotic nodule at posterior isthmus.

showed complete resolution of hydroureter and hydronephrosis.

Case 2

A 28-year old nulliparous female with complaints of severe dysmenorrhoea, dyspareunia and primary infertility with no urinary complaints, was taken for diagnostic hysterolaparoscopy at another institution. Laparoscopy revealed frozen pelvis due to extensive endometriosis with bilateral severe ureteric involvements. No operative intervention was done at that time. During further evaluation, renal US showed bilateral renal cortical thinning. A confirmatory CT revealed similar bilateral hydroureter and hydronephrosis with obstruction of bilateral ureters (Fig. 3a). After complete urological

evaluation and bilateral ureteric stenting, she was reoperated for ureterolysis and excision/anastomoses if needed.

Operative laparoscopy revealed extensive fibrosis, resulting from deep infiltrating disease of both the right and left hemipelvis (Fig. 3b), with obstruction of bilateral ureters due to fibrosis. Extensive adhesiolysis and bilateral ureterolysis (Fig. 3c) were performed following a step-by-step approach for adequate exposure, development of retroperitoneal spaces, followed by ureterolysis up to the level of the crossing of the uterine artery. Resection of adjacent fibrotic cicatrising endometriotic tissue was performed at the level of the attachment of the uterus to the posterior surface of the uterus, i.e. torus uterinus (Fig. 3d). The postoperative period was uneventful.

Case 3

A 36-year-old nulliparous female presented with pelvic pain, dysmenorrhoea, and infertility. MRI of the abdomen and pelvis showed endometriotic deposits in both ovaries with adhesions to the ileal loop. A 2.6×1.4 cm abnormal-signal-density lesion in a rectovaginal pouch encasing the bilateral lower ureters was identified, resulting in moderate hydronephrosis and hydroureter.

The patient underwent an operative laparoscopy that revealed a complete obliteration of the pelvis with adhesions and endometriosis. Hydrosalpinges were seen on both sides, along with a large right ovarian endometriotic cyst forming a tubo-ovarian mass (Fig. 4a). Bilateral

