

Pre and Postoperative Lower Urinary Tract Dysfunction Associated with Deep Infiltrating Endometriosis: A Prospective Observational Study

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Abstract

Objective: This study evaluates the impact of deep infiltrating endometriosis (DIE) surgery on lower urinary tract dysfunction for patient without preoperative lower urinary tract symptom or documented bladder endometriosis.

Design: A prospective observational study.

Method: We used a portable ultrasound device (bladder scan) to measure bladder post-voiding residual volume (PVR), before and after surgery for all patients undergoing surgery for DIE. Criteria of inclusion: patients older than 18 years-old diagnosed with DIE confirmed by pelvic magnetic resonance imaging (MRI) and required surgical intervention. Criteria of exclusion were patients with contraindication for laparoscopic surgery, patients with preoperative lower urinary tract symptom, patients diagnosed with DIE involving the bladder or the urological tract, patients with history of neurogenic bladder, patients with history of surgical treatment of endometriosis.

Result: 49 patients were included in the study. 9 of 49 patients (18.4%) presented with abnormal preoperative PVR. Among them, 5 patients (10.2%) had normal post-operative PVR and 4 (8.2%) were diagnosed with bladder atony before and after the surgical intervention. 40 patients (81.6%) had normal pre-operative PVR. Among them, 12 patients (24.5%) had abnormal PVR in post-operative period.

Conclusion: Endometriosis is a sever benign condition that could impair bladder function in totally asymptomatic patient. Preoperative PVR measurement is a simple and non-invasive tool to assess voiding function before surgery. Preoperative and postoperative voiding function assessment should be part of the management of patients undergoing surgery for DIE. Impact of DIE and surgery on voiding function should be part of the information given to patients.

Keywords: Deep Infiltrating Endometriosis; Pelvic Surgery; Nerve Sparing; Post-Voiding Residual Volume

Introduction

Deep infiltrating endometriosis (DIE) can be defined as lesions presenting in pelvic and retro-peritoneum space with depth at least 5 mm [1,2]. It has been estimated that 7 - 10% of female population of reproductive age may have endometriosis [3,4]. Millions of women are affected with this disease in different stages. Therefore, considering the magnitude of incidence of the disease and its impact on quality of life, DIE could be considered as public health problem.

The autonomic nervous system of female pelvis involves both sympathetic and parasympathetic pathways [5-8]. The pelvis innervation is supply by parasympathetic fibers that arise from the S2-4 nerve roots and by sympathetic fiber from the superior hypogastric plexus. Sympathetic and parasympathetic fibers join to the inferior hypogastric plexus [5-7,9,10]. The bladder receives motor and sensitive innervation from both sympathetic and parasympathetic systems by inferior hypogastric nerve and splanchnic nerves respectively. Therefore, bladder function may be impaired in patients due to endometriosis lesions or fibrotic neural involvement that caused by the deep infiltration of endometriosis in pelvic organs and retro-peritoneum spaces [2,11,12].

Bladder atony is a common complication that may occurred after surgical interventions that require extensive dissection into the lateral and the posterior pelvic wall and parametria [7,12-16]. This condition is most often transitory but may be persistent in 3.5 - 14.3% of cases [12].

Nerve-sparing surgery developed in surgical oncology has also been advocated for DIE [17]. This type of surgery is usually used in excision of utero-sacral ligament and recto-vaginal endometriosis. Although, its benefit is still unclear, many publications justify the feasibility and better outcome with this type of procedure [6,10,18].

Aim of the Study

The aim of this study is to focus on perioperative bladder function in patients diagnosed with DIE without any lower urinary tract symptom or history of bladder endometriosis lesions to precise the existence of preoperative asymptomatic bladder dysfunction in patients who might present with postoperative voiding complications.

Materials and Methods

We conducted a monocenter prospective observational study for one-year duration.

We included all patients who match the following inclusion criteria: Patients older than 18 with DIE confirmed by pelvic magnetic resonance imaging (MRI) and requiring surgical treatment according to clinical recommendation.

