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Original Article

Clinical characteristics and surgical treatment of ureteral endometriosis

Jiali Gu[1*], Ding Ding[1*], Xishi Liu[1,2]

[1]Shanghai OB/GYN Hospital, Fudan University, Shanghai 200011, China; [2]Shanghai Key Laboratory of Female Reproductive Endocrine-Related Diseases, Fudan University, Shanghai 200011, China. [*]Equal contributors.

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Abstract: Objective: Ureteral endometriosis is a special type of deep endometriosis, ureteral endometriosis is from the ectopic endometrium in the ureteral area surrounding the adhesion, and it causes oppression to the ureter or ectopic endometrial infiltrating growth in the ureteral surface and wall, as well as causes urinary tract obstruction, narrowing, and pathological changes of diseases such as hydronephrosis, and can even lead to kidney failure. In this study, we explore and discuss the clinical characteristics, surgical therapeutic methods and postoperative recurrence of ureteral endometriosis (UE). Materials and Methods: The clinical data of 80 patients with ureteral endometriosis who were treated and operated on by the Obstetrics and Gynecology Hospital of Fudan University from January 2015 to July 2020 were retrospectively analyzed. Telephone follow-up or regular outpatient follow-up information was carried out to analyze the recurrence of the disease or symptoms. Results: Median patient ages were 39±7 years old. Thirty-seven cases (46.25%) had a history of related procedures (for ovarian endometrioma, adenomyosis and deep endometriosis). Sixty-five (81.25%) and 21 cases (26.25%) had dysmenorrhea and urinary system-related symptoms, respectively. Ten cases (12.50%) demonstrated elevated creatinine levels prior to surgery. Hydronephrosis and obstruction of the upper urinary tract were identified in 38 of 49 cases who underwent preoperative imaging examination of the urinary system. UE was confirmed in only 9 cases (11.25%) prior to surgery. All patients had other endometriosis-related conditions and underwent surgical treatment. The revised classification of American Society for Reproductive Medicine (rASRM) scores were >40 points (Stage IV) in 61 cases (76.25%). Seventy-four cases (92.50%) were successfully followed up after surgery. Dysmenorrhea and urinary system-related symptoms recurred in 13 (17.57%) and 4 cases (5.41%), respectively. No pathological or radiological imaging evidence of ureter re-involvement was identified during follow-up. Conclusion: UE is characterized by insidious urinary system symptoms, complication with other endometriosis-associated conditions, and is not usually discovered at early stages. Preoperative imaging should be performed for patients with urinary system symptoms, a history of endometriosis operation or renal dysfunction, to acquire evidence for UE. Eventual diagnosis of UE is based on laparoscopic surgical findings and pathological assessment. Surgical treatment is effective to relieve obstruction, and appropriate surgical approaches should be selected according to the degree of ureteral involvement, and the site and size of endometriotic lesions. Individualized postoperative medication after surgery can reduce the recurrence risk of UE.

Keywords: Ureteral endometriosis, diagnosis, characteristics, surgical treatment, recurrence

Introduction

Endometriosis is a common gynecologic disorder in women of reproductive age. Ureteral endometriosis (UE) is a special type of deep endometriosis, which refers to endometriotic implants that involve the ureter or the surrounding tissue resulting in adhesion to the ureter, which cause oppression to the ureter or ectopic lesion and infiltrates the ureteral surface and wall, causing urinary tract obstruction, narrowing, and pathophysiological changes such as hydronephrosis, and even lead to kidney failure.

However, UE is easily ignored and very difficult to diagnose at the early stage due to the absence of specific symptoms, and around 50% of women with UE may be asymptomatic [1]. UE is usually unilateral, and the distal ureter is the most commonly affected site [2]. Moreover, UE is complex, which often coexists

with other subtypes of endometriosis, or deep endometriosis on other location such as the bladder or uterosacral ligament or rectovaginal septum, or adenomyosis [3]. Theoretically, the treatment of ureter endometriosis may be either medical or surgical, however, in fact, in many circumstances, ureteral obstruction has already occurred when symptoms appear, which demands surgical intervention, to alleviate the obstruction and reverse hydronephrosis, renal malfunction or even loss of renal function, or to prevent the occurrence of these situations. Surgery is an effective means for the treatment of UE, the option of surgical approach depends on the severity of ureteral involvement and the severity of the obstruction, and the location of the lesion, etc. [3].