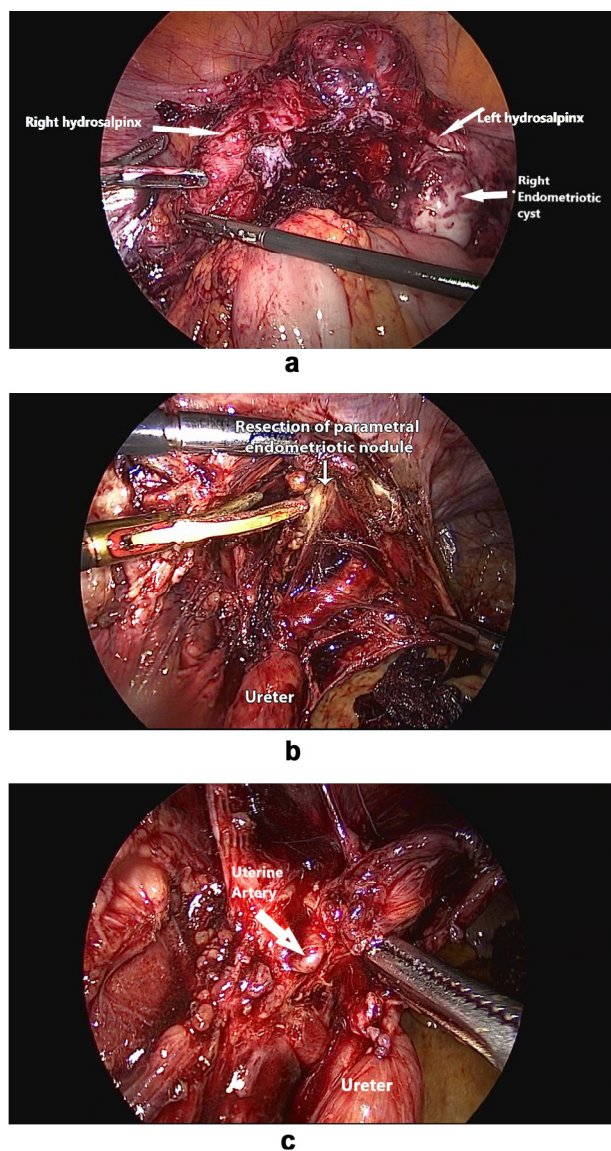


Fig. 4 (a) Extensive adhesions with bilateral hydrosalpinges. (b) Release of dense fibrosis of perivascular parametria, mobilising the ureter away from the vascular structures. (c) Ureteric dissection to the level of the crossing of the uterine artery.

ureters were entirely encased in fibrosis and endometriosis. After extensive adhesiolysis, the bilateral adnexa were released. Bilateral salpingectomy was performed in view of hydrosalpinges with extensive fibrosis of the tubes. This was followed by the bilateral ureterolysis, which was started from normal and healthy tissue at the level of the pelvic brim. Dissection was progressed in the direction of the uterosacral ligament, and the ureter was freed to the level of the crossing of the uterine artery (Fig. 4b and c). Satisfactory ureterolysis was achieved when the ureters were freed from the fibrotic nodules forming constriction bands, resulting in ureteric obstruction or a normal appearing ureter was seen distal to the stricture.

Postoperative follow-up of the patient revealed relief of symptoms, as well as US verified resolution of the hydroureter and hydronephrosis at 3 months after surgery.

Discussion

Ureteric endometriosis is a rare, but serious condition affecting women of child-bearing age, which presents with nonspecific symptoms but may lead to silent loss of renal function. The ureters are the second most common site of urinary tract endometriosis with a ratio of bladder/ureter/kidney endometriosis of 40:5:1 [10].

It has been estimated that as many as 25–50% of nephrons are lost when there is evidence of ureteric endometriosis, and 30% of patients will present with decreased kidney function at the time of diagnosis resulting in ‘silent’ kidney loss [11].

Considering the risk of loss of renal function, as well as the nonspecific symptoms, a prompt clinical suspicion and preoperative assessment including a thorough history, physical examination, and imaging can potentially help in the diagnosis. Additionally, ureteric involvement should be suspected when there is clinical involvement of the uterosacral ligaments. In all our patients, we found an endometriotic nodule at the level of the insertion of the uterosacral ligament at the site of ureteric involvement. In all our present cases, patients were evaluated thoroughly to determine the extent of the disease. Our present case series emphasised that preoperative assessment of the upper and lower urinary tract in patients with deep infiltrating endometriosis should be considered, as detailed descriptions of the involvement of ureteric or other urinary tract lesions are important for counselling of the patients and for providing information to the surgeon.

Surgical management remains the ‘gold standard’ in the case of severe forms of endometriosis. In particular, laparoscopic surgery provides many advantages over conventional laparotomy, namely a magnified view of the pelvis, greater exposure, and a greater ability for identification of the disease in the pelvis and retroperitoneal space, as well as in the lower urinary

tract, which allows for close examination and visualisation of endometriotic implants and consequently allows very fine and close dissection.

Surgery for deep infiltrating endometriosis, and in particular for urinary endometriosis, is a challenging procedure as it needs a radical approach for removing all macroscopic lesions, as well as a conservative approach for preserving organ functions. There are certain challenges related to the disease itself, e.g. fibrosis causes retraction and the lower ureter might be shifted from its normal lateral position to medially, demanding the need for a careful diagnostic and operative approach. Another important aspect is the preservation of the peri-ureteric vascular supply during ureterolysis and ureteric surgery. In all our cases, a systematic surgical approach was followed including understanding the disease extent, an adequate exposure, dissections of the vital structures, followed by extensive adhesiolysis and complete but careful excision of the all visible endometriotic implants.