The criteria of exclusion were a contraindication for laparoscopic surgery, active lower urinary tract symptom before surgery, lower urinary tract endometriosis lesion, neurogenic bladder and history of surgical treatment of endometriosis.

The clinical bladder assessment was performed by measuring the post-voiding residual volume (PVR) by using portable ultrasonic bladder scan (bladder scan) the day before surgical intervention and after removing the indwelling bladder catheter after the surgery.

There is no consensus concerning the definition of bladder atony on measurement of PVR volume in comparison with voided volume. The diagnosis of bladder atony in this study was confirmed if one of the following criteria met the diagnosis:

- Patients unable to void at all.
- PVR more or equal to one third of total micturition volume.

No further investigation was performed for evaluation of the bladder atony before the surgery. According to French policies, no ethical committees' agreement was necessary to undergo the study, as the evaluated intervention was noninvasive, without any impact on patients care, and perform in the context of routine practice. Patients were asked to sign a consent after information before being enrolled in the study.

Results

We included 49 patients who met the inclusion criteria. The duration of the inserted indwelling bladder catheter was 24h - 72h. The mean age was 33.6 +/- 6.2 years and the average body mass index (BMI) was 24.4 +/- 5.1. Nine patients (18.4%) presented with abnormal preoperative PVR. Among them, four patients (8.2%) were diagnosed with bladder atony before and after the surgery (Table 1), among these four patients, only one had endometriotic lesion that affects the uterosacral ligament and could increase the risk of bladder atony. Five patients (10.2%) were diagnosed with abnormal preoperative PVR and normal postoperative PVR (Table 2). 40 patients had normal pre-operative PVR, within those cases, and 12 patients had abnormal PVR in postoperative period (Table 3). All patient underwent surgery had no intra-operative or post-operative complication.

Age (years)	BMI (Kg/m ²)	Site of DIE	Surgical intervention	Pre-operative Micturition volume (mL)	Pre-operative PVR (mL)	Post-operative Micturition volume (ml)	Post-operative PVR (mL)
34	21.4	Para-Rectal fossa	Adhesiolysis, Tubal permeability, Unilateral Salpingectomy, Resection of Retroperitoneal Cyst in the space para-rectal	125	258	75	70
34	20.3	Ovarian Fossa and Uterus	Adhesiolysis Abdomen-pelvic, Tubal permeability	100	143	180	106
27	30.9	Uterosacral Ligament (bilateral)	Abdomen-pelvic Adhesiolysis, Tubal Permeability, Resection of Uterosacral Ligaments	70	59	50	100
22	21.3	Ovarian Fossa and uterus	Abdomen-pelvic Adhesiolysis, Tubal Permeability	25	10	50	18

Table 1: Patients with abnormal voiding function before and after surgery.

Age (years)	BMI (Kg/m ²)	Site of DIE	Type of surgery	Pre-operative Micturition volume (mL)	Pre-operative PVR (mL)	Post-operative Micturition volume (ml)	Post-operative PVR (mL)
31	21.7	Ovarian Fossa and Uterus	Tubal and Pelvis Adhesiolysis, Tubal Permeability Test	100	55	130	22
36	21.1	Recto-Vaginal Space	Abdominal and Pelvis Adhesiolysis, Tubal Permeability Test, Removal of Recto-vaginal septum, Sigmoidectomy with bowel anastomosis	75	64	250	30
33	21.1	Ovarian and Sigmoid Infiltrated Endometriosis	Pelvis Adhesiolysis, Tubal Permeability, Ovarian cystectomy Recto-Sigmoid Resection with Colo-rectal Anastomosis	125	92	320	60
43	29.9	Recto-vaginal space Endometriosis lesion	Total hysterectomy with Bilateral Salpingectomy, Resection of Recto-Vaginal Lesion, Rectal Resection and Anastomosis	125	93	439	55
37	23.44	Uterosacral ligament endometriosis lesion (unilateral)	Tubal and Pelvis Adhesiolysis, Tubal Permeability, Resection of Uterosacral ligament	250	139	329	52

Table 2: Patients with abnormal urinary activity before surgery and normal urinary activity after surgery.

