CLINICAL ARTICLE

Clinical outcomes associated with surgical treatment of endometrioma coupled with resection of the posterior broad ligament

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A B S T R A C T

Objective: To evaluate clinical outcomes associated with the resection of both endometrioma and posterior broad ligament (PBL) among women with PBL adhesion associated with endometrioma. Methods: Between January 2007 and December 2009 at the Villanova Hospital, Florence, Italy, a prospective trial was conducted on 99 consecutive patients with unilateral or bilateral endometrioma who underwent laparoscopic ovarian cystectomy by a stripping technique and homolateral PBL resection where PBL adhesion was associated with endometrioma. The prevalence of PBL adhesion and endometriosis, the association between PBL endometriosis and pain, and the recurrence of endometrioma and pain were evaluated. All data were analyzed with Prism software. Results: Among 124 endometriomas treated by concomitant PBL resection, the PBL was not affected by adhesions in only 2% of patients. PBL endometriosis was superficial in 36 (29.5%) and deep in 86 (70.5%) of the histologic preparations; deep endometriosis correlated with preoperative pain. At 1-year follow-up, endometrioma had recurred in 7 patients; the main symptom reported was mid-cycle pain (24 patients, 24%; $P = 0.0007$). Conclusion: Ovarian endometriosis was often (98%) associated with PBL endometriosis; deep endometriosis of PBL correlated with pain symptoms. Although PBL resection increased the incidence of mid-cycle pain, it was associated with low recurrence of endometrioma.

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1. Introduction

Endometriosis is a chronic gynecologic condition that affects women of reproductive age, causing infertility and pelvic pain. The most commonly affected sites are the pelvic organs and peritoneum [1], and the extent of the disease varies from a few small lesions on otherwise normal pelvic organs to large ovarian endometriotic cysts (endometriomas) and/or extensive fibrosis and adhesion formation causing marked distortion of pelvic anatomy.

Ovarian endometriosis accounts for 35% of benign cysts and, even though the ovary is not the most common location of pelvic endometriosis [1,2], it occurs in 17%–44% of patients with this disease [3,4]. Excisional surgery for endometriomas should be considered the preferential surgical approach because it provides a more favorable outcome than drainage and ablation with regard to recurrence of the ovarian localization, recurrence of symptoms, and subsequent spontaneous pregnancy in infertile woman [5].

Among a population of 1785 patients with surgically treated endometriosis, only 19 (1%) of patients had exclusively ovarian involvement, findings that support the concept that adequate surgical treatment of ovarian endometrioma requires surgical treatment of all of the pelvic areas involved, especially of deep endometriotic lesions [1]. It has been well demonstrated that, to decrease the risk of recurrence (or possible persistence) of endometriosis, the best surgical approach should be one that completely removes all of the visible disease [6]. Therefore, if improvement in patient symptoms, reduction of recurrence, enhancement of fertility, and patient satisfaction are intended, the complete eradication of endometriosis is mandatory [7–10]. At laparoscopy, deeply infiltrating endometriosis may have the appearance of minimal disease [11]; thus, the isolated identification of ovarian endometriosis and its single excision can lead to under-diagnosis and under-treatment.

The aim of the present study was to evaluate prospectively clinical outcomes associated with the resection of both endometrioma and posterior broad ligament (PBL) among women with PBL adhesion associated with endometrioma and without other evident localization of disease. Specifically, the study aimed to evaluate whether concomitant resection of the PBL can help to determine (1) the prevalence of PBL endometriosis among dense adhesions between endometrioma and ovarian fossa; (2) the degree of endometriosis invasion in the

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peritoneum of the PBL; (3) the putative association between PBL endometriosis and pain symptoms; and (4) the recurrence rate of pain and endometriotic cysts at 1-year follow-up from surgery.

2. Materials and methods

In a prospective study conducted at the Villanova Hospital of Florence, Florence, Italy, 104 fertile women with suspected ovarian endometriosis were consecutively enrolled from January 8, 2007, to December 18, 2009. The inclusion criteria were 18 years or older, signed written informed consent, and the presence of at least 1 sign of endometrioma by instrumental exam (ultrasound and/or magnetic resonance imaging). The exclusion criteria were absence of written informed consent, preoperative suspicion of extraovarian endometriotic localization, previous surgery for endometriosis, and hormonal treatment for endometriosis in the 6 months before current surgery. Ethics approval for the study was obtained from the Institutional Review Board.