Although many studies have reported on ureteral endometriosis, certain characteristics, clinical parameters, effects of surgical management, and especially complete follow-up and recurrence information of UE information are still slightly missing in these reports. In the present study, we collected the clinical, surgical and postoperative follow-up information of 80 UE patients who were treated and underwent UE related surgeries at the Fudan University Obstetrics and Gynecology Hospital from January 2015 to July 2020. This study reported a larger number of cases of complete and detailed analysis on the clinical characteristics, diagnosis (including laboratory and imaging examination) and laparoscopic surgical treatment of ureteral endometriosis, as well as the postoperative efficacy, long-term management and follow-up information, so as to give better understanding of the characteristics of UE, which may contribute to early diagnosis, improve treatment effects, and reduce recurrence rate, and eventually improve the quality of life, which may provide better diagnosis and treatment of UE in the future.

Materials and methods

We performed a search of our surgical and pathological databases from January 2015 to July 2020 for cases of UE. Finally, the clinical data of 80 patients who underwent UE related surgical treatment and laparoscopically and were histologically diagnosed with UE in the Obstetrics and Gynecology Hospital Affiliated to Fudan University were collected.

The general characteristics (age and previous endometriosis related surgical history), presenting symptoms and clinical manifestations (dysmenorrhea and urinary system-related symptoms) were collected. Laboratory examinations such as renal functions and the imaging examinations related to urinary system, such as urological ultrasound examination, intravenous pyelography (ivp) examination, abdominal computer tomography (CT) examination, CT urography (CTU) examination, magnetic resonance urography (MRU) examination were also used and recorded. The situations of coexisting endometriosis (ovarian endometrioma, deep endometriosis of other sites) or adenomyosis were collected as well. The surgical approaches, intraoperative situations (specific sites of the lesions, rASRM scores), postoperative pathological reports and postoperative situations (symptoms) and medical treatment were also recorded.

The revised American Society for Reproductive Medicine (rASRM) classification system (1997) is the most widely adopted and claims to be relatively easy to use, to estimate the severity of the disease. The scoring system is based on the results of intraoperative examination and scores in view of the size and the adhesion of the endometrial lesion on the peritoneum and ovary, the fallopian tube, and the adhesion between the pouch of Douglas and uterus. The rASRM total points lead to stage I-IV (I = 1-5, II = 6-15, III = 16-40, IV = >40) [4].

Surgery is an effective means for the treatment of UE. The surgical approaches included ureterolysis, partial ureterectomy with end-to-end anastomosis and ureterovesical reimplantation. Ureterolysis refers to the removal of the lesion on the surface of the ureter and the restore its original anatomical structure. Partial ureterectomy and end-to-end anastomosis is recommended when the lesion is larger or the whole ureteral wall is involved, the ureter of the affected segment needs to be completely resected, and then the two segment ends are anastomosed. Ureteral reimplantation (ureteroneocystostomy) is recommended when the lesion is located at or near (<2 cm) the entrance of ureter into bladder, and the lesion is larger and the obstruction is serious, the affected ureter needs to be completely resected, and then the end of ureter will be reimplanted into

Table 1. The clinical characteristics and surgical treatment methods of 80 patients with UE