Age (years)	BMI (Kg/m ²)	site of DIE	Type of the intervention	Pre-operative Micturition volume (mL)	Pre-operative PVR (mL)	Post-operative Micturition volume (ml)	Post-operative PVR (mL)
49	23.3	Ovaries, broad Ligament and Uterosacral Ligament's	Total hysterectomy with Bilateral Salpingectomy, Left Cystectomy and Right Oophorectomy	450	83	310	110
28	37.3	Ovarian Fossa and Uterus	Tubal and Pelvis Adhesiolysis, Tubal Permeability test	150	37	50	20
37	23.7	Recto-Vaginal Space and the base of the Uterus	Total hysterectomy with bilateral salpingectomy, rectal shaving	400	60	50	30
37	26.9	Base of Uterus, Sigmoid, Recto-Vaginal Space	Total hysterectomy with Bilateral Salpingectomy, Recto-Sigmoid Resection with Anastomosis	400	80	400	200
28	24.7	Left uterosacral Ligament	Adhesiolysis, Tubal Permeability, Resection of Left Uterosacral Ligament	125	0	150	70
42	19.5	Ovarian Fossa, Uterus and Sigmoid	Adhesiolysis, tubal permeability test, resection of sigmoid with anastomosis	290	44	130	80
24	18.5	Recto-Vaginal Space	Adhesiolysis, Shaving Rectal with Colectomy, Rectal Resection and Anastomosis	250	65	30	40

26	21.6	Uterosacral Ligaments	Adhesiolysis, Tubal Permeability, Bilateral Resection of Uterosacral Ligament	400	98	50	125
30	25.1	Ovarian Fossa, Tube and Uterus	Tubal and Pelvis Adhesiolysis, Tubal Permeability Bilateral Ovarian Cystectomy	250	97	300	104
34	30.4	Ovarian Fossa, Tube and Uterus	Tubal and Pelvis Adhesiolysis, Tubal Permeability Unilateral Ovarian Cystectomy and Unilateral Salpingectomy	200	53	250	112
29	19.1	Ovarian Fossa, Tube and Uterus, Uterosacral Ligament	Tubal and Pelvis Adhesiolysis, Tubal Permeability, Resection Uterosacral Ligament	200	64	50	36
35	36.6	The base of the uterus, uterosacral ligament, sigmoid and rectum	Pelvis Adhesiolysis Resection of Uterosacral ligament, Resection Recto-Sigmoid with Anastomosis	450	83	310	110

Table 3: Patients with normal urinary activity before surgery who shows abnormal result after surgery.

Discussion

In our study 9 out of 49 (18.4%) presented with abnormal preoperative PVR without any involvement of the lower urinary tract by DIE. All of those patients did not have any urological symptom before surgery. Endometriosis lesions were spotted in the posterior pelvic compartment in all cases (recto-vaginal septum, uterosacral ligament, ovarian fossa, pararectal space, and bowel infiltration).

Little data has been reported concerning preoperative bladder atony and DIE. It has quite believed that infiltrating endometriosis lesion could affect the autonomic nerves system of the bladder. This is probably due to endometriosis or fibrotic involvement of the inferior hypogastric plexus that run in the uterosacral ligament, near the rectum and the vaginal fornix [2,5].

In a retrospective study from our team, among 16 cases of persistent urinary retention after surgery for DIE 18.8% of patients reporting one preoperative lower urinary tract symptom [12]. This rate is consistent with the observation of the current study.