Data on patient age, body mass index, parity, infertility status, intraoperative disease localizations, disease stage according to r-AFS score [12], histopathologic findings, total operative time, intra- and post-operative complications, and discharge from hospital were prospectively recorded in a database.

Before surgery, the participants underwent a routine examination, including rectovaginal examination, abdominal and pelvic ultrasound scanning, and double-contrast barium enema in cases of suspected bowel localization. Each patient was individually counseled with regard to the potential risks and benefits of the intervention before signing written informed consent. Pre-operative pain symptoms (dysmenorrhea, dyspareunia, dysuria, dyschezia, and mid-cycle pain) were evaluated by a visual analog scale (VAS) with a 10-point rating from 1 (lack of pain) to 10 (unbearable pain) [13].

The day before surgery, all patients underwent mechanical bowel preparation. Antithrombotic prophylaxis with low molecular-weight heparin was administered from the evening before the operation until mobilization, and prophylactic antibiotic therapy with cefazolin was given at the beginning of the operation. The laparoscopic procedure was performed in the modified dorsolithotomic position under endotracheal general anesthesia. After pneumoperitoneum induction with a Veress needle and introduction of a 10-mm laparoscope in the standard umbilical position, three 5-mm trocars were placed in the following positions: sovrapubic, left iliac fossa, and right iliac fossa.

For each participant, the intraoperative endometriotic localizations and adnexal adhesions were noted. First, the pelvis, abdomen, and external surface of the cyst were inspected for possible evidence of malignancy. Peritoneal fluid was aspirated for cytologic examination. If necessary, lysis of the adhesion was performed. After mobilization of the adnexa, followed by opening of the cyst and drainage of its content, the cleavage plane was found and the cyst pseudo-capsule was separated from the ovarian parenchyma by means of repeated diverging traction applied with atraumatic forceps.

In the case of an adhesion between the endometrioma cyst and homolateral PBL, a pair of 5-mm bipolar scissors was used to excise the PBL completely. The dissection started retroperitoneally from healthy tissue at the level of the pelvic brim. The peritoneum covering the ureter was opened with the bipolar scissors, blunt dissection progressed in the direction of the uterosacral ligament, and the ureter was freed at the level of the uterine artery. All surgical specimens were sent for histologic examination, and PBL involvement was classified as superficial when infiltration of the peritoneal surface was less than 4 mm and deep when it was 5 mm or more.

The operation time was calculated from anesthesia induction to patient awakening, including the surgeon's change time. Blood loss during surgery was estimated by measuring the aspirated blood volume. Surgery was performed with an indwelling Foley catheter in situ that was removed as soon as the patient could independently reach the toilet.

All patients were clinically evaluated 1 month and 12 months after surgery. Follow-up consisted of pelvic examination, transvaginal ultrasound evaluation, and rating of pain symptoms.

All data were analyzed with Prism software (GraphPad Software, San Diego, CA, USA) and were expressed as mean ± SD (range) or as number (percentage) of patients. The Kolgomorov–Smirnos test was used to evaluate whether values had a Gaussian distribution in order to choose between parametric and non-parametric statistical tests. Comparisons of proportions and means between groups were assessed via χ^2 test and an independent t test, respectively. For 2 groups, statistical differences between repeated measurements were calculated by the paired t-test or the Wilcoxon matched pairs test for non-parametric values. For more than 2 groups, analysis of variance for repeated measures and Friedman test were used for parametric and non-parametric data, respectively. The level of significance was set at a P value of less than 0.05.

3. Results

The clinical and anthropometric details of the study population are given in Table 1. Surgical indications for laparoscopy were radiologic evidence of endometrioma in 1 or both ovaries, associated with infertility or with pelvic pain. A total of 124 endometriomas were laparoscopically removed from 99 patients: 27 patients had bilateral endometriomas, and 70 had monolateral endometriomas.

