Diagnosis and management of cases with deep infiltrating endometriosis affecting the urinary tract

C.B. Coroleucă, C. Berceanu2, L. Brindușe3, D. Marcu4, C.A. Coroleucă1, Elvira Brătilă1

Abstract: Objective: The goal of this paper is to present the management of cases of deep endometriosis that affects the bladder, the ureters and the kidney.

Materials and method: In this review we analyzed the sensitivity and specificity of imaging techniques for diagnosing deep infiltrating endometriosis, the optimal surgical technique and the surgical approach.

Results: In patients with pelvic endometriosis in advanced stages the urinary tract is frequently involved. Preoperative work-up of patients with deep infiltrating endometriosis is aimed at evaluating the extension of the lesions in order to assess the complexity of the intervention and to choose the optimal approach.

Conclusions: Laparoscopic and robotic management of these cases are good therapeutic alternatives. Ultrasound, sonovaginography with gel and MRI are useful imaging techniques for evaluating patients with deep infiltrating endometriosis. The surgical management of patients with deep infiltrating endometriosis that involves the urinary tract consists of partial bladder resections, ureterolysis, ureteral resection and anastomosis and ureteral reimplantation.

Keywords: bladder endometriosis, deep infiltrating endometriosis, ureterolysis

INTRODUCTION

Endometriosis is a benign pathology of the female reproductive tract, characterized by the presence of endometrial glands or stroma outside the uterine cavity [1]. The presence of endometrial tissue at the level of the bladder will be stimulated during the menstrual cycle. In response to the cyclical stimulation of hormones throughout the menstrual cycle, some patients may even present with cyclic hematuria [2,3].

Bladder endometriosis can be defined as “primary” or “secondary”. Primary bladder endometriosis is represented by lesions associated with deep infiltrating endometriosis.

Secondary bladder endometriosis is represented by lesions that have occurred iatrogenically after pelvic surgery, caesarean section or hysterectomy [4,5].

The distribution of the lesions is multifocal, affecting the bladder trigone and dome from the serosa to the mucosa [6,7].

The ectopic endometrial tissue is subjected to stimulation during the normal cycle creating hormonal changes that result in
bleeding, inflammation and adhesions [8]. The two main manifestations of this disease are chronic pelvic pain of varying intensity and infertility [9,10].

Table 1: The prevalence of urinary tract endometriosis [11]

<table>
<thead>
<tr>
<th>Location</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney</td>
<td>4% of all urinary tract locations</td>
</tr>
<tr>
<td>Ureter</td>
<td>9% of all urinary tract locations</td>
</tr>
<tr>
<td>Bladder</td>
<td>85% of all urinary tract locations</td>
</tr>
<tr>
<td>Urethra</td>
<td>2% of all urinary tract locations</td>
</tr>
<tr>
<td>Prevalence</td>
<td>0.3 – 12% of all cases of endometriosis</td>
</tr>
</tbody>
</table>

**DIAGNOSIS**

The diagnosis of bladder endometriosis is based on the presence of ectopic endometrial glands and stroma located at the level of the detrusor muscle. Patients presenting with bladder endometriosis often present nonspecific urinary symptoms. In some cases, patients will present with dysuria, urgency to void, frequent micturition and abdominal pain [12,13]. The main aspect that dominates the clinical picture is exacerbation of these symptoms during the menstrual period [14]. Due to the fact that the symptomatology of bladder endometriosis is nonspecific, many women will not seek medical attention in the first few years. The symptomatology can vary depending on the site and the dimension of the lesion [15]. The various degrees of abdominal or pelvic pain associated with bladder endometriosis will not prompt patients to seek additional work-up for this syndrome [16]. Thus, an average of 6 years will pass from the onset of the symptomatology to the diagnosis of endometriosis [17].

Urinary tract endometriosis can present with a nonspecific symptomatology [18-20]. The presence of endometrial tissue at the level of ureteral orifices can produce hydronephrosis, with subsequent renal failure [21,22]. If the ureteral obstruction is acute, the symptoms may mimic a renal colic that requires a form of drainage [23-25]. In chronic urinary obstruction, the lumbar pain can be absent and the renal insufficiency could appear like arterial hypertension, due to a bad regulation of blood pressure, thus involving the delay of a right treatment [26-28]. The medical history and accurate identification of the patient’s symptoms can guide the clinician in choosing the correct imaging investigations based on the presenting symptoms.