In a prospective study published by Panel, *et al.* and was conducted on 30 patients with DIE presented that all patients underwent preoperative standardized investigation including detailed evaluation of lower urinary tract symptom and urodynamic studies. Twenty-three patients (76.7%) had one or more lower urinary tract symptoms and 29 patients (96.7%) had one or more abnormalities at urodynamic examination. All patients had posterior endometriosis and a third has also an involvement of the anterior pelvic compartment. Nevertheless, in their experience, voiding symptoms (60.0%), impairment of flowmetry (30.0%) and increased maximum urethral closure pressure (90.0%) were frequent and not correlated with any specific location. Those findings suggest that dysfunctional voiding may be secondary to an impairment of the inferior hypogastric plexus by posterior DIE [11].

Serati, *et al.* stated that there is a significant impairment of detrusor function in a prospective study of 25 asymptomatic endometriosis patients, 12 with DIE and 13 with ovarian endometriosis. All patients underwent a preoperative urodynamic evaluation and authors observed that detrusor overactivity was correlated with the presence of deep infiltrating endometriosis (91.7% of the DIE group versus 7.7% in the group with ovarian endometriosis) [2]. Their study gives some evidence of the effect of endometriosis on bladder activity even in asymptomatic patients. Urodynamic evaluation seems to be an acceptable clinical exam for evaluating the impact of DIE, but in our (experimental study) experience, it is difficult to be offered to patient without lower urinary tract symptoms or documented endometriosis in urinary tract. Portable ultrasound bladder scanner is a non-invasive approach that may be useful in this context.

Post-operative bladder atony is quite frequent after surgical intervention due to extensive surgical dissection into the lateral and the posterior pelvic wall and parametria [7,12-16]. Such complication most likely occurs due to injury of the hypogastric nerve which carries the sympathetic and sensory fibers to pelvis organs as bladder and rectum. Excision of pelvic endometriosis lesion especially in posterior pelvic wall could lead to bladder and rectum dysfunction [7]. Dysuria is most often transitory but may be persistent [12]. When a colorectal resection is performed, almost 30% of patients need intermittent bladder self-catheterization after surgery [17,19-21].

Some authors defined bladder atony as a PVR > 100 mL [12]. In this study the diagnosis of bladder atony was confirmed when the PVR was less or equals of one third of total micturition or when patient was unable to urinate before and after the surgery. Measuring the PVR is an important evaluation in the postoperative clinical assessment, the portable ultrasound bladder scanners use had been widely accepted [22]. It has been demonstrated that the accuracy of these devices is acceptable [22-24] and more comfortable with less complication than indwelling bladder catheterization [25].

During our observation we demonstrate that five patients had preoperative bladder atony and showed normal result after surgery. This result where difficult to interrupt and may be due to decrease infiltration and inflammation of endometriosis lesions after surgical excision which could explain the normalization of urinary activity. In the other hand, within 40 patients with normal pre-operative PVR, 12 patients had abnormal PVR in post-operative period. This observation is essential for patient information and we have to keep in mind that surgery may be related to post-operative voiding dysfunction but could also enhance bladder function, even if we have no possibility to predict the positive or negative impact of surgery on bladder function.

Transient atony after radical endometriosis surgery has been reported in about 20 - 25% of cases. This might be due to the transient inflammatory reaction and tissue edema. Most of these resolve in few days and last up 7 days +/- 3 days [15,26]. While persistent lower urinary tract dysfunction will concern 3.3 to 14% of patients who will undergo surgery for DIE [15,16,26-29]. The duration of atony may

differ, and it is difficult to know if the bladder normal function will return to normal. Dubernard., *et al.* reported that the mean duration of catheterization of 85 days (range 10 - 420 days) [19], while Minelli., *et al.* reported that less than 1% of patients would not recover from bladder retention (median follow-up 19.6 month range 6 - 48 month). In this study most of bladder activity return to normal in two days except for 3 patients where it takes 7 days to recover.