The laparoscopic findings are given in Table 2. The mean operative time was 100 minutes (range 43–137 minutes), the mean blood loss was 103 mL (range 10–180 mL), no intra-operative or postoperative complications were detected, and the mean time to hospital discharge was 1 day (range 1–3 days). There was no involvement of the PBL in only 2 of the 124 of endometriomas (1.6%); by contrast, there was dense adhesion involving the homolateral PBL in the remaining 122 endometriomas. Histopathologic examination of the PBL revealed endometriosis in all cases; according to a previous

Table 1
Clinical and anthropometric details of the study population.[a]

Characteristic	Data [a]
Total number of patients	99 (100)
Age, years	33.2 ± 6.5 (19–47)
Body mass index	21.8 ± 1.6 (27.3–15.2)
Height, cm	165.0 ± 5.3 (182–156)
Parity, number	
0	79 (80)
1	16 (16)
2	4 (4)
Infertility	26 (26)
Chief symptoms [b]	
Dysmenorrhea	57 (58); VAS score 6.4 ± 1.9
Dyschezia	9 (9); VAS score 5.6 ± 1.5
Dyspareunia	16 (16); VAS score 5.5 ± 1.2
Dysuria	12 (12); VAS score 5.2 ± 1.2
Mid-cycle pain	43 (43); VAS score 5.5 ± 1.4
Stage	
I	2 (2)
II	15 (15)
III	49 (50)
IV	33 (33)
Laterality	
Monolateral endometrioma	71 (72)
Bilateral endometrioma	28 (28)

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by the square of height in meters); VAS, visual analog scale (a simple 10-point list: no pain, 0; severe pain, 10; significant pain was rated as VAS ≥ 4 [13]).
[a] Values are given as mean ± SD (range) or number (percentage) unless stated otherwise.

Table 2
Intra-operative findings during laparoscopy.

Endometriosis localization	Data [a]	P value
Left ovary		
Number of patients	76	
Largest diameter, cm	4.1 ± 1.5 (1–7)	
Right ovary		
Number of patients	51	
Largest diameter, cm	3.8 ± 1.9 (1–7.5)	
Left posterior broad ligament		<0.0001
Number of patients	80	
Superficial	27 (34)	
Deep	53 (66)	
Right posterior broad ligament		0.0042
Number of patients	63	
Superficial	23 (37)	
Deep	40 (63)	
Left uterosacral ligament		0.237
Number of patients	32	
Superficial	11 (34)	
Deep	21 (66)	
Right uterosacral ligament		0.0194
Number of patients	30	
Superficial	10 (33)	
Deep	20 (67)	
Rectum		>0.9999
Number of patients	3	
Superficial	1 (33)	
Deep	2 (67)	
Douglas		0.5671
Number of patients	6	
Superficial	4 (67)	
Deep	2 (33)	
Left anterior broad ligament		0.0101
Number of patients	8	
Superficial	7 (87)	
Deep	1 (13)	
Right anterior broad ligament		0.2063
Number of patients	5	
Superficial	4 (80)	
Deep	1 (20)	
Bladder		<0.0001
Number of patients	20	
Superficial	18 (90)	
Deep	2 (10)	

[a] Values are mean ± SD (range) or number (percentage) unless stated otherwise.

classification [14], there was deep endometriotic infiltration in 86 (70.5%) and superficial endometriosis in 36 (29.5%) of the 122 PBL. None of the patients received postoperative hormonal therapy.

Endometrioma excision coupled with PBL resection in the case of PBL adhesion was associated with a reduction of pain symptoms at the 1-month follow-up among the 99 study participants as follows: the prevalence of dysmenorrhea was reduced from 57 (58%) to 16 (17%) patients ($P<0.0001$) (VAS score, 6.4 ± 1.9 versus 4.7 ± 0.9; $P<0.0001$); dyschezia from 9 (9%) to 0 (0%) patients ($P=0.0032$) (VAS score, 5.6 ± 1.5 versus not applicable); dyspareunia from 16 (16%) to 1 (1%) patient ($P=0.0002$) (VAS score, 5.5 ± 1.2 versus 4.0 ± 0.0; $P<0.0001$); dysuria from 12 (12%) to 0 (0%) patients ($P=0.0003$) (VAS score 5.2 ± 1.2 versus not applicable); mid-cycle pain from 43 (43%) to 11 (11%) patients ($P<0.0001$) (VAS score, 5.5 ± 1.4 versus 5.5 ± 1.3; $P=0.7237$). Endometrioma recurrence occurred in 7 patients (7%).

