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Surgical outcomes according to the degree of parametrial dissection with hysterectomy for deep endometriosis

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ABSTRACT

Background: There is no standardisation of the degree of parametrial dissection and excision with hysterectomy in the presence of deep endometriosis (DE).

Objectives: To apply an anatomical classification of dorso-lateral parametrectomy to hysterectomy for DE and correlate with postoperative complications and functional outcomes.

Methods: Women with histologically confirmed DE who underwent hysterectomy with varying degrees of parametrectomy were retrospectively identified. Dorso-lateral parametrectomy was classified as follows: superficial (medial to presacral fascia), deep type 1 (beyond the presacral fascia), type 2 (caudal to medial rectal artery), and type 3 (laterally and deeply the hypogastric fascia). Statistical analysis was performed to correlate the degree of parametrial dissection with operative complications and functional outcomes at 6 months.

Main Outcome Measures: Incidence of intra- and postoperative complications; changes in gastrointestinal, urinary, and sexual function; pain improvement.

Results: Eighty-nine patients underwent parametrectomy with hysterectomy: superficial extended hysterectomy (EH) with superficial parametrectomy (EHSP, n=52), deep EH with deep parametrectomy type 1 (EHDP1, n=19), deep type 2 (EHDP2, n=12), and deep type 3 (EHDP3, n=6). Eight patients (8.9%) had intraoperative complication of which 5/52 (9.6%) underwent EHSP, 1/19 (5.3%) EHDP1, 2/12 (16.7%) EHDP2. Bladder voiding dysfunction occurred in 11 patients (12.3%) with higher incidences of 6/19 (31.6%) undergoing EHDP1 and 1/6 (16.7%) EHDP3 (P=0.016). Pain outcomes significantly improved across all groups (P<0.001).

Conclusions: This classification of parametrectomy at the time of hysterectomy for DE offers a framework for assessing surgical complexity and outcomes. While substantial pain relief is observed, bladder dysfunction remains a significant concern, especially when parametrectomy extends beyond the presacral fascia.

What is New? This classification for modified radical hysterectomy provides a method to standardise the description of parametrectomy for DE, facilitating more precise correlations between the extent of disease in the parametria and functional outcomes.

Keywords: Bladder, fascia, hysterectomy, intraoperative complication, pelvic pain, postoperative complications

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Introduction

Parametrial deep endometriosis (DE) is recognised as one of the most complex forms of this disease. It is frequently associated with severe pelvic pain, dysfunction of adjacent pelvic organs, and technically demanding surgical procedures that carry a substantial risk of neurofunctional complications.[1-5] In particular, parametrectomy is known to entail a broad range of postoperative risks, including bladder voiding dysfunction, reported in 6.5–32% of cases,[1-7] and overall complication rates of approximately 2–26%,[1-8] even in high-volume, specialised referral centres. Despite its clinical relevance, parametrial DE remains a highly debated topic in the literature. This is largely due to the absence of a shared definition of the parametrium itself,[1,2,7-12] along with the use of inconsistent terminology, heterogeneity in reporting outcomes, and the lack of a classification system specifically dedicated to DE. While numerous studies have explored surgical complications and recurrence rates after hysterectomy for endometriosis,[13-15] only a few have addressed how the extent of parametrial resection influences functional outcomes or postoperative morbidity.[7,8]

Unlike early-stage cervical cancer, in which the width of parametrectomy is determined by tumour size and oncological risk factors, the extent of resection in cases of DE is determined by the need for complete removal of infiltrative lesions. Although nerve-sparing strategies adapted from oncologic gynaecology are often employed,[10,16] their application for DE can be challenging and imprecise due to the marked tissue distortion and fibrotic remodelling that characterise this condition.

To address these limitations and to enable meaningful comparison between studies, our group has recently introduced an anatomical classification of dorsolateral parametrectomy for DE.[7] The present study applies this classification to extended hysterectomy (EH) for parametrial DE, with the aim of exploring the association between the extent of parametrial dissection, postoperative complications, and functional outcomes.

Methods

Study Design

In this retrospective observational analysis, 89 consecutive cases of women treated with EH for histologically verified DE were included. We enrolled all patients who underwent surgery during the study period and who met the inclusion criteria, without subjectively excluding any case. Surgeries were performed at the University Hospital 'Policlinico Universitario IRCCS "A. Gemelli"' in Rome between March 2019 and June 2023, and at the Mater Olbia Hospital, Olbia (Sardinia region) between March 2023 and March 2024.

Women were considered eligible if they were over 18 years old, sexually active, and suffering from pelvic pain refractory to medical therapy. All candidates had undergone clinical evaluation supported by transvaginal and transabdominal ultrasound and/or pelvic magnetic resonance imaging (MRI) showing suspected parametrial involvement, and they were all scheduled for hysterectomy. Final histopathological confirmation of parametrial DE was required for inclusion. Exclusion criteria included being aged under 18 years, absence of sexual activity, and any history of bowel or bladder resection, ureteral reimplantation, or prior pelvic radiotherapy.

The research protocol received approval from the Institutional Review Boards of both participating institutions Policlinico Universitario IRCCS A. Gemelli (protocol number: 0007739/25, date: 24.03.2025) and Mater Olbia Hospital (protocol number: MOH 0001921, date: 29.11.2024). All procedures complied with the Declaration of Helsinki. Prior to surgery, all patients signed written informed consent forms that allowed the use of their anonymised clinical data for research purposes.