Age (years), m ± SD	39±7
Previous relevant surgical history, n (%)	37/80 (46.25%)
Ovarian endometrioma operation, n (%)	26/37 (70.27%)
Adenomyosis operation, n (%)	4/37 (10.81%)
Deep endometriosis operation, n (%)	2/37 (5.41%)
Multiple related operations, n (%)	5/37 (13.51%)
Clinical manifestations	
Dysmenorrhea, n (%)	65/80 (81.25%)
Urinary system-related symptoms, n (%)	21/80 (26.25%)
Imaging examinations, n (%)	49/80 (61.25%)
Surgical treatment approaches	
Ureterolysis, n (%)	59/80 (73.75%)
Partial ureterectomy with end-to-end anastomosis, n (%)	14/80 (17.50%)
Ureterovesical reimplantation, n (%)	3/80 (3.75%)
One side of ureteral adhesion lysis + the other side of partial ureterectomy with end-to-end anastomosis, n (%)	4 (5.0%)

the bladder [5]. The surgical approach applied intraoperatively was based on the severity of ureteral involvement and the severity of the obstruction, the location of the lesion, and the informed consent of patients and their families.

Telephone follow-up or regular outpatient follow-up information were carried out to know whether the patient's dysmenorrhea, chronic pelvic pain, or urinary system symptoms recurred, and imaging examinations were applied to evaluate whether the disease recurred, and if the ureter was involved again. All data were analyzed retrospectively.

This study was approved by the Ethical Committee of the Ob & Gyn Hospital, at Fudan University.

Statistical analysis

This is a retrospective study, we analyzed the characteristics of the recruited ureter endometriosis patients, and calculated the proportion of each of the studied parameters. Statistical analysis was performed with Microsoft Excel 2019 for Windows.

Results

The clinical characteristics (age, previous relevant surgical history, and clinical manifestations) and surgical treatment approaches of 80 patients with ureteral endometriosis are listed in **Table 1**. The mean age of the recruited patients was 39±7 years old. Among these patients, 65/80 (81.25%) had dysmenorrhea, and 21/80 (26.25%) patients had urinary tract related symptoms.

Clinical characteristics

Among the patients with dysmenorrhea, 13 patients (20.0%) had mild dysmenorrhea; 23 patients (35.38%) had moderate dysmenorrhea; and 29 patients (44.62%) had severe dysmenorrhea.

Urinary tract related symptoms mainly included lumbar discomfort (lumbar acid, lumbar pain) in 11 cases (52.38%), urinary tract irritation (frequent urination, urgent urination, dysuria) in 6 cases (28.57%), lumbar discomfort and urinary tract irritation in 3 cases (14.29%), and hematuria, lumbar discomfort and urinary tract irritation in 1 case (4.76%). The mean duration of urinary symptoms was 11.4 months. Among 21 cases with urinary system-related symptoms, 19 cases (90.48%) had dysmenorrhea at the same time.

Laboratory and imaging related examinations

Ten of the 80 patients (12.50%) showed elevated creatinine (>71 umol/L) on preoperative renal function examination, the highest recorded level was 101 μmol/L.

Table 2. Nine cases of ureteral endometriosis were diagnosed preoperatively

Case	clinical manifestations		Creatinine (μmol/L)	History of related operations	Coexisting other sites of endometriosis
	Dysmenorrhea	Urinary system-related symptom			
1	Severe	Urinary irritation	75	No	Other deep endometriosis
2	No	No	50	No	Other deep endometriosis
3	Moderate	No	101	No	Other deep endometriosis
4	Severe	No	73	Endometrioid ovarian cyst operation	Other deep endometriosis + Ovarian endometrioma
5	No	Hematuria + Lumbar discomfort + Urinary irritation	56	No	Adenomyosis
6	Moderate	No	60	No	Other deep endometriosis + Ovarian endometrioma
7	No	Urinary irritation	51	Endometrioid ovarian cyst operation	Ovarian endometrioma
8	No	No	47	No	Other deep endometriosis
9	Severe	No	86	No	Other deep endometriosis

History of related operations: endometrioid ovarian cyst operation, adenomyosis operation and deep endometriosis operation.

Of the patients who underwent preoperative urological imaging examinations, 13 patients (26.53%) underwent urological ultrasound examination, 1 patient (2.04%) underwent intravenous pyelography (IVP) examination, 4 patients (8.16%) underwent abdominal computer tomography examination, 7 patients (14.29%) underwent CT urography (CTU) examination, and 2 patients (4.08%) underwent magnetic resonance urography (MRU) examination, 22 patients (44.90%) underwent multiple imaging examinations. 38 cases (77.55%) displayed hydrops and upper urinary tract obstruction.