**Imaging diagnosis**

Ultrasonography is the first line imaging investigation used in the work-up for patients with endometriosis. The bladder and the kidneys can be evaluated using transvaginal and abdominal ultrasound. The patient’s bladder should be in semirepletion for a correct evaluation. (Figure 1)

Abdominal ultrasound can be used in cases of suspected lesions of the bladder, abdominal wall and umbilical endometriosis [29]. During the initial work-up of a patient with deep infiltrating endometriosis, an abdominal ultrasound must be performed to evaluate the impact on the ureters and kidneys. Endometriotic lesions can affect the ureter extrinsically or intrinsically. This can have an impact on the kidney causing hydronephrosis or ureterohydronephrosis. Any other causes of ureteral extrinsic compression must be excluded [30-33]. If surgical excision of the lesions is not performed this may affect the kidney leading to loss of function [19-25].

There are some authors that suggest that ureteral endometriosis should be suspected in all cases of deep infiltrating endometriosis [34].

Sonovaginography with ultrasound gel is a useful diagnostic option in cases with deep infiltrating endometriosis. This method is useful for identifying endometriotic lesions in the posterior compartment as well as in the anterior compartment. An acoustic window is created by introducing 20 ml of ultrasound
gel into the vagina. The technique initially used saline solution [35]. Using this technique, we observed a high diagnostic accuracy for the following locations (transvaginal ultrasound – TVS sonovaginography with gel – SVG) – Table 2.

<table>
<thead>
<tr>
<th>Endometriotic lesion</th>
<th>Ultrasound</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovaries</td>
<td>TVS</td>
<td>94.8 %</td>
<td>95.6 %</td>
<td>92.5 %</td>
<td>94 %</td>
</tr>
<tr>
<td></td>
<td>SVG</td>
<td>95.5 %</td>
<td>97 %</td>
<td>92.6 %</td>
<td>93 %</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>TVS</td>
<td>65.5 %</td>
<td>98.6 %</td>
<td>66.6 %</td>
<td>98.5 %</td>
</tr>
<tr>
<td></td>
<td>SVG</td>
<td>67 %</td>
<td>97 %</td>
<td>98 %</td>
<td>98 %</td>
</tr>
<tr>
<td>Utero-sacral ligaments</td>
<td>TVS</td>
<td>69.7 %</td>
<td>95 %</td>
<td>84.2 %</td>
<td>87 %</td>
</tr>
<tr>
<td></td>
<td>SVG</td>
<td>78.5 %</td>
<td>96 %</td>
<td>89 %</td>
<td>91 %</td>
</tr>
<tr>
<td>Vagina</td>
<td>TVS</td>
<td>58.5 %</td>
<td>99 %</td>
<td>94.3 %</td>
<td>95.4 %</td>
</tr>
<tr>
<td></td>
<td>SVG</td>
<td>79 %</td>
<td>99 %</td>
<td>92 %</td>
<td>96 %</td>
</tr>
<tr>
<td>Recto-vaginal septum</td>
<td>TVS</td>
<td>64.8 %</td>
<td>99.4 %</td>
<td>81.5 %</td>
<td>97.8 %</td>
</tr>
<tr>
<td></td>
<td>SVG</td>
<td>94 %</td>
<td>97 %</td>
<td>82 %</td>
<td>93.5 %</td>
</tr>
<tr>
<td>Pouch of Douglas</td>
<td>TVS</td>
<td>81.5 %</td>
<td>99 %</td>
<td>95 %</td>
<td>97 %</td>
</tr>
<tr>
<td></td>
<td>SVG</td>
<td>81 %</td>
<td>98 %</td>
<td>91 %</td>
<td>97 %</td>
</tr>
<tr>
<td>Recto-sigmoid</td>
<td>TVS</td>
<td>91 %</td>
<td>97 %</td>
<td>95 %</td>
<td>96 %</td>
</tr>
<tr>
<td></td>
<td>SVG</td>
<td>94 %</td>
<td>95.5 %</td>
<td>91 %</td>
<td>97.2 %</td>
</tr>
</tbody>
</table>

In the anterior compartment the transvaginal ultrasound and sonovaginography with gel have a similar sensitivity and specificity (80.1 % vs 81.2 % and 97.1% vs 97%). However, the positive predictive value is in favour of the latter (79.5 % vs 95.3 %). In cases of with deep infiltrating endometriosis the association between magnetic resonance imaging and computer tomography- based virtual colonoscopy has a sensitivity of 98.36 % for nodule identification. The association of these two investigations allows a superior mapping of the endometriotic lesions at the level of the posterior compartment. This aspect is important in the preoperative work-up and planning for the surgery [37].