Preoperative Evaluation

Prior to surgery, all patients underwent a standardised diagnostic assessment, which included rectovaginal examination along with targeted transvaginal and transabdominal ultrasound and/or pelvic MRI. In cases of ureteral dilatation, further imaging such as uro-computed tomography, uro-MRI, and renal angioscintigraphy was conducted to allow a more precise evaluation of the urinary tract. If patients reported symptoms suggesting possible compression or infiltration of the sacral plexus or other somatic nerves, they were referred for neuropelveological assessment in accordance with the recommendations of the International Society of Neuropelveology.[17] Electromyography and/or urodynamic studies were added when clinically indicated. Pelvic pain symptoms including dysmenorrhea, dyspareunia, chronic pelvic pain, dysuria, and dyschezia were consistently assessed using a visual analogue scale (VAS) ranging from 0 (no pain) to 10 (the most severe pain imaginable).

Data Collection and Classification Systems

All clinical, surgical, and functional data were prospectively entered into a dedicated database. Collected variables included: demographic data [age, body mass index (BMI) ongoing hormonal therapy, and surgical history]; pre- and postoperative clinical data (pain scores, urinary, gastrointestinal, and sexual function); surgical variables (operative time, blood loss, intraoperative complications, additional procedures, and the lateral/caudal extent of parametrectomy); and perioperative outcomes (hospital stay, postoperative complications, and the need for self-catheterisation). The extent of the disease was assessed intraoperatively using both the revised American Society for Reproductive Medicine (r-ASRM) classification[18] and the Enzian system.[19] Postoperative complications within 30 days of the procedure were classified based on the Clavien–Dindo grading system.[20] At six months post-surgery, patients underwent clinical follow-up, which included a rectovaginal examination and repeat transvaginal and transabdominal ultrasonography. Pain symptoms were reassessed using the same VAS scale. To evaluate functional outcomes, patients completed a number of validated questionnaires. Specifically, bowel function was assessed using the Knowles-Eccersley-Scott symptom (KESS) questionnaire[21] (0–39 points, with scores of 10 or higher indicating constipation); gastrointestinal quality of life was measured using the gastro-intestinal quality of life index (GIQLI)[22] (0–144, where higher scores reflect better quality of life); urinary symptoms were evaluated via the Bristol female lower urinary tract symptoms total score (BFLUTS) questionnaire[23] (0–45, with higher scores corresponding to more severe symptoms); and sexual function was assessed through the female sexual function index (FSFI),[24] a 19-item questionnaire, where total scores below 26.5 suggest dysfunction. Urinary retention was identified when post-void residual volume remained ≤100 mL on three successive measurements, prompting the initiation of intermittent self-catheterisation.

Surgical Procedure and Anatomical Landmarks for Extended Hysterectomy

This study applied a standardised surgical approach for dorsolateral parametrectomy performed during EH, building on the anatomical classification recently described by our group.[7] This classification distinguishes four types of parametrial dissection based on three key anatomical landmarks used to preserve the inferior hypogastric plexus: the presacral fascia, which envelops the hypogastric nerves (HN) (Figure 1), the middle rectal artery (MRA), typically contained in the lateral ligament of the rectum (LLR) (Figure 2), and the hypogastric fascia (Figure 3).

Using this system, procedures were categorised as:

- EH with superficial parametrectomy (EHSP): limited medially to the presacral fascia and cranially to the MRA;
- EH with deep parametrectomy type 1 (EHDP1): extending laterally beyond the presacral fascia;
- EH with deep parametrectomy type 2 (EHDP2): reaching caudally beyond the MRA;
- EH with deep parametrectomy type 3 (EHDP3): progressing laterally to the hypogastric fascia.

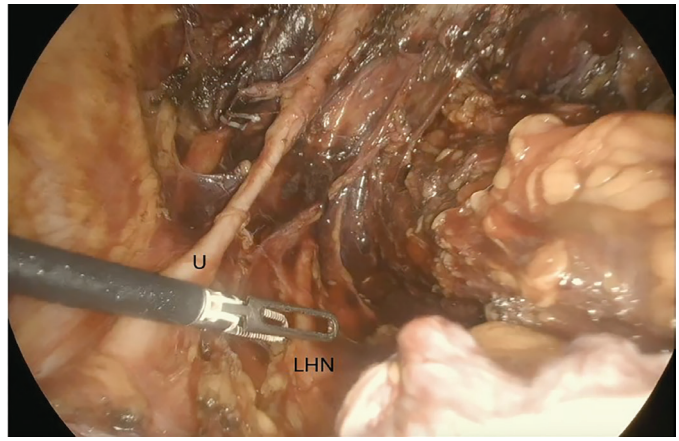

Figure 1. Left Medial pararectal space with hipogastric nerve covered by presacral fascia.

U: Left ureter, LHN: Left hypogastric nerve covered by presacral fascia.

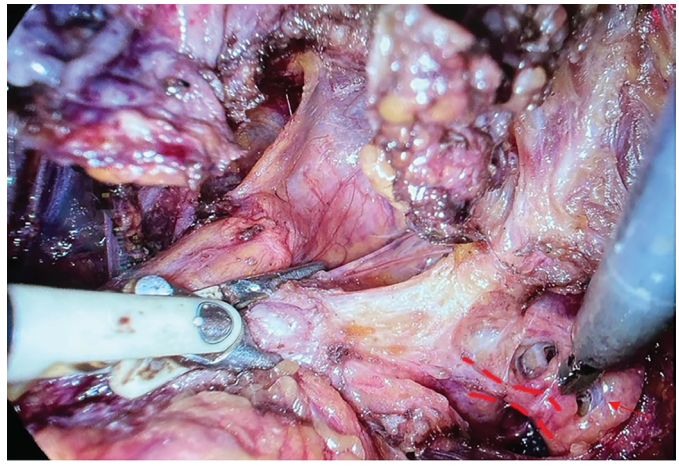

Figure 2. Through the partially dissected lateral ligament of the rectum, the middle rectal artery can be seen (indicated by the red dotted lines), and caudally and laterally to it, part of the branch of the inferior hypogastric plexus directed to the rectum (indicated by the arrow).