Hydrops and obstruction of upper urinary tract were confirmed among patients with abnormal findings on preoperative CTU, abdominal CT and MRU; the sites and causes of obstruction (such as pelvic space-occupying compression of endometrioid ovarian cyst, and invasion of other deep infiltrating endometriosis lesions) and the relation between the ureter and surrounding tissues in the involved area were also displayed.

Only 9 patients (11.25%) were shown to have ureteral endometriosis in preoperative examination. **Table 2** shows the clinical manifestations, previous relevant surgical history, renal function (creatinine), complications and related imaging results of these 9 patients. Surgical indications were other endometriosis-related diseases (endometrioid ovarian cyst, adenomyosis, and other deep infiltrating endometriosis) in 69 cases (86.25%), and uterine myoma in 2 cases (2.50%).

Soft tissue space-occupying shadow in the lower ureter was identified in preoperative imaging for 2 cases, leading to biopsies being performed. Both demonstrated UE upon pathological examination. Preoperative imaging examinations identified that other deep endometriosis may be involved the ureter in the remaining 7 cases.

Surgical treatment

All 80 UE patients underwent surgical treatment. **Table 3** shows intraoperative ureteral involvement, complications with other endometriosis, and r-ASRM scores.

There were 62 patients with ovarian endometrioid cyst, 39 patients with adenomyosis, and 68 patients with other deep endometriosis at the same time.

All patients with ovarian endometrioid cyst underwent ovariectomy or oophorectomy, and all patients with other deep endometriosis underwent lesion resection at the same time. There were 39 patients with adenomyosis at the same time, of which 31 patients underwent adenomyosis related surgery (29 patients underwent total hysterectomy and 2 patients underwent adenomyomectomy).

Uterosacral ligament (the average size of the lesion was 2.16 cm on the left and 1.70 cm on the right), rectum (the average size of the lesion was 2.72 cm) and uterorectal fovea (the average size of the lesion was 2.75 cm) were the

Table 3. Intraoperative conditions of 80 patients with ureteral endometriosis, including ureteral involvement, complications with other subtypes of endometriosis, rASRM score and histological pattern

Involved side of the ureter	
Right side, n (%)	39/80 (48.75%)
Left side, n (%)	28/80 (35.0%)
Bilateral, n (%)	13/80 (16.25%)
Involved site of the ureter	
Lower 1/3 of ureter, n (%)	62/80 (77.50%)
Middle 1/3 of ureter, n (%)	15/80 (18.75%)
Lower 1/3 + middle 1/3 of ureter, n (%)	3/80 (3.75%)
Other endometriosis-related diseases	
Endometrioid ovarian cyst, n (%)	6/80 (7.50%)
Adenomyosis, n (%)	1/80 (1.25%)
Other deep endometriosis, n (%)	12/80 (15.0%)
Ovarian endometrioma + Adenomyosis, n (%)	5/80 (6.25%)
Ovarian endometrioma + Other deep endometriosis, n (%)	23/80 (28.75%)
Adenomyosis + Other deep endometriosis, n (%)	5/80 (6.25%)
Ovarian endometrioma + Adenomyosis + Other deep endometriosis, n (%)	28/80 (35.0%)
rASRM stage	
Stage I (slight, score 1-5), n (%)	1/80 (1.25%)
Stage II (mild, score 6-15), n (%)	9/80 (11.25%)
Stage III (moderate, score 16-40), n (%)	9/80 (11.25%)
Stage IV (severe, score >40), n (%)	61/80 (76.25%)
Histological pattern	
Endometriotic UE, n (%)	70 (87.5%)
Fibrotic UE, n (%)	10 (12.5%)

Table 4. Postoperative medical treatment

Postoperative treatment	47/74 (63.51%)
GnRH-a, n (%)	33/47 (70.21%)
Oral contraceptives, n (%)	2/47 (4.26%)
Mirena, n (%)	2/47 (4.26%)
GnRH-a + oral contraceptives, n (%)	6/47 (12.76%)
GnRH-a + Mirena, n (%)	4/47 (8.51%)

three most affected sites in other deep infiltrating endometriosis.