However, in cases of obstructive uropathy due to the ureteric endometriosis the surgeon needs to decide amongst various treatment options such as ureterolysis, segmental resection and anastomoses, distal ureterectomy, and ureteric re-implantation, depending on the severity of the case.

Previous works by researchers such as Nezhat et al. [12] and Antonelli et al. [13], found that ureteric endometriosis is not always resolved by ureterolysis, but rather ureteric resection and anastomoses, ureterocystoneostomy and in very rare cases nephrectomy may also be needed to complete endometriotic nodule resection. However, many recent studies have proposed a conservative approach for treating ureteric endometriosis even in cases of moderate-to-severe endometriosis.

In a multicentre cohort study involving 33 patients, Ghezzi et al. [14] found that 85% of 33 women with obstructive uropathy benefited from ureterolysis after a median follow-up of 16 months. Soriano et al. [15] found an improvement of symptoms in 91% of 45 patients with ureteric involvement, of whom 22.2% had hydronephrosis and were treated by ureterolysis. Bosev et al. [16], in a retrospective study including 96 women with ureteric endometriosis who underwent ureterolysis, concluded that laparoscopic diagnosis and management of ureteric endometriosis are safe and efficient. In a prospective study by Mereu et al. [2], 56 patients with preoperative or intraoperative evidence of moderate-severe ureter dilatation were enrolled. Although laparoscopic ureterolysis was performed in 35 cases, the authors concluded that elective laparoscopic ureterolysis should be indicated only when there is minimal extrinsic and non-obstructive ureteric involvement. More recently, Uccella et al. [17] analysed data of 109 patients with ureteric endometriosis, 60%

with hydronephrosis, treated by ureterolysis. They concluded that laparoscopic ureterolysis is a safe procedure and provides encouraging pregnancy rates and satisfactory long-term results. However, large endometriotic nodules or hydronephrosis of Grade > 2 was associated with a higher risk of perioperative and long-term adverse outcomes. In a case series of 13 patients reported by Smith and Cooper [5], 10 patients underwent ureterolysis and three patients were managed with a ureteric resection. Thus, most of the patients (10/13) were successfully treated without resection of the ureteric segment.

In a recent study by the Knabben et al. [18], 98.1% of the patients with ureteric involvement were successfully treated by ureterolysis solely, without major intraoperative complications. Only two patients required a ureteroneocystostomy. In the other 13 (86.7%) patients with obstructive uropathy, ureterolysis led to sufficient drainage of the kidney.

In our present cases, all patients were managed with conservative ureterolysis alone, as in all cases the ureter was found to be involved mainly extrinsically due to fibrosis by endometriotic implants. This finding in association with the above-mentioned studies, whereby the vast majority of cases were found to have extrinsic ureteric endometriosis, demonstrates conservative ureterolysis as a suitable option for primary management of ureteric endometriosis. It can be recommended as the primary approach for selected patients with ureteric endometriosis, if done in a systematic step-by-step approach.

In all our present cases, we found the involvement of the rectovaginal septum as well, which was in accordance with the study of Knabben et al. [18], where they observed that ureteric involvement becomes more likely if the endometriotic nodule of the rectovaginal septum is > 30 mm. They found that patients with a nodule > 30 mm had a four-fold risk of having ureteric endometriosis.

As all our present cases had severe endometriotic extrinsic compression, we resorted to preoperative ureteric stenting in all cases. In our experience a stented ureter does not pose any hindrance to dissection. The stent actually acted as a scaffold on which we could perform very close shaving of endometriotic tissue.

Conclusion

In conclusion, treatment for deep endometriosis, in particular ureteric endometriosis is a challenging procedure. The best approach is a careful diagnosis by identification of all the potential localisations of deep infiltrating endometriosis, through a thorough preoperative assessment of the patient. The treatment should aim for complete surgical excision of ureteric endometriosis, as well as restoration of the reproductive organs. Although the choice of treatment in the case of ureteric endometriosis

varies from case to case, it should be tailored to relieve ureteric obstruction from all endometriotic tissue, restore normal function and minimise the morbidity associated with demolitive surgery. The above review recommends that laparoscopic ureterolysis provides a suitable option for primary conservative approach for all women with ureteric endometriosis, a procedure with low complication and recurrence rates.