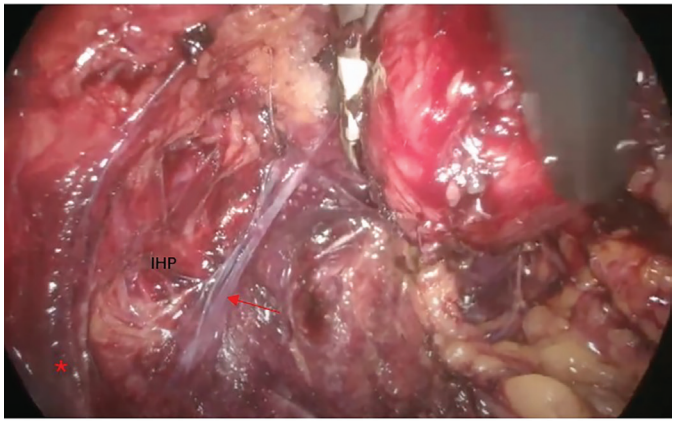

Figure 3. A red arrow indicates the left hypogastric fascia dissected during a dorsal-lateral parametrectomy.

*Left hypogastric nerve, IHP: Inferior hypogastric plexus.

All operations were conducted by surgeon MMI, who has a high level of proficiency in the surgical management of DE. The nerve-sparing method, previously documented, foresees interfascial dissection between the parietal and visceral pelvic fasciae, performed via a combined latero-medial and medio-lateral approach.[4,7] The only parameter used to decide the depth of parametrectomy was the macroscopic visualisation of soft tissue free of macroscopic disease. Among the patients who underwent surgery, none of them had considered "non-radical" surgery to minimise the risk of complications, and thus no selection biases were evident.

In cases of recto-sigmoid endometriosis, an initial conservative shaving technique was employed. When residual nodules remained, either segmental or discoid bowel resection was performed based on lesion characteristics, proximity to the anal verge, and the degree of circumferential involvement.[25] When the disease involved the ureter, ureterolysis was attempted first. If this was insufficient to release the ureter, ureteroneocystostomy was carried out.[5] All patients included received a histological confirmation of endometriosis.

Study Endpoints

The main objective of this study was to assess surgical outcomes including intraoperative, perioperative, and postoperative complications in women undergoing nerve-sparing dorsolateral parametrectomy, categorised according to the lateral and caudal depth of resection. Secondary outcomes included an assessment of postoperative changes in pelvic organ function (bowel, urinary, and sexual domains) using validated questionnaires (KESS, GIQLI, FSFI, BFLUTS), an evaluation of changes in pain symptoms from baseline to 6 month follow-up, and an exploration of potential correlations between the extent of parametrial dissection and postoperative functional outcomes, in combination with clinical, anthropometric, and intraoperative data.

Statistical Analysis

Given the retrospective observational design, no formal sample size calculation was performed. A total of 89 patients who met the inclusion criteria and underwent surgery during the study period were enrolled. Descriptive statistics summarised cohort characteristics. Categorical variables were reported as absolute numbers and percentages, while continuous variables were expressed as means with standard deviations or medians with interquartile ranges, depending on data distribution. The Shapiro–Wilk test assessed the normality of continuous variables.

Comparisons of quantitative variables across EH groups (EHSP, EHDP1, EHDP2, and EHDP3) were made using analysis of variance -one way or the Kruskal-Wallis test, as appropriate for non-normally distributed data. Differences in qualitative variables across HS groups were assessed using the chi-squared test or Fisher's exact test, as appropriate. Changes in quality-of-life and functional scores between baseline and follow-up were analysed using paired Student's t-tests or Wilcoxon signed-rank tests, as appropriate. A *P* value less than 0.05 was considered statistically significant. All statistical analyses were conducted using R software, version 4.2.0 (CRAN®, R Core 2022).

Results

The clinical and demographic characteristics of the study population are summarised in Table 1. The study included 89 women, whose mean age was 43.48±5.10 years and whose mean BMI was 24.78±3.33 kg/m². Both age and BMI (calculated as weight in kilograms over height in meters squared) showed no significant differences between groups. More than 60% of the cohort (n=54) had previously undergone surgery for endometriosis, and specifically 55.8% were in the SP group, 63.1% were in EHDP1, 83.3% were in EHDP2, and 50% were in EHDP3. Prior surgery occurred most frequently in EHDP2 (83.3%, n=10), although this difference did not achieve statistical significance (*P*=0.3). The only preoperative variable that differed significantly between groups was hydronephrosis, which was more common in EHDP3.

In accordance with the revised ASRM classification,[26] all patients were categorised as either stage III (40.4%) or stage IV (59.6%).