Laparoscopic nerve sparing surgery has been suggested to decrease the risk of bladder atony and self-catheterization [10] and it is recommended whenever possible [30]. Indeed, when feasible, it is likely to significantly improve postoperative lower urinary tract function compared to a conventional technique. Nerve visualization is possible during surgery for DIE in high rate of patients depending on the distribution and extent of endometriosis, but careful technique is necessary and may be difficult to undergo in case of severe tissue retraction and nerve or perineural involvement [17,18,30]

Overall, we have to point out the fact that even documented on a urodynamic evaluation, preoperative lower urinary tract dysfunction is often asymptomatic and then, the benefit of surgery on PVR would be less appreciate by patients than a postoperative deterioration of voiding function. Nevertheless, preoperative urodynamic evaluation may have the advantage to assess the preoperative voiding impairment in case of postoperative bladder atony that could not be considered as a complication solely related to surgery.

Conclusion

Endometriosis is a sever benign condition which could affect the bladder function in totally asymptomatic patient by local infiltration of the pelvic nerves by the lesions. Measuring the PVR before surgery is recommended especially in severe cases of DIE. The observation of abnormal lower urinary tract function in pre-operative consultation is important as it may provide some information about an existent neural involvement and is crucial in the pre-operative information given to patients related to the risk of post-operative voiding complication. Portable ultrasound bladder scanner is a non-invasive approach to diagnose pre-operative voiding dysfunction especially for patient without lower urinary tract symptom and its use does not require special training. It can give a simple and precise evaluation of the bladder activity before and after the surgery. Further investigations should be considered to study the physiopathological aspects of preoperative and asymptomatic lower urinary tract dysfunction in patients with DIE and the interest of its preoperative diagnosis and evaluation.

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Disclosure of Interests

None.

Bibliography

1. Koninckx PR., *et al.* "Suggestive evidence that pelvic endometriosis is a progressive disease, whereas deeply infiltrating endometriosis is associated with pelvic pain". *Fertility and Sterility* 55 (1991): 759-765.
2. Serati M. *et al.* "Deep endometriosis and bladder and detrusor functions in women without urinary symptoms: a pilot study through an unexplored world". *Fertility and Sterility* 100 (2013): 1332-1336.
3. Parazzini F., *et al.* "Epidemiology of endometriosis and its comorbidities". *European Journal of Obstetrics and Gynecology and Reproductive Biology* 209 (2017): 3-7.
4. Bulun SE. "Endometriosis". *The New England Journal of Medicine* 360 (2009): 268-279.