At the 12-month follow-up after surgery, the following prevalence of pain symptoms among the 99 study participants was recorded: dysmenorrhea in 19 (19%) patients ($P=0.7$); dyschezia in 1 (1%) patient ($P=1$); dyspareunia in 5 (5%) patients ($P=0.1$); dysuria in 3 (3%) patients ($P=0.2$); mid-cycle pain in 24 (24%) patients ($P=0.0007$). Fig. 1 shows the changes in pain symptoms among the study population before treatment and during follow-up.
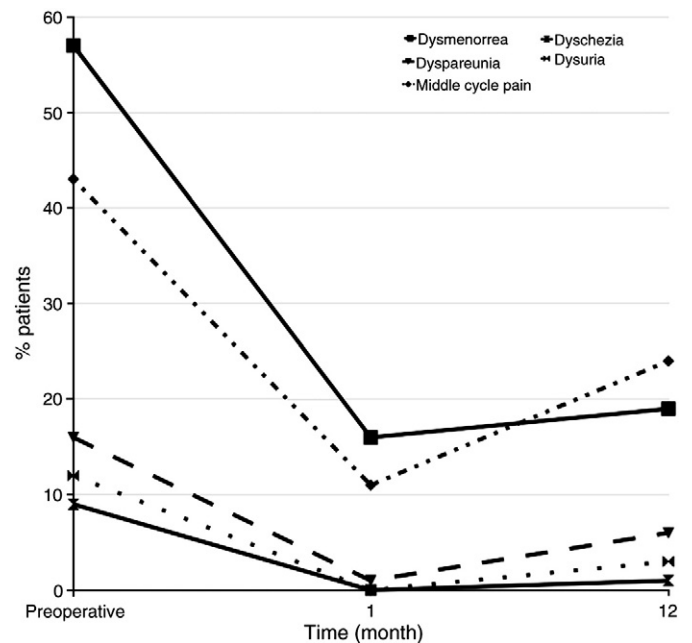

Fig. 1. Changes in pain symptoms among study participants from preoperative assessment to the 12-month follow-up.

4. Discussion

The first objective of the study was to evaluate the prevalence of dense PBL adhesions in patients affected by endometrioma and the prevalence of endometriosis in those adhesions. Among 124 endometriomas excised, 122 (98.4%) had dense adhesions involving the homolateral PBL. Furthermore, there was deep endometriotic infiltration in 86 (70.5%) and superficial infiltration in 36 (29.5%) of these 122 endometriomas. These findings suggest that endometriosis is rarely (1.6%) confined exclusively to ovaries and that the peritoneal infiltration is frequently deep (70.5%). These data are in line with those reported by Redwine [1], who found that patients with ovarian endometriosis had more pelvic and intestinal areas involved than those without ovarian involvement. Those data, together with the present study, support the concept that endometrioma seems to be a marker for more extensive disease. As a result, surgeons encountering ovarian endometriosis should expect to find the disease elsewhere and should research for it. In accordance with previous work [1], the intra-operative findings showed that endometriomas and peritoneal endometriotic lesions were more frequent on the left than on the right side (Table 2).

The second objective was to evaluate whether there is a correlation between pain symptoms (dysmenorrhea, dyschezia, dyspareunia, dysuria, and/or mid-cycle pain) and laparoscopic findings. Complete laparoscopic excision of endometriosis contributes to satisfactory long-term symptomatic relief, especially in patients presenting with severe or debilitating symptoms. The present data support the notion that, among symptomatic patients undergoing surgery for endometrioma, it is extremely important to identify and treat not only the ovarian cyst but also the PBL localization to avoid under-diagnosis and under-treatment. Among the 122 endometriomas with PBL adhesion, the presence of deep endometriosis in the PBL was associated with more extensive dysmenorrhea (64 [52.5%] versus 3 [2.5%] patients; VAS score, 6.5 ± 1.9 versus 5.7 ± 0.6), more extensive dyschezia (14 [11.5%] versus 1 [0.8%] patient; VAS score, 5.9 ± 1.4 versus 5.0 ± 0.0), more extensive dyspareunia (27 [22.1%] versus 1 [0.8%] patient; VAS score, 5.7 ± 1.1 versus 4.0 ± 0.0), more extensive dysuria (21 [17.2%] versus 0 [0%] patients; VAS score, 5.3 ± 1.2 versus not applicable) compared with superficial endometriosis.