Intraoperative and Postoperative Complications

Intra- and postoperative surgical variables are summarised in Table 2 and Supplementary Figure 1. Overall, 8 patients (8.9%) experienced intraoperative complications: 5 (9.6%) with EHSP, 1 (5.3%) with EHDP1, and 2 (8.3%) with EHDP2. These events included six bladder injuries and two rectosigmoid injuries, all of which were detected intraoperatively and successfully repaired by primary suturing. There were no occurrences of rectovaginal, vesicovaginal, ureteral, or bladder fistulas, nor cases of ureteral stenosis, uroperitoneum, hemoperitoneum, subcutaneous hematoma, or pelvic abscess. Significant differences were observed among groups for postoperative bladder voiding dysfunction (*P*=0.001). Bladder voiding dysfunction occurred in 11 women (12.3%), most frequently with EHDP1 (31.6%, 6 patients). At the 6-month follow-up, only two women (2.24%) needed self-catheterisation: one who had EHDP1 (5.26%) and one who had EHDP2 (8.3%). The mean duration of self-catheterisation was longest for EHDP2 (6.7 days).

Table 1. General characteristics of the study sample groups at baseline (n=89).

Variables	Overall (n=89)	EHSP (n=52)	EHDP1 (n=19)	EHDP2 (n=12)	EHDP3 (n=6)
Age (years)	43.48 (5.10)	44.15 (4.9)	42.57 (5.82)	42.3 (4.5)	42.8 (5.4)
BMI, kg/m^2	24.78 (3.33)	24.46 (3.8)	25.07 (2.86)	25.1 (2.63)	25.8 (1.9)
Previous surgery for endometriosis	54 (60.8)	29 (55.8)	12 (63.1)	10 (83.3)	3 (50.0)
Hydronephrosis	8 (8.9)	1 (1.9)	3 (15.8)	0	4 (66.7)
r-ASRM					
III	36 (40.4)	28 (77.8)	5 (13.9)	3 (8.3)	0
IV	53 (59.6)	24(46.1)	14 (73.6)	9 (75)	6 (100)

EHSP: Extended hysterectomy with superficial parametrectomy, EHDP1: Extended hysterectomy with deep parametrectomy type 1, EHDP2: Extended hysterectomy with deep parametrectomy type 2, EHDP3: Extended hysterectomy with deep parametrectomy type 3, BMI: Body mass index, r-ASRM: Revised American Society for Reproductive Medicine.

Table 2. Comparison in term of intra- and post-operative complications between the study groups.

Complications	Overall (n =89)	EHSP (n=52)	EHDP1 (n=19)	EHDP2 (n=12)	EHDP3 (n=6)	*P* values
Intraoperative complications	8 (8.99)	5 (9.6)	1 (5.3)	2 (8.3)	0	0.031*
Transfusion	3 (3.37)	3 (5.8)	0	0	0	-
Bladder voiding deficit	11 (12.36)	2 (3.8)	6 (31.6)	2 (16.7)	1 (16.7)	0.016*
Intestinal anastomosis leakage	1 (1.10)	0	1 (5.3)	0	0	-
EBL	221.4 (168.7)	201.5 (193.3)	266.8 (152.5)	217.5 (80.0)	258.3 (91.7)	0.024*
ORT	262.6 (97.91)	229.7 (67.03)	280.5 (118.5)	319.8 (97.03)	377.2 (124.3)	0.013*
Day of hospitalisation	4.96 (1.97)	4.36 (1.6)	5.78 (2.25)	5.3 (1.8)	6.8 (2.7)	0.076*
Clavien-Dindo maximum grade						
0	63 (70.8)	43 (82.7)	9 (47.4)	8 (66.7)	3 (50)	
1	9 (10.1)	2(3.8)	5 (26.3)	2 (16.7)	0	0.047*
2	16 (18.0)	7 (13.5)	4 (21.1)	2 (16.7)	3 (50)	
3	1 (1.1)	0	1 (5.3)	0	0	
Definitive auto catheterisation	2 (2.24)	0	1 (5.26)	1 (8.3)	0	

Descriptive statistics are expressed as a median and interquartile range for quantitative variables, and as absolute and relative percentage frequencies for qualitative variables. Statistically significant values were marked with an *.
EHSP: Extended hysterectomy with superficial parametrectomy, EHDP1: Extended hysterectomy with deep parametrectomy type 1, EHDP2: Extended hysterectomy with deep parametrectomy type 2, EHDP3: Extended hysterectomy with deep parametrectomy type 3, EBL: Estimated blood loss, ORT: Operative time in minutes.

Median hospital stay was 4.96 days overall, ranging from 4.36 days with EHSP to 6.8 days with EHDP3 (not statistically significant). Mean estimated blood loss was 221.4±168.7 mL and was similar across groups, while mean operative time (377.2±124.3 min) was longest with EHDP3. There was only one Clavien–Dindo grade III complication, namely an intestinal anastomotic leak with EHDP1, which was managed conservatively.

Additional Surgical Procedures

Disease mapping in accordance with the #Enzian classification is reported in Supplementary Table 1, which also shows a significantly different distribution of ovarian and ureteric involvement, with obstruction among groups. Ureterolysis was required in 79 women (88.8%), which included all patients who had EHDP1-3 and 80.8% (n=42) of those who had EHSP (Table 3). Rectal shaving was performed in 11 cases (12.4%) and segmental bowel resection in 26 (29.2%). Shaving was mainly performed with EHSP (8/52; 15.4%) and EHDP2 (2/12; 16.7%), while segmental resection was more frequent with EHDP1 (7/19; 36.8%), EHDP2 (6/12; 50%), and EHDP3 (3/6; 50%).

Partial vaginal resection was done in 20 patients (22.5%), including 6 in EHDP1 (31.6%). No laparotomic conversions occurred. Neurolysis of the hypogastric, obturator, sacral plexus or sciatic nerves was carried out in 10 patients (11.2%), mainly those who had EHDP2 (60%). Unilateral nerve ablation of the HN or inferior hypogastric plexus was required in 8 cases (9%), predominantly on the left side with EHDP1 and on the right with EHDP3.