5. Ramanah R., *et al.* "Anatomy and histology of apical support: a literature review concerning cardinal and uterosacral ligaments". *International Urogynecology Journal* 23 (2012): 1483-1494.
6. Butler-Manuel SA., *et al.* "Pelvic nerve plexus trauma at radical hysterectomy and simple hysterectomy: the nerve content of the uterine supporting ligaments". *Cancer* 89 (2000): 834-841.
7. Possover M. "Pathophysiologic explanation for bladder retention in patients after laparoscopic surgery for deeply infiltrating rectovaginal and/or parametric endometriosis". *Fertility and Sterility* 101 (2012): 754-758.
8. De Lapasse C., *et al.* "Urinary functional and urodynamic preoperative evaluation of patients with deep pelvic surgical endometriosis: about 12 cases". *Gynécologie Obstétrique and Fertilité* 36 (2008): 272-277.
9. Riiskjær M. *et al.* "Pelvic organ function before and after laparoscopic bowel resection for rectosigmoid endometriosis: a prospective, observational study". *The International Journal of Gynecology and Obstetrics* 123 (2016): 1360-1367.
10. Ceccaroni M., *et al.* "Nerve-sparing laparoscopic eradication of deep endometriosis with segmental rectal and parametrial resection: the Negrar method. A single-center, prospective, clinical trial". *Surgical Endoscopy* 26 (2012): 2029-2045.
11. Panel P., *et al.* "Bladder symptoms and urodynamic observations of patients with endometriosis confirmed by laparoscopy". *International Urogynecology Journal* 27 (2015): 445-451.
12. Azaïs H., *et al.* "Persistent urinary retention after surgery for deep infiltrating endometriosis: a multi-center series of 16 cases". *The Archives of Gynecology and Obstetrics* 291 (2014): 1333-1339.
13. Mombelli G., *et al.* "Free uroflowmetry versus "Do-It-Yourself" uroflowmetry in the assessment of patients with lower urinary tract symptoms". *International Urology and Nephrology* 46 (2014):1915-1919.
14. Possover M., *et al.* "Identification and Preservation of the Motoric Innervation of the Bladder in Radical Hysterectomy Type III". *Gynecologic Oncology* 79 (2000): 154-157.
15. Minelli L. *et al.* "Laparoscopic colorectal resection for bowel endometriosis: feasibility, complications, and clinical outcome". *Archives of Surgery* 144 (2009): 234-239.
16. Kovoor E., *et al.* "Long-term urinary retention after laparoscopic surgery for deep endometriosis". *Fertility and Sterility* 95 (2011): 803.e9-803.e12.
17. Volpi E., *et al.* "Laparoscopic identification of pelvic nerves in patients with deep infiltrating endometriosis". *Surgical Endoscopy and Other Interventional Techniques* 18 (2004): 1109-1112.
18. Landi S., *et al.* "Laparoscopic nerve-sparing complete excision of deep endometriosis: is it feasible?" *Human Reproduction* 21 (2006): 774-781.
19. Dubernard G., *et al.* "Urinary Complications After Surgery for Posterior Deep Infiltrating Endometriosis are Related to the Extent of Dissection and to Uterosacral Ligaments Resection". *The Journal of Minimally Invasive Gynecology* 15 (2008): 235-240.
20. Darai E., *et al.* "Urological morbidity of colorectal resection for endometriosis". *Minerva Medica* 103 (2012): 63-72.
21. Ballester M., *et al.* "Urinary dysfunction after colorectal resection for endometriosis: results of a prospective randomized trial comparing laparoscopy to open surgery". *American Journal of Obstetrics and Gynecology* 204 (2011): 303.e1-6.
22. Byun SS., *et al.* "Accuracy of bladder volume determinations by ultrasonography: are they accurate over entire bladder volume range?" *Urology* 62 (2003): 656-660.

23. Griffiths CJ, *et al.* "Accuracy and repeatability of bladder volume measurement using ultrasonic imaging". *The Journal of Urology* 136 (1986): 808-812.
24. Simforoosh N, *et al.* "Accuracy of Residual Urine Measurement in Men: Comparison Between Real-Time Ultrasonography and Catheterization". *The Journal of Urology* 158 (1997): 59-61.
25. Schaeffer AJ and Chmiel J. "Urethral meatal colonization in the pathogenesis of catheter-associated bacteriuria". *The Journal of Urology* 130 (1983): 1096-1099.
26. Stepniewska A, *et al.* "Laparoscopic treatment of bowel endometriosis in infertile women". *Human Reproduction* 24 (2009): 1619-1625.
27. Mereu L, *et al.* "Laparoscopic treatment of deep endometriosis with segmental colorectal resection: Short-term morbidity". *Journal of Minimally Invasive Gynecology* 14 (2007): 463-469.
28. Lyons SD, *et al.* "Clinical and quality-of-life outcomes after fertility-sparing laparoscopic surgery with bowel resection for severe endometriosis". *Journal of Minimally Invasive Gynecology* 13 (2006): 436-441.
29. Vercellini P, *et al.* "The effect of surgery for symptomatic endometriosis: the other side of the story". *Human Reproduction* 15 (2009): 177-188.
30. Rabischong B, *et al.* "[Nerve sparing techniques in deep endometriosis surgery to prevent urinary or digestive functional disorders: Techniques and results: CNGOF-HAS Endometriosis Guidelines]". *Gynaecology Obstetrics Fertility and Senology* 46 (2018): 309-313.

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