Only 5 cases (6.25%) were complicated by endometriosis of the bladder, including 2 cases with lesions at the entrance of the ureter-bladder, involving both the ureter and the bladder. The ureter and the bladder were involved at different sites in the remaining 3 cases.

Postoperative pathology

Endometriotic lesions completely adhering to the ureter or the affected ureters were resected during operation. Following surgical resection, 70 cases (87.50%) demonstrated UE upon pathological examination of endometriotic glands and stroma; the remaining 10 cases (12.50%) were diagnosed with fibrous tissue, inflammation, hemosiderosis and remote hemorrhage.

Postoperative medical treatment and follow-up

The median follow-up time was 25 months (range 6-68 months) as of January 31, 2021. Seventy-four cases (92.50%) were successfully followed up, and the remaining 6 cases (7.50%) were lost to follow-up. Further postoperative treatment after surgery were applied and listed in **Table 4**. The average duration of postoperative gonadotropin-releasing hormone agonist (GnRH)-a treatment and oral contraceptive treatment was 4.72 months and 11.36 months, respectively.

Among the 74 patients who were successfully followed up, 13 cases (17.57%) experienced recurrence of dysmenorrhea symptoms; the average time to symptom recurrence was 6 months after surgery; 1 case had symptoms

which were relieved with oral Chinese medicine.

Urinary system-related symptoms recurred in 4 cases (5.41%) at an average of 7.5 months after operation; these mainly manifested as lumbar discomfort and dysuria. There were no obvious abnormalities identified upon urinary system ultrasound examination. No pathological or radiological imaging evidence of ureteral re-involvement was identified in the 74 patients who achieved follow-up.

Discussion

Clinical manifestations of ureteral endometriosis

With regard to clinical manifestations, UE is known to cause urinary system-related symptoms such as frequent urination, urgent urination, dysuria and lumbar discomfort; renal failure can occur in severe cases [6], but symptoms are generally insidious in nature [7, 8]. In this study, only 21 patients (26.25%) had urinary system-related symptoms, and only 1 patient (1.25%) had hematuria, indicating that UE at early stage maybe asymptomatic.

In addition, one previous study [9], showed that dysmenorrhea in patients with ureteral endometriosis could be as high as 83%. In this study, 65 patients (81.25%) had dysmenorrhea. Among 21 patients with urinary system-related symptoms, 19 patients (90.48%) also had dysmenorrhea, which was also consistent with the literature.

Deep endometriosis and ureteral endometriosis

Ureteral endometriosis is a special type of deep endometriosis. At present, the etiology of ureteral endometriosis has not been fully elucidated. Some scholars believe that ureteral endometriosis is developed from endometriosis in other sites of the pelvic cavity, which is the current Mullerian tube metaplasia (embryo cell planting theory) [10].

Studies have shown that the ureter could be most often involved when the endometriotic lesions are located in the uterosacral ligament and cardinal ligament [11, 12]. In addition, studies have shown that when the size of endometriotic lesions located in the right uterosacral ligament >1.75 cm or left uterosacral ligament endometriosis >1.95 cm can increase the risk of ureteral involvement [13]. In this study, 68 patients were complicated with other parts of deep endometriosis. The most affected three sites were the uterosacral ligament, rectum and uterorectal cul de sac. In this study, the average size of the left uterosacral ligament endometriosis was 2.16 cm, and the average size of the right uterosacral ligament endometriosis was 1.70 cm, which is basically consistent with the literature.

Only 5 cases (6.25%) were complicated by bladder endometriosis, including 3 cases with ureteral and bladder involvement at different sites. These findings are consistent with reports from Mauricio Simoes Abrao suggesting no specific correlation between UE and bladder endometriosis [14].