Functional Outcomes

A significant reduction in VAS scores for pain was observed between baseline and 6-month follow-up across all groups, especially for dyspareunia and dyschezia ($P<0.0001$; Table 4; Supplementary Figure 2). In terms of functional outcomes, KESS scores improved significantly with EHDP1, EHDP2, and EHDP3. GIQLI scores improved in the same three groups. BFLUTS scores improved significantly only with EHSP and EHDP3. FSFI scores showed no significant changes with EHDP1 and EHDP2, whereas EHDP3 showed significant improvement across all questionnaires.

Table 3. Intraoperative variables.

Surgery	**Overall (n=89)**	**EHSP (n=52)**	**EHDP1 (n=19)**	**EHDP2 (n=12)**	**EHDP3 (n=6)**	***P* values**
Bowel surgery	42 (47.2)	21 (40.4)	9 (47.4)	9 (75)	3 (50)	0.194
Shaving	11 (12.4)	8 (15.4)	1 (5.3)	2 (16.7)	0	0.498
Discoid resection	6 (6.7)	4 (7.7)	1 (5.3)	1 (8.3)	0	0.891
Segmental resection	26 (29.2)	10 (19.2)	7 (36.8)	6 (50)	3 (50)	0.078*
Distance from the anal verge, cm	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.0 (0.0-5.0)	2.00 (0-5)	2.6 (0-5)	0.056
Ileostomy	14 (15.7)	2 (3.8)	4 (21.1)	5 (41.7)	3 (50)	0.001*
Ureterolysis	79 (88.8)	42 (80.8)	19 (100)	12 (100)	6 (100)	0.045*
Neurolysis						
Right	3 (3.4)	0	3 (15.8)	0	0	-
Bilateral	3 (3.4)	1 (1.9)	1 (5.3)	1 (8.3)	0	
Left	4 (4.5)	0	2 (10.5)	1 (8.3)	1 (16.7)	
Ablation						
Right	4 (4.5)	0	3 (15.8)	0	1 (16.7)	-
Left	4 (4.5)	0	1 (5.3)	0	3 (50)	
Other data						
Urethral resection/reimplantation	7 (7.9)	1(1.9)	2 (10.5)	0	4 (66.7)	0.001*
Partial resection of the bladder	4 (4.5)	1 (1.9	2 (10.5)	1 (8.3)	0	0.375
Partial vaginal resection	20 (22.5)	9 (17.3)	6 (31.6)	3 (25.0)	2 (33.3)	0.541
Conversion to laparotomy	0	0	0	0	0	-
Anterior parametrectomy	3 (3.4)	0	1 (5.3)	1 (.3)	1 (16.7)	-

Statistically significant values were marked with an *.
EHSP: Extended hysterectomy with superficial parametrectomy, EHDP1: Extended hysterectomy with deep parametrectomy type 1, EHDP2: Extended hysterectomy with deep parametrectomy type 2, EHDP3: Extended hysterectomy with deep parametrectomy type 3.

Table 4. Pain VAS scale and questionnaire evaluations before intervention and at 6-month follow-up (n=89).

	Overall (n=89)		*P* value	EHSP (n=52)		*P* value	EHDP1 (n=19)		*P* value	EHDP2 (n=12)		*P* value	EHDP3 (n=6)		*P* value
	Baseline	FU-6		Baseline	FU-6		Baseline	FU-6		Baseline	FU-6		Baseline	FU-6	
VAS															
Dysuria	**0 (0–2)**	**0 (0–0)**	**0.0001***	**0 (0–0.5)**	**0 (0–0)**	0.0001*	0 (0–3)	0 (0–0)	0.148	0 (0–3)	0 (0–0)	0.083	0 (0–4.5)	0 (0–0)	0.064
Dysmenorrhea	8 (7–10)	-	-	8 (6.7–9.2)	-	-	7 (6–8.5)	-	-	10 (9–10.5)	-	-	8 (7.5–9)	-	-
Dyspareunia	**8 (6–9)**	**0 (0–2)**	**0.0001***	**8 (4.5–8.3)**	**0 (0–0.2)**	**0.0001***	**8 (7–9)**	**0 (0–0.3)**	**0.0001***	**8 (6.5–9)**	**2 (0–3.3)**	**0.0001***	**6 (1.3–7.8)**	**0 (0–2)**	**0.0001***
Dyschezia	**0 (3–7)**	**0 (0–0)**	**0.0001***	**2 (0–7)**	**0 (0–0)**	**0.0001***	**3 (0–8.5)**	**0 (0–2)**	**0.0001***	**6 (0–8)**	**0 (0–0)**	**0.0001***	**4 (0–7)**	**0 (0–0)**	**0.0001***
Questionnaires															
KESS	**16.35 (6.61)**	**13.13 (7.21)**	0.0001*	15.65 (6.18)	14.25 (7.7)	**0.027***	**17.21 (6.6)**	**12.26 (5.8)**	**0.0001***	**19.5 (6.5)**	**12.7 (6.7)**	**0.0001***	**13.5 (9.1)**	**7 (4.5)**	**0.0001***
GIQLI	83.1 (25.2)	87.6 (27.8)	0.057	87.19 (22.0)	88.05 (26.91)	0.420	**77.21 (28.89)**	**88.8 (28.1)**	**0.0001***	**89 (21.2)**	**93.3 (24.4)**	**0.0001***	**54.6 (29.8)**	**69.5 (39.7)**	**0.0001***
FSFI tot	19.5 (7.4)	17.5 (9.9)	0.079	20.30 (6.3)	18.58 (9.6)	0.084	18.5 (6.3)	16.1 (7.3)	0.094	16.84 (11.7)	18.2 (13.0)	0.075	**21.8 (9.7)**	**11.01 (12.2)**	**0.0001***
BFLUTS tot	14.8 (10.2)	13.3 (10.04)	0.097	**15.23 (10.44)**	**12.92 (9.74)**	**0.0001***	17.9 (10.9)	17.2 (10.6)	0.704	**10.9 (8.3)**	**13.1 (10.4)**	**0.0001***	**12.4 (8.2)**	**9.5 (5.7)**	**0.0001***

Statistically significant values were marked with an *.