Conflict of interest

The authors declare that they have no conflicts of interest and nothing to disclose.

Source of funding

None.

References

- [1] Eskenazi B, Warner ML. Epidemiology of endometriosis. *Obstet Gynecol Clin North Am* 1997;**24**:235–58.
- [2] 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**:46–51.
- [3] Ghezzi F, Cromi A, Bergamini V, Boils P. Management of ureteral endometriosis: areas of controversy. *Curr Opin Obstet Gynecol* 2007;**19**:319–24.
- [4] Clement PB. Endometriosis, lesions of the secondary Mullerian system and pelvic mesothelial proliferations. In: Kurman RJ, editor. *Blaustein's pathology of the female genital tract*. 3rd ed. New York: Springer-Verlag; 1987. p. 516–59.
- [5] Smith IA, Cooper M. Management of ureteric endometriosis associated with hydronephrosis: an Australian case series of 13 patients. *BMC Res Notes* 2010;**3**:45. <https://doi.org/10.1186/1756-0500-3-45>.
- [6] Umar SA, MacLennan GT, Cheng L. Endometriosis of the ureter. *J Urol* 2008;**179**:2412. <https://doi.org/10.1016/j.juro.2008.03.083>.
- [7] Muñoz JL, Jiménez JS, Tejerizo A, Lopez G, Duarte J, Sánchez Bustos F. Rectosigmoid deep infiltrating endometriosis and ureteral involvement with loss of renal function. *Eur J Obstet Gynecol Reprod Biol* 2012;**162**:121–4.
- [8] Seracchioli R, Mabrouk M, Manuzzi L, Guerrini M, Villa G, Montanari G, et al. Importance of retroperitoneal ureteric evaluation in cases of deep infiltrating endometriosis. *J Minim Invasive Gynecol* 2008;**15**:435–9.
- [9] Yohannes P. Ureteral endometriosis. *J Urol* 2003;**170**:20–5.
- [10] Palla VV, Karaolanis G, Katafigiotis I, Anastasiou I. Ureteral endometriosis: a systematic literature review. *Indian J Urol* 2017;**33**:276–82.
- [11] Nezhat C, Paka C, Gomaa M, Schipper E. Silent loss of kidney secondary to ureteral endometriosis. *JSLs* 2012;**16**:451–5.
- [12] Nezhat C, Silfen S, Nezhat F, Martin D. Surgery for endometriosis. *Curr Opin Obstet Gynecol* 1991;**3**:385–93.
- [13] Antonelli A, Simeone C, Zani D, Sacconi T, Minini G, Canossi E, et al. Clinical aspects and surgical treatment of urinary tract endometriosis: our experience with 31 cases. *Eur Urol* 2006;**49**:1093–7.
- [14] Ghezzi F, Cromi A, Bergamini V, Serati M, Sacco A, Mueller MD. Outcome of laparoscopic ureterolysis for ureteral endometriosis. *Fertil Steril* 2006;**86**:418–22.
- [15] Soriano D, Schonman R, Nadu A, Lebovitz O, Schiff E, Seidman DS, 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**:483–8.
- [16] Bosev D, Nicoll LM, Bhagan L, Lemyre M, Payne CK, Gill H, et al. Laparoscopic management of ureteral endometriosis: the Stanford University hospital experience with 96 consecutive cases. *J Urol* 2009;**182**:2748–52.
- [17] Uccella S, Cromi A, Casarin J, Bogani G, Pinelli C, Serati M, et al. Laparoscopy for ureteral endometriosis: surgical details, long-term follow-up, and fertility outcomes. *Fertil Steril* 2014;**102**:160–6.
- [18] 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**:147–52.