Preoperative diagnosis of ureteral endometriosis

Ureteral endometriosis reported in the literature is often combined with endometriosis in other parts, with 50% of UE being asymptomatic [1] and easily ignored in the early stage. In this study, only 49 patients (61.25%) had urinary system-related imaging examinations before surgery, and among them, 38 patients (77.55%) showed positive findings such as hydronephrosis and lower urinary tract obstruction. All 80 patients were coexisting with endometriosis on other sites, however, only 9 cases (11.25%) were diagnosed with UE prior to surgery. Complications with multiple conditions makes UE diagnosis challenging.

Previous related surgical history and ureteral endometriosis

It was reported that the risk of UE can be significantly related to the surgical history of endometriosis and r-ASRM stage IV [15]. In this study, 37 cases (46.25%) had a history of endometriosis related surgeries, and the intraoperative r-ASRM in 61 cases (76.25%) were >40 points, which mean at r-ASRM stage IV, this proved that these two indicators are the high-risk factors of UE.

Other features of ureteral endometriosis

UE frequently occurs in women of childbearing age (30-40 years old) and occurs most fre-

quently in the lower 1/3 part of ureter [16, 17]. The majority of UE cases unilaterally affect the left side [17, 18] (approximately 55-60% cases), while around 10-20% of patients have bilateral involvement. In our cohort of 80 UE patients, the average patient age was 39±7 years and the lower 1/3 of ureter was involved in 62 cases (77.50%); these findings are consistent with previous reports of UE. However, we identify a larger percentage of cases with unilateral involvement on the right side as compared to previous reports (48.75% of our cohort), with only 35.0% demonstrating unilateral left-sided UE. Different etiological mechanisms represent one potential explanation for this discrepancy; further research is required to characterize laterality-determining factors in UE.

Imaging examination of ureteral endometriosis

As a convenient and inexpensive examination-urinary system ultrasonography can initially check the severity of urinary system obstruction and hydronephrosis [18]. IVP and CTU are superior to ultrasound in that they can identify the exact location, area and degree of local stenosis. CTU has the advantages of multi-directional observation of lesions and high diagnostic rate of negative stones. MRU can show the site and nature of lesions, the relation between lesions and surrounding tissues such as the degree of adhesion. Ureteroscopy can be used to directly observe ureteral lesions and is useful for obtaining biopsy specimens for histological analysis and diagnosis [19]. In this study, among the 22 patients who underwent a variety of imaging investigations prior to surgery, no obvious abnormalities were found in urinary system ultrasound examination and in CTU there was only one case. Three cases displayed no obvious abnormalities via urinary system ultrasound prior to surgery; urinary system obstruction and hydrops were identified by further imaging. The remaining 18 cases underwent all-round urinary system imaging examinations before surgery, where abnormalities were confirmed.

When ureteral compression and obstruction are suspected, it is necessary to conduct comprehensive evaluations, selecting the most appropriate investigative imaging techniques to determine whether urinary tract obstruction and hydronephrosis are present. Imaging evaluation helps us to determine whether timely surgical intervention is needed to relieve ureteral obstruction, protect renal function and prevent the further development of loss of renal function.

Treatment of ureteral endometriosis

Currently, medical treatment is therefore mainly used to reduce inflammatory reactions, alleviate pain, and shrink the lesion prior to surgery, increasing the likelihood of complete resection of the lesion [20, 21]; medical treatment is also the core of long-term management of endometriosis, which helps to shrink the residual lesions and to reduce the risk of recurrence [21].

Surgery is an effective treatment approach for UE to relieve ureteral obstruction, protect renal function and prevent the further development of complete loss of renal function [22]. Surgical procedures mainly include ureterolysis, partial ureterectomy with end-to-end anastomosis, ureteroneocystostomy and nephro-ureterectomy on the affected side [5].