BFLUTS tot: Bristol female lower urinary tract symptoms total score, EHSP: Extended hysterectomy with superficial parametrectomy, EHDP1: Extended hysterectomy with deep parametrectomy type 1, EHDP2: Extended hysterectomy with deep parametrectomy type 2, EHDP3: Extended hysterectomy with deep parametrectomy type 3, FSFI tot: Female sexual function index total score, GIQLI: Gastro-intestinal quality of life index, KESS: Knowles-Eccersley-Scott symptom; VAS: Visual analog scale, FU-6: Follow-up 6 months.

Discussion

Main Findings

This study provides preliminary evidence that the proposed classification of dorsolateral parametrectomy can be a useful framework to link the extent of parametrial resection to both postoperative complications and functional outcomes in patients undergoing EH for DE. In particular, our data show that EHDP1 procedures involving more extensive dorsolateral dissections were associated with a significantly higher incidence of postoperative bladder dysfunction (31.6%) compared to EHSP (3.8%) and EHDP2 (16.7%). This finding aligns with the work of Ianieri et al.,[7] who demonstrated that parametrial dissection beyond the presacral fascia and the MRA carries an increased risk of neurovegetative injury.

Consistent with our earlier findings,[4,7] we observed that EH for DE was associated with improvements in dyspareunia, but not necessarily with better sexual function as measured by FSFI scores. No significant differences emerged among the groups, which could be due to partial damage to autonomic fibres that regulate vaginal blood flow and lubrication.

Regarding bowel function, KESS scores significantly improved with EHDP1 and EHDP3, while no change was seen with EHDP2. This difference may relate to the variable degree of preservation of the rectal autonomic innervation, which passes through the LLR, in one of the three branches of the inferior hypogastric plexus, and which reaches the rectum. This data should also prompt reflection on the real impact that intestinal surgery for DE can have on organ dysfunction. Indeed, patients undergoing a caudal parametrectomy

that overcomes the MRA have potential dysfunction, but not patients undergoing intestinal surgery per se. [27]

Strengths and Limitations

To our knowledge, this is the first study to evaluate gastrointestinal, urinary and sexual outcomes using validated questionnaires in patients undergoing EH for DE, stratified according to the extent of parametrial dissection. This classification makes it possible to have a clearer attribution of complications regarding parametrectomy and supports the need for a standardised system. We have recently proposed an anatomical landmark-based system for parametrial dissection, which we hope will enable more consistent comparison across studies.[7]

This study has some limitations. The number of EHDP3 cases was small, and the follow-up period was too short to evaluate long-term pain recurrence or functional deterioration. In fact, the limited number of cases of EHDP3 did not allow us to describe the real incidence of complications in this group, particularly intraoperative ones, which would probably have been higher, especially in terms of potential vascular lesions. The retrospective nature of our study is usually connected to biases relating to incomplete or imperfect data collection, but our data comes from a prospective collection of questionnaires that are routinely collected during hospital admission and visits. Nonetheless, there is potential bias related to this being the surgical experience of a single surgeon, which can make the reproducibility of the classification unverified and, above all, dependent on a high level of knowledge of anatomy and endometriosis surgery, limiting its use to a small number of more experienced surgeons. Moreover, although validated questionnaires were used, they carry an inherent risk of subjective bias.

Strengths and Limitations Compared to Other Studies

The lack of sexual function improvement, measured by FSFI scores, is probably due to the intraoperative damage of nerve fibres and is consistent with previous data reported by our group.[4,7] This element should be addressed during the preoperative counselling of patients, to help avoid false expectations. Moreover, this finding may lead surgeons to understand that, even though they can use a "nerve-sparing" approach, sometimes they cannot really ensure complete preservation of all the ortho- and para-sympathetic nerve fibres. Furthermore, we must not forget that endometriosis can be associated with disorders of the contractility of the pelvic floor muscles.[28]

In our previous series,[4] post-voiding dysfunction occurred in approximately 13% of patients undergoing EH, and Darlet et al.[6] reported a comparable rate (13.5%) of self-catheterisation in 52 similar cases. However, neither study stratified outcomes according to the lateral–caudal extent of parametrectomy, limiting interpretation of the findings.

More broadly, the literature on EH for DE is highly heterogeneous, largely because the extent of parametrial dissection is rarely defined in precise anatomical terms.[5,6,15] Most studies describe the surgical technique[15,29-31] without specifying which portions of the parametrium were excised, likely explaining the wide variability reported for postoperative urinary retention (3.4–32%).[3,7]

Our data suggest that parametrectomy does not consistently improve urinary function, and discrepancies in the literature[31,32] may reflect not only patient selection bias but also the lack of assessment of how dissection depth relative to key anatomical landmarks influences the risk of pelvic autonomic nerve injury. Overall, published data on the functional impact of parametrial resection remain inconsistent, as many studies fail to provide a clear definition of parametrectomy.[5,6,15,31-33] Even for procedures widely adopted since their first description in 2008,[11] substantial variation has been documented among surgeons regarding the actual extent of dissection performed.[11,34]

Unlike the Querleu–Morrow classification,[10] originally developed for oncological surgery, our system is intended to reflect the anatomical features of parametrial DE, where radical excision must be balanced with preservation of pelvic autonomic nerves. As recently emphasised by our group,[7] this highlights the need for a classification tailored to the specific topography and neurovascular anatomy of endometriosis.