Laparoscopic resection of the homolateral PBL was feasible in all patients with evidence of dense adhesions in ovarian fossa because no intra-operative or post-operative complications were recorded. Indeed, the mean operative time (103 minutes) was higher than that reported in other studies where only enucleation of endometriomas was performed [13–17]. Considering the type of surgery performed to achieve complete eradication of endometriotic localizations, both the surgical operation time and hospital discharge time were considered satisfactory in the present study.

The last objective of the study was to evaluate the recurrence rate of pain and endometrioma in patients that undergo to laparoscopic endometrioma excision coupled with resection of the PBL when it is involved in endometriosis. The risk of ovarian recurrence of endometrioma after single surgical excision varies from 6% to 56%, depending on the surgical approach (ablation versus cystectomy), follow-up time, type of recurrence detection (reported symptoms, ultrasound, histology), and cyst size [15–20]. In the present study, the recurrence of ovarian endometriosis as assessed by ultrasound was 7% after 12 months. This low rate can be explained by the surgical technique adopted. Indeed, as compared with drainage and ablation, excisional surgery for endometriomas provides more favorable outcomes with regard to recurrence of endometrioma, recurrence of symptoms, and subsequent spontaneous pregnancy in infertile women [5].

Moreover, concomitant resection of endometriotic peritoneal localizations and, in particular, the homolateral PBL guarantees the complete excision of endometriosis, thereby providing long-term pain relief, improved quality of life, and a low rate of recurrent disease among most patients with deeply infiltrating endometriosis [16,21,22].

Data on pain symptoms revealed a substantial improvement by 1 month after surgery with a subsequent slightly worsening 12 months after surgery for dysmenorrhea, dyspareunia, dyschezia, and dysuria; by contrast, for mid-cycle pain there was a significant increase from 11% at the 1-month follow-up to 24% at the 12-month follow-up ($P = 0.0007$). Mid-cycle pain or Mittelschmerz syndrome refers to abdominal or pelvic pain that is experienced between periods and is usually related to ovulation. Theoretically, the presence of adnexal endometriosis and adhesions could be a cause of painful ovulation and might explain the high incidence of this symptom among patients affected by endometriosis and/or adhesions at the level of adnexa and PBL. The high rate of mid-cycle pain in the present population might be explained by the formation of adnexal adhesions between 2 damaged surfaces: the ovary and the PBL.

Although 70% of the patients were symptomatic at the 1-year follow-up, it should be taken into consideration that this kind of surgical approach—even if it gives good results in terms of endometrioma recurrence—has a high risk of adnexal adhesions with consequent Mittelschmerz syndrome and retroperitoneal ovarian localization. It remains to be demonstrated whether the use of anti-adherence substances can be beneficial in this kind of surgery by reducing adhesions and mid-cycle pain. Either way, in the case of infertile or asymptomatic women undergoing surgery for endometrioma, the possible consequences related to concomitant endometrioma enucleation and resection of PBL should be taken into consideration when selecting the treatment options.

The present preliminary study has focused on 1 strategy for the surgical treatment of endometrioma and its related concerns. To clarify which treatment might be best for this disease, a future prospective controlled study will compare the clinical outcomes of endometrioma excision with and without resection of PBL.

In conclusion, the present study has shown that ovarian endometriosis is a rare disease because in most cases there was involvement of the PBL peritoneum. Surgical treatment of endometrioma with PBL resection seemed to reduce the rate of ovarian recurrence, despite the possibility of adhesion formation with subsequent Mittelschmerz syndrome. Surgical treatment must be individualized by taking the clinical problem in its entirety into account, including the impact of the disease and the effect of its treatment on quality of life.

Conflict of interest

The authors have no conflicts of interest.

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