The efficacy of surgical treatment is related to the location and severity of lesions, alongside the surgeon's technique and experience. In this study, 59 cases (73.75%) underwent ureterolysis. Among them, the ureter was wrapped by the endometriotic lesions at the diseased site in 3 cases and ureterolysis was performed. The remaining 56 cases had superficial endometriotic lesions on the surface of ureter and underwent ureterolysis and lesion resection on the ureter surface. In 14 cases (17.50%), the lesions deeply involved the ureter and ureteral stenosis was obvious at the diseased site; the lesions were located away from the bladder, and partial ureterectomy with end-to-end anastomosis was therefore performed. Three cases (3.75%) with deeply located lesions near the entrance of ureter-bladder and severe obstruction underwent ureterovesical reimplantation following lesion resection. Finally, bilateral ureters were involved in different degrees for 4 cases (5%), so ureteral adhesion lysis was performed on one side, while partial ureterectomy with end-to-end anastomosis was adopted on the other side.

Postoperative histological pattern and related classification

Fibrosis is commonly seen in endometriosis [23], but represents a complex process, the mechanisms are not yet fully understood. Recently emerging evidence indicates that endometriotic lesions experience cyclical bleeding, they are essentially wounds undergoing repeated tissue injury and repair (ReTIAR), and platelets induce epithelial-mesenchymal transition (EMT), fibroblast-to-myofibroblast transdifferentiation (FMT), leading ultimately tissue fibrosis [23-25]. Tissue fibrosis also occurs in UE. Thus, the histological classification refers to endometriotic UE or fibrotic UE. Endometriotic UE refers to ectopic endometrial components (glands and stroma) in the wall of ureter or the tissue around ureteral epithelium, and also includes a large number of fibrous components in the lesion. Fibrotic UE refers to only fibrous tissue in the ureteral wall or the tissue around ureteral epithelium. In this study, for the 80 cases of UE, 70 (87.5%) and 10 (12.5%), respectively, were reported with endometriotic tissue and fibrotic tissue only by pathological diagnosis. Besides, it is reported UE could also be classified as extrinsic and intrinsic UE and the distinction between extrinsic and intrinsic UE based on the degree of ureteral wall infiltration by endometriosis [6].

Postoperative management of ureteral endometriosis

A number of studies have confirmed the efficacy of postoperative treatment following endometriosis resection for reducing the risk of subsequent recurrence [20, 26]. Radical surgical resection of endometriotic lesions is also an important factor for reducing recurrence [27]. In this study, 47 patients were treated with GnRH-a, oral contraceptives or intrauterine Mirena implant after surgery. No ureteral reinvolvement was identified by postoperative imaging or histological diagnosis in the 74 patients with follow-up. Dysmenorrhea recurred in 13 cases (17.57%) at an average duration of 6 months after surgery, while urinary system-related symptoms relapsed in 4 cases (5.41%) at an average of 7.5 months after surgery, indicating that symptom recurrence is more likely to occur after UE surgeries.

Conclusion

UE is asymptomatic at early stages, with insidious urinary system-related symptoms and is frequently coexists with other sites of endometriosis; which contributes to difficulty in early diagnosis of UE. Increased awareness of UE is important for reducing delayed diagnosis. Preoperative urinary system imaging should be performed for patients with urinary system-related symptoms, larger lesions at the sites of uterosacral ligament or Pouch of Douglos, a history of related endometriosis surgeries or renal dysfunction, to identify possible UE. Urinary system imaging plays an important role in improving diagnosis. Urinary system ultrasound examination can be applied as the first-line choice for routine screening, while both CTU and MRU could provide further help for diagnosis; however, definitive diagnosis is based upon the intraoperative findings and postoperative pathology. Surgical treatment can effectively relieve obstruction; appropriate surgical methods should be selected based on the degree of ureteral involvement, site of the lesion and the size, to completely resect the lesion and protect or reverse the renal function. Individualized postoperative medications need to be actively applied based on patients' age, conditions of endometriosis at other sites, and staging and severity of the disease, and eventually reduce the risk of recurrence.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Xishi Liu, Shanghai Obstetrics and Gynecology Hospital, Fudan University, 419 Fangxie Road, Shanghai 200011, China. Fax: +86-21-63455090; E-mail: lxsdoc@hotmail.com

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