Clinical and Policy Implications

From a clinical perspective, these findings could guide intraoperative decisions regarding the extension of dissection beyond defined anatomical landmarks, balancing radical excision with functional preservation. Preoperative counselling is essential to align expectations regarding pain relief and postoperative functional recovery, in particular regarding potential post-operative bladder dysfunctions and the lack of improvement in sexual dysfunction.

Given the complexity of these surgical procedures, and especially the wide heterogeneity of symptoms and post-operative complications, referral to specialised centres with multidisciplinary expertise should be mandatory in cases of parametrial DE. Standardisation of terminology and classification would further improve comparability between centres and facilitate the development of consensus recommendations for radical surgery in DE.

Unanswered Questions and Future Research

The element that is probably most lacking in this study is the absence of a recurrence rate over a longer follow-up, which would have provided further information and evidence regarding the choice of whether to pursue radical surgery in the subgroup of patients with parametrial endometriosis. Obviously, the evaluation of functional outcomes, over a follow-up period of years after surgery for parametrial DE, deserves a separate study, especially to understand whether compensatory mechanisms can be established over time to convey potential ortho- and parasympathetic nerve lesions. That, however, goes beyond the scope of this study.

Conclusion

In conclusion, our classification for EH constitutes a significant advance in standardising the description of parametrectomy for DE, facilitating more precise correlations between disease extension in the parametria and functional outcomes. Nonetheless, it should be emphasised that the retrospective nature of this study and the heterogeneous size of the four groups do not make definitive conclusions possible. Prospective and especially multicentre validation will be needed to demonstrate the reproducibility of our proposed classification.

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Data sharing: The dataset used and analysed in the current study is not publicly available but can be made available by the corresponding author upon reasonable request.

Transparency: The authors affirm that the manuscript is an honest, accurate, and transparent account of the studies assessed. There are no important aspects of the studies omitted.

Supplementary Figures: https://d2v96fxpocvxx.cloudfront.net/37eae217-e8b5-4f55-976f-35df98003e83/content-images/e0b07c94-1449-45ae-accb-acbf0e565472.pdf

Supplementary Table: https://d2v96fxpocvxx.cloudfront.net/37eae217-e8b5-4f55-976f-35df98003e83/content-images/2de32bf9-4064-42f9-836d-68bf93c7ab62.pdf

References

1. Mabrouk M, Raimondo D, Arena A, Iodice R, Altieri M, Sutherland N, et al. Parametrial endometriosis: the occult condition that makes the hard harder. J Minim Invasive Gynecol. 2019;26:871-6.
2. Chiantera V, Petrillo M, Abesadze E, Sozzi G, Dessole M, Catello Di Donna M, et al. Laparoscopic neuronavigation for deep lateral pelvic endometriosis: clinical and surgical implications. J Minim Invasive Gynecol. 2018;25:1217-23.
3. Ceccaroni M, Clarizia R, Bruni F, D'Urso E, Gagliardi ML, Roviglione G, et al. Nerve-sparing laparoscopic eradication of deep endometriosis with segmental rectal and parametrial resection: the Negrar method. A single-center, prospective, clinical trial. Surg Endosc. 2012;26:2029-45.
4. Rosati A, Pavone M, Campolo F, De Cicco Nardone A, Raimondo D, Serracchioli R, et al. Surgical and functional impact of nerve-sparing radical hysterectomy for parametrial deep endometriosis: a single centre experience. Facts Views Vis ObGyn. 2022;14:121-7
5. Ianieri MM, Nardone AC, Pavone M, Benvenga G, Pafundi MP, Campolo F, et al. Are ureterolysis for deep endometriosis really all the same? An anatomical clssification proposal for ureterolysis: a single centre experience. Int J Gynaecol Obstet. 2023;162:1010-9.
6. Darlet G, Margueritte F, Drioueche H, Fauconnier A. Laparoscopic modified radical hysterectomy for severe endometriosis: a single-center case series. J Minim Invasive Gynecol. 2024;31:423-31.
7. Ianieri MM, Alesi MV, Querleu D, Ercoli A, Chiantera V, Carcagnì A, et al. Anatomical-based classification of dorsolateral parametrectomy for deep endometriosis. Correlation with surgical complications and functional outcomes: a single- center prospective study. Int J Gynaecol Obstet. 2024;167:1043-54
8. Ianieri MM, Raimondo D, Rosati A, Cocchi L, Trozzi R, Maletta M, et al. Impact of nerve-sparing posterolateral parametrial excision for deep infiltrating endometriosis on postoperative bowel, urinary, and sexual function. Int J Gynecol Obstet. 2022;159:152-9.
9. Ercoli A, Delmas V, Fanfani F, Gadonneix P, Ceccaroni M, Fagotti A, et al. Terminologia Anatomica versus unofficial descriptions and nomenclature of the fasciae and ligaments of the female pelvis: a dissection-based comparative study. Am J Obstet Gynecol. 2005;193:1565-73.
10. Querleu D, Cibula D, Abu-Rustum NR. 2017 Update on the Querleu–Morrow classification of radical hysterectomy. Ann Surg Oncol. 2017;24:3406-12.

11. Querleu D, Cibula D, Abu-Rustum NR, Fanfani F, Fagotti A, Pedone Anchora L, et al. International expert consensus on the surgical anatomic classification of radical hysterectomies. Am J Obstet Gynecol. 2024;230:235.e1-235.e8.

12. Ceccaroni M, Clarizia R, Roviglione G, Ruffo G. Neuro-anatomy of the posterior parametrium and surgical considerations for a nerve-sparing approach in radical pelvic surgery. Surg Endosc. 2013;27:4386-94.

13. Rizk B, Fischer AS, Lotfy HA, et al. Recurrence of endometriosis after hysterectomy. Facts Views Vis ObGyn. 2014;6:219-27.

14. Shirane A, Andou M, Shirane T, Ichikawa F, Sakate S, Sawada M. Recurrence of endometriosis after laparoscopic hysterectomy. *J Minim Invasive Gynecol*. 2019;26:S94.

15. Uccella S, Marconi N, Casarin J, Ceccaroni M, Boni L, Sturla D, et al. Impact of endometriosis on surgical outcomes and complications of total laparoscopic hysterectomy. Arch Gynecol Obstet. 2016;294:771-8.

16. Fujii S, Takakura K, Matsumura N, Higuchi T, Yura S, Mandai M, et al. Precise anatomy of the vesico-uterine ligament for radical hysterectomy. Gynecol Oncol. 2007;104:186-91.

17. Possover M. Neuropelveology: an emerging discipline for the management of pelvic neuropathies and bladder dysfunctions through to spinal cord injury, anti-ageing and the mars mission. J Clin Med. 2020;9:3285.

18. Revised American Society for Reproductive Medicine classification of endometriosis: 1996. Fertil Steril. 1997;67:817-21.

19. Haas D, Shebl O, Shamiyeh A, Oppelt P. The rASRM score and the Enzian classification for endometriosis: their strengths and weaknesses. Acta Obstet Gynecol Scand. 2013;92:3-7.

20. Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, et al. The Clavien-Dindo classification of surgical complications: five-year experience. Ann Surg. 2009;250:187-96.

21. Knowles CH, Eccersley AJ, Scott SM, Walker SM, Reeves B, Lunniss PJ. Linear discriminant analysis of symptoms in patients with chronic constipation: validation of a new scoring system (KESS). Dis Colon Rectum. 2000;43:1419-26.

22. Eypasch E, Williams JI, Wood-Dauphinee S, Ure BM, Schmülling C, Neugebauer E, et al. Gastrointestinal quality of life index: development, validation and application of a new instrument. Br J Surg. 1995;82:216-22.

23. Brookes ST, Donovan JL, Wright M, Jackson S, Abrams P. A scored form of the Bristol Female Lower Urinary Tract Symptoms questionnaire: data from a randomized controlled trial of surgery for women with stress incontinence. Am J Obstet Gynecol. 2004;191:73-82.

24. Rosen R, Brown C, Heiman J, Leiblum S, Meston C, et al. The Female Sexual Function Index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. J Sex Marital Ther. 2000;26:191-208.

25. Ianieri MM, De Cicco Nardone A, Benvenga G, Greco P, Pafundi PC, Alesi MV, et al. Vascular- and nerve-sparing bowel resection for deep endometriosis: a retrospective single-center study. Int J Gynecol Obstet. 2024;164:277-85.

26. Lee SY, Koo YJ, Lee DH. Classification of endometriosis. Yeungnam Univ J Med. 2020;38:10-8.

27. Seracchioli R, Ferrini G, Montanari G, Raimondo D, Spagnolo E, Di Donato N. Does laparoscopic shaving for deep infiltrating endometriosis alter intestinal function? A prospective study. Aust N Z J Obstet Gynaecol. 2015;55:357-62

28. Mabrouk M, Del Forno S, Spezzano A, Raimondo D, Arena A, Zanello M, et al. Painful love: superficial dyspareunia and three dimensional transperineal ultrasound evaluation of pelvic floor muscle in women with endometriosis. J Sex Marital Ther. 2020;46:187-96.

29. Tanaka Y, Higami S, Shiraishi M, Shiki Y. Total laparoscopic hysterectomy when there is posterior cul-de-sac obliteration: a step-by-step nerve-sparing technique. Am J Obstet Gynecol. 2023;229:178-80.

30. Melnyk A, Rindos NB, El Khoudary SR, Lee TTM. Comparison of laparoscopic hysterectomy in patients with endometriosis with and without an Obliterated Cul-de-sac. J Minim Invasive Gynecol. 2020;27:892-900.

31. Ballester M, Santulli P, Bazot M, Coutant C, Rouzier R, Daraï E. Preoperative evaluation of posterior deep-infiltrating endometriosis demonstrates a relationship with urinary dysfunction and parametrial involvement. J Minim Invasive Gynecol. 2011;18:36-42.

32. Laterza RM, Uccella S, Serati M, Umek W, Wenzl R, Graf A, et al. Is the deep endometriosis or the surgery the cause of postoperative bladder dysfunction? J Minim Invasive Gynecol. 2022;29:567-75.

33. Seracchioli R, Mabrouk M, Mastronardi M, Raimondo D, Arena A, Forno SD, et al. Anatomic cartography of the hypogastric nerves and surgical insights for autonomic preservation during radical pelvic procedures. J Minim Invasive Gynecol. 2019;26:1340-5.

34. Bizzarri N, Ianieri MM, Rosati A, Pedone Anchora L, Ronsini C, Ladisa I, et al. Consensus on the Gemelli terminology of surgical anatomy for radical hysterectomy. Int J Gynecol Cancer. 2023;33:876-81.