TREATMENT

Medical treatment

Medical treatment using progestins, oral contraceptives and GnRH agonists can be used in the treatment of patients with endometriosis [38-40]. The contraindications of medical treatment in patients with urinary tract endometriosis are: evidence of the kidney being affected by hydronephrosis, the patient’s desire and contraindications for the treatment [41,42]. The imunohistochemical aspects of patients treated with progesterone can be useful in choosing the optimal medical treatment after the surgical intervention [43,44]. The expression of the anti-apoptotic markers (Bcl-2), cell proliferation markers (Ki-67), estrogen and progesterone receptors offers anexplanation for the different outcomes after medical treatment for patients with endometriosis [45,46].

Surgical treatment

Surgical treatment of urinary tract endometriosis must be performed when the patient does not respond to medical treatment, if the patient suffers from infertility or if the lesion has an impact on the kidney (ureteral obstruction, hydronephrosis or uretero-hydronephrosis) [47,48]. Due to the fact that the obstruction of the ureter is due to fibrosis, patients will not respond well to medical treatment [49,50]. During the initial work-up and planning for the surgical intervention, the symptoms exhibited by the patient
and the imaging investigations can guide the therapeutic conduct and anticipate the complexity of the case [51,52]. This is a key aspect in deciding the optimal intervention for the patient and anticipate whether a multidisciplinary approach is in order (gynaecologist, urologist and colorectal surgeon) [53,54]. The treatment for bladder endometriosis is represented by the surgical excision of the lesion.

**Figure 2:** Robotic ureterolysis ([Personal collection of Prof. Elvira Brătilă](#))

The surgical approach can be performed by laparotomy, laparoscopy or robotic surgery (Figure 2) [55-57]. The treatment for ureteral endometriosis consists of the surgical excision of the lesions involving the ureters in order to prevent ureteral compression (Figure 3).

**Figure 3:** Endometriotic lesion of that affected the ureter extrinsically at the level of the vesicoureteral junction ([Personal collection of Prof. Elvira Brătilă](#))

Ureterolysis is the first procedure performed when the lesion affecting the ureter is extrinsic. During the laparoscopic and robotic surgery, the transperitoneal approach way allows a thorough evaluation of the extension of the disease.

When the ureters are affected intrinsically, the ureteral segment can be infiltrated by the endometriotic lesions. In this case, a resection of the affected segment and reimplantation can be an alternative if ureterolysis cannot be performed [58,59].

After the completion of the ureterolysis (dissection of the tissue up to the level of the cardinal ligament), a thorough assessment of the remaining segment is required [60]. This must take into account the possibility of another obstruction of the ureter. The level at which the ureter is affected represents a factor for the intraoperative decision to perform ureterolysis, ureteral resection and anastomosis or ureteroneocystotomy [61,62]. If the lesion is located in the distal part of the ureter, the affected segment can be resected and the ureter can be reimplanted in the bladder. If the lesion is located in the upper third of the ureter, the affected segment can be resected and repaired with an uretero-ureteral anastomosis. The choice between ureterolysis and resection cannot be
made preoperatively.

CONCLUSIONS
In patients with pelvic endometriosis in advanced stages, the urinary tract is frequently involved. Laparoscopic and robotic management of these cases is a good therapeutic alternative [63,64]. Preoperative work-up of patients with deep infiltrating endometriosis is aimed at evaluating the extension of the lesions in order to assess the complexity of the intervention and to choose the optimal approach [65,66]. Ultrasound, sonovaginography with gel and MRI are useful imaging techniques for evaluating patients with deep infiltrating endometriosis [67]. The surgical management of patients with deep infiltrating endometriosis that involve the urinary tract consists of ureterolysis, ureteral resection and anastomosis and ureteral reimplantation [68-70].

References:


