



Endometriosis Resection Using Nerve Sparing Versus Non-nerve Sparing Surgical Techniques

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Abstract

Introduction Endometriosis is the condition in which there are ectopic endometrial tissues outside the uterine cavity. The use of nerve sparing technique has been well established in the field of oncology, leading to better quality of life following radical oncologic procedures without compromising on the long-term survival. The objective of this study is to compare the quality of life in terms of sexual function and urinary function in women undergoing nerve sparing surgeries for endometriosis and those undergoing non-nerve sparing surgeries.

Material and Methods Data of 51 patients operated for endometriosis at Galaxy Care Laparoscopic Institute, Pune, India between 1st January 2020 till 31st December 2020 were collected and analysed. We included patients in age group between 38 and 44 years in monogamous relationship, with moderate to severe endometriosis (Revised American Society of Reproductive Medicine r-ASRM score of 16 and above 5), being operated for hysterectomy along with ureterolysis and/or bowel resection (including shaving of rectal endometriosis, discoid resection, segmental resection), and excision of large ovarian endometriomas (> 3 cm size) with cul-de-sac obliteration.

Results The patients were evaluated for the following factors: age, parity, nature of surgery done, immediate intraoperative complications (bowel injury, bladder injury, ureteric injury), operative time in minutes, average blood loss, length of hospital stay, days to removal of foley's catheter and postoperative urinary and sexual function which were assessed on follow up visit and a 1-year follow up interview. We found that the urinary and sexual function in the group undergoing nerve sparing surgeries was significantly better than the patients undergoing non-nerve sparing surgeries.

Conclusion Laparoscopic nerve sparing approach for clearance of endometriosis has allowed better quality of life post surgery. Proper understanding and demonstration of pelvic neuroanatomy has made this approach feasible and achievable in carefully selected patients.

Keywords Endometriosis · Laparoscopy · Nerve sparing · Hypogastric plexus

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Introduction

Endometriosis is the condition in which there are ectopic endometrial tissues outside the uterine cavity. There are multiple theories of implants of endometriosis in various tissues including retrograde menstruation, coelomic metaplasia, Mullerian remnants, immunological, genetic and environmental theories [1]. Dysmenorrhea, dyspareunia, dysuria and dyschezia are some of the common symptoms of endometriosis. The severity of these symptoms depend on the depth and extent of implants. Dyspareunia and dysuria may cause significant decrease in quality of life in the affected individuals. Complete surgical resection of endometriosis

is possible through laparoscopic route along with a laparoscopic hysterectomy or with uterus preserving procedures. Laparoscopic surgery is associated with less pain, shorter hospital stay and quicker recovery and hence is preferred over open surgery [2]. The use of nerve sparing technique has been well established in the field of oncology, leading to better quality of life following radical oncologic procedures without compromising on the long-term survival [3]. The objective of this study is to compare the quality of life in terms of sexual function and urinary function in women undergoing nerve sparing surgeries for endometriosis and those undergoing non-nerve sparing surgeries.

Material and Methods

Patient Selection

Data of 51 patients operated for endometriosis at Galaxy Care Laparoscopic Institute, Pune, India, between 1st January 2020 till 31st December 2020 were collected and analysed. The diagnosis was established using clinical history taking [4], abdominopelvic examination and supportive imaging studies like ultrasound and magnetic resonance imaging (MRI). The imaging modality of choice was guided by the symptomatology of the patient. We included patients in age group between 38 and 44 years in monogamous relationship, with moderate to severe endometriosis (revised American Society of Reproductive Medicine r-ASRM score of 16 and above [5]), being operated for hysterectomy along with ureterolysis and/or bowel resection (including shaving of rectal endometriosis, discoid resection, segmental resection), and excision of large ovarian endometriomas (> 3 cm size) with cul-de-sac obliteration. Exclusion criteria were patients with history of previous pelvic surgeries and proven malignancies. All the patients were clinically examined and the endometriosis staging was done as per the revised ASRM staging system. They were explained about the procedure of laparoscopic surgery, its benefits and potential risks and the possibility of conversion to laparotomy. All 51 patients had a routine OPD follow-up visit after 5–7 days of discharge from the hospital. We collected data from 47 patients at a 1-year follow-up interview (mean follow-up period of 13.65 ± 1.63 months). The interview was conducted telephonically after taking verbal consent. 4 patients were lost to follow-up.

Surgical Procedure

All the procedures were performed by the same surgical team using laparoscopic route. There were no conversions

to laparotomy intraoperatively. All patients received standard pre-operative bowel preparation and prophylactic antibiotics. Combined regional (spinal or epidural) and general anaesthesia was used. The patient was placed in modified Lloyd Davies position at 30–45° angle. Foley's catheterisation was done before starting the procedure. Pneumoperitoneum was created using Veress needle inserted in the Palmers point. Peritoneal cavity was entered under vision using optical 5 mm trocar just lateral to the Veress needle entry point. 5 standard ports were placed (1 camera port—10 mm and 2 working ports on either side for surgeon and assistant, respectively). Intraoperatively, the feasibility of preservation of pelvic autonomic nerves was assessed based on the extent of disease involvement and when the nerve planes were free of disease. When hysterectomy was indicated, our previously published technique of total laparoscopic hysterectomy [6] was followed. Oncologic principles of laparoscopic radical hysterectomy using the “Pune Technique” were applied when necessary [7]. For preserving the autonomic nerve supply of the pelvis, the dissection was begun by first identifying the ureter at its crossing point with the common iliac artery. Dissection continued medially towards the sacral promontory till the lateral part of the superior hypogastric plexus was identified. Inferior hypogastric nerve was then identified along the course of the ureter and eventually dissected away from the uterosacral ligament. Clipping of the uterine vein was done at a point superior and medial to the hypogastric nerve and in this way the nerve was spared. These principles of dissection were followed in all surgeries where nerve sparing was feasible, i.e. where the nerve planes were free of endometriotic deposits. Similar dissection principles were followed in ovarian endometriomas for dissection of the cysts from the adhesions to the pouch of Douglas and rectum. “Rectal shaving” was performed when the involvement was limited to the serosa. Discoid resection and segmental resection with a diversion ileostomy was also performed in a total of 9 cases out of which nerve sparing could be achieved in 4 cases.

Results

The patients were evaluated for the following factors: age, parity, nature of surgery done, immediate intraoperative complications (bowel injury, bladder injury, ureteric injury), operative time in minutes, average blood loss, length of hospital stay, days to removal of foley's catheter and postoperative urinary and sexual function which were assessed on follow-up visit and a 1-year follow-up interview. Table 1 represents the demographic and operative characteristics of the subjects. The patient demographics showed no

significant difference. Among the nerve sparing surgeries, we had 16 hysterectomies with ureterolysis, 4 underwent bowel resection (either discoid or segmental bowel resection) and 1 patient underwent extensive adhesiolysis with excision of bilateral ovarian endometriomas. There were 19 hysterectomies with ureterolysis, 5 hysterectomies with bowel resections and 2 excisions of ovarian endometriomas in the non-nerve sparing group. There was no significant difference in the average operative time and blood loss in both nerve sparing and non-nerve sparing surgeries.

There were no patients with bowel injuries in either group. Intraoperative bladder injury was identified in 1 patient in the nerve sparing group and 1 patient in the non-nerve sparing group. These were managed by multi-layer primary repair of the bladder using polyglactin 3–0 sutures.

Ureteric injury was identified in 1 patient in the non-nerve sparing group. Ureteric reimplantation and placement of ureteric stents was done for this patient. Prophylactic ureteric DJ stenting was also done in 5 patients in the nerve sparing and 7 patients in the non-nerve sparing group where extensive ureterolysis was done.

Total days of hospitalisation in patients who underwent hysterectomy with ureterolysis averaged 3.6 in the nerve sparing group and 5.4 in the non-nerve sparing group (Table 2). We found this to be statistically significant (P value < 0.0001). However, the duration of hospitalisation was not significantly different in patients undergoing bowel resection or excision of endometriomas. 7 patients (36.84%) who underwent non-nerve sparing hysterectomy with ureterolysis had urinary retention after removal of catheter and had

Table 1 Clinical and operative characteristics

	Nerve sparing ($N=21$)	Non nerve sparing ($N=26$)	P value
Age (Mean \pm SD)	42 \pm 1.95	42 \pm 2.32	0.26
Parity			
a. Nulliparous	2	3	
b. P1	11	17	
c. P2 and above	8	6	
Surgeries			
a. Hysterectomy with ureterolysis	16	19	
b. Hysterectomy with bowel resection	4	5	
c. Cystectomy and adhesiolysis	1	2	
Operative time in minutes			
a. Hysterectomy with ureterolysis	99 \pm 9.12	97 \pm 10.46	0.69
b. Hysterectomy with bowel resection	153 \pm 11.09	157 \pm 15.65	0.73
c. Cystectomy and adhesiolysis	82	87.5 \pm 2.5	
Blood loss			
a. Hysterectomy with ureterolysis	73.13 \pm 36.10	92.11 \pm 28.93	0.09
b. Hysterectomy with bowel resection	125 \pm 28.87	150 \pm 35.36	0.29
c. Cystectomy and adhesiolysis	50	75 \pm 25	
Immediate complications—bowel injury			
a. Hysterectomy with ureterolysis	0	0	
b. Hysterectomy with bowel resection	0	0	
c. Cystectomy and adhesiolysis	0	0	
Immediate complications—bladder injury			
a. Hysterectomy with ureterolysis	1	1	
b. Hysterectomy with bowel resection	0	0	
c. Cystectomy and adhesiolysis	0	0	
Immediate complications—ureteric injury			
a. Hysterectomy with ureterolysis	0	1	
b. Hysterectomy with bowel resection	0	0	
c. Cystectomy and adhesiolysis	0	0	
Prophylactic DJ stenting			
a. Hysterectomy with ureterolysis	5	7	
b. Hysterectomy with bowel resection	0	0	
c. Cystectomy and adhesiolysis	0	0	

to be re-catheterised, which was seen in only 1 patient who had the same surgery using nerve sparing technique. This was found to be of statistically significant. The incidence of urinary retention in patients undergoing bowel resection along with hysterectomy by either technique was not statistically significant. There were no incidences of urinary retention in patients who had excision of ovarian endometriomas with either technique.

Sexual function postoperatively (mean follow-up period of 13.65 ± 1.63 months) was assessed using the FSFI questionnaire. The domains of sexual desire, arousal, vaginal lubrication, orgasm, overall satisfaction and pain were assessed using the standardised scoring system and the scores of both the groups were compared. We found that the sexual function in the group undergoing nerve sparing surgeries was significantly better than the patients undergoing non-nerve sparing surgeries (Table 3A,B).

Discussion

Increasing depth of knowledge about pelvic neuroanatomy has led to the evolution of pelvic autonomic nerve sparing surgeries. This concept of nerve sparing surgery has been traditionally associated with radical oncologic surgeries. Our series of nerve sparing laparoscopic radical hysterectomy in early cervical cancer showed a better functional and urologic outcome with comparable oncologic outcomes as compared to conventional non-nerve sparing laparoscopic radical hysterectomy [8]. Urinary dysfunction can be induced in 2.4–17.5% of patients due to lesions of autonomic nerves [9]. The principles of autonomic nerve preservation have thus been increasingly applied to surgeries for deep infiltrating endometriosis

as well. In uterus preserving surgeries, i.e. in cases of bilateral ovarian endometriomas, clipping of the uterine vein was not necessary. In such cases, during dissection of the endometriomas free from the pouch of Douglas, the superior hypogastric plexus was dissected along the course of the ureter and thus complete clearance of the endometrioma from the pouch of Douglas was achieved (Fig. 1). Nerve preservation was confirmed by visual control and identification. In 2 cases of ovarian endometriomas, there was involvement of the nerve planes and thus total nerve sparing could not be achieved. Most of the times, with rectal involvement there is also involvement of the parametrium. The Negrar method [10] has also been applied in such cases. This method involves 6 steps: step 0-adhesiolysis and excision of involved peritoneal tissues; step 1-opening of pre-sacral space, development of avascular spaces, and identification and preservation of pelvic sympathetic fibres of the inferior mesenteric plexus, superior hypogastric plexus, upper hypogastric nerves, and S2–S4 nerve fibres; step 2-dissecting along the course of the ureter and preservation of sympathetic fibres of postero-lateral parametrium and lower mesorectum; step 3-posterior parametrectomy, deep uterine vein identification, and preservation of the parasympathetic pelvic splanchnic nerves by ligating the deep uterine vein at a point superior and medial to the caudal part of the inferior hypogastric plexus; step 4-preserving the caudal part of the inferior hypogastric plexus in postero-lateral parametrial ligaments; step 5-preservation of caudal part of the inferior hypogastric plexus in the paravaginal planes. The final sixth step is resection of the affected segment of rectum and colorectal anastomosis. With the application of this method, Ceccaroni et al. [11], in their prospective study of 126 patients, observed significantly

Table 2 Post-operative characteristics

Hospital Stay	Nerve sparing (<i>N</i> =21) Mean \pm SD	Non nerve sparing (<i>N</i> =26)	<i>P</i> value
Days of hospitalisation			
a. Hysterectomy with ureterolysis	3.63 \pm 0.62	5.44 \pm 1.03	< 0.0001
b. Hysterectomy with bowel resection	6.25 \pm 1.5	6 \pm 1.0	0.77
c. Cystectomy and adhesiolysis	3	3.5 \pm 0.71	
Days to first removal of catheter			
a. Hysterectomy with ureterolysis	3.8 \pm 1.28	4.95 \pm 0.85	0.003
b. Hysterectomy with bowel resection	7 \pm 3.83	7.6 \pm 1.52	0.75
c. Cystectomy and adhesiolysis	3	3.5 \pm 0.71	
Urinary retention	No. of patients (%)		
a. Hysterectomy with ureterolysis	1 (6.25%)	7 (36.84%)	0.03
b. Hysterectomy with bowel resection	1(25%)	1(20%)	0.85
c. Cystectomy and adhesiolysis	0	0	

Bold values indicate the best results

Table 3 Sexual function at follow-up interview(FSFI score components), (A) hysterectomy with ureterolysis, (B) hysterectomy with bowel resection, (C) cystectomy with adhesiolysis

(A) Hysterectomy with ureterolysis	Mean score \pm SD		
	Nerve sparing ($n=16$)	Non-nerve sparing ($n=19$)	<i>P</i> value
FSFI component (minimum/maximum)			
Desire (1.2/6.0)	4.16 \pm 1.16	2.74 \pm 0.5	< 0.0001
Arousal (0/6.0)	4.72 \pm 0.63	3.17 \pm 0.59	< 0.0001
Lubrication (0/6.0)	4.44 \pm 0.66	3.23 \pm 0.72	< 0.0001
Orgasm (0/6.0)	4.52 \pm 0.57	3.64 \pm 0.32	< 0.0001
Satisfaction (0.8/6.0)	4.27 \pm 0.45	3.74 \pm 0.23	< 0.001
Pain (0/6.0)	4.22 \pm 0.43	3.07 \pm 0.4	< 0.0001
(B) Hysterectomy with bowel resection	Mean score \pm SD		
	Nerve sparing ($n=4$)	Non-nerve sparing ($n=5$)	<i>P</i> value
FSFI component (minimum/maximum)			
Desire (1.2/6.0)	4.5 \pm 0.77	3.2 \pm 0.8	0.04
Arousal (0/6.0)	4.87 \pm 0.86	2.52 \pm 0.62	0.002
Lubrication (0/6.0)	4.35 \pm 0.86	2.52 \pm 0.62	0.007
Orgasm (0/6.0)	3.6 \pm 0.32	3.28 \pm 0.17	0.1
Satisfaction (0.8/6.0)	4.2 \pm 0.23	4.08 \pm 0.17	0.40
Pain (0/6.0)	3.9 \pm 0.38	3.04 \pm 0.21	0.003
(C) Cystectomy with adhesiolysis	Mean score \pm SD		
	Nerve sparing ($n=1$)	Non-nerve sparing ($n=2$)	<i>P</i> value
FSFI component (minimum/maximum)			
Desire (1.2/6.0)	4.8	3.2	
Arousal (0/6.0)	3.6	2.4	
Lubrication (0/6.0)	3.9	2.7	
Orgasm (0/6.0)	4.0	2.4	
Satisfaction (0.8/6.0)	4.4	3.2	
Pain (0/6.0)	4.0	2.8	

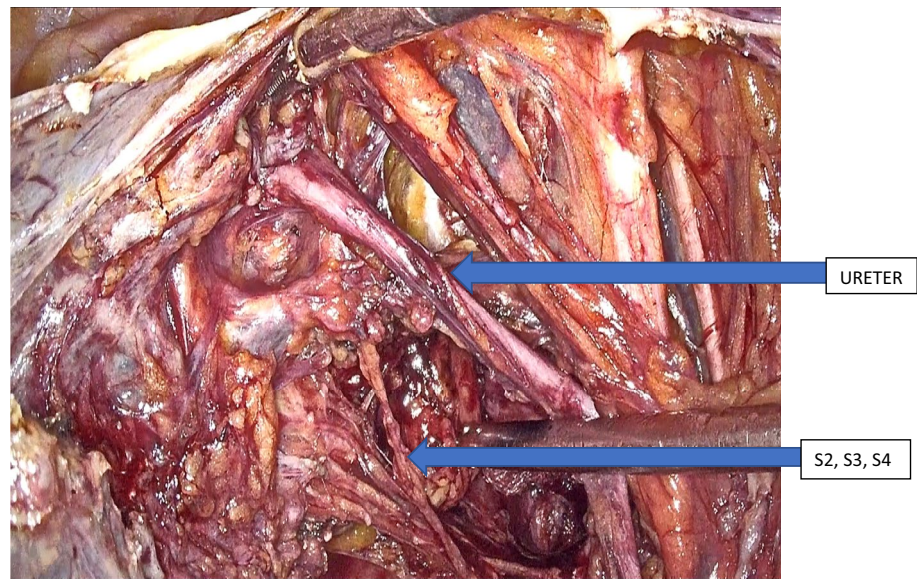
Bold values indicate the best results

better bladder function (lower mean days of self catheterisation and lower incidence of urinary retention) in the nerve sparing group as compared to the non-nerve sparing group. They also concluded that the incidence of severe rectal and sexual dysfunction was significantly different between the two groups. Nerve sparing surgery has also been recommended by the recent CNGOF-HAS endometriosis guidelines [12]. Women with endometriosis have a ninefold increase in incidence of deep dyspareunia as compared to general female population [4]. Dyspareunia is associated with endometriotic implants in posterior vaginal fornix, lateral pelvic walls, infiltration of the cardinal and uterosacral ligaments. Fritzer et al. in their prospective study of 96 subjects, demonstrated the pre- and post-operative dyspareunia scores as per visual analogue scales (VAS) over a mean follow-up period of 10 months. They found significant improvement in pain

scores (6.18 and 2.49 pre- and post-operatively, respectively) after surgical resections of endometriosis [13]. They also used the FSFI scoring system for quantifying the overall quality of sexual life post-surgery. A systematic review of literature showed significant improvement in quality of sexual life after surgical resection of endometriosis by using other methods of measurement as well, i.e. McCoy Female Sexuality Questionnaire [14], Global Sexual Satisfaction Index [15], and Sexual Activity Questionnaire [16].

A limitation of this study is the retrospective design and subjective nature of the FSFI questionnaire. Objective evaluation of urinary function by urodynamic studies was not possible due to financial constraints in the population studied. Demonstration of the effectiveness of nerve sparing surgery in preserving the quality of life

Fig. 1 Intraoperative Laparoscopic photograph showing vital pelvic structures



post-surgical resection of endometriosis is the strength of the study.

Conclusion

Laparoscopic nerve sparing approach for clearance of endometriosis has allowed better quality of life post-surgery. Proper understanding and demonstration of pelvic neuroanatomy has made this approach feasible and achievable in carefully selected patients.

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Declarations

Conflict of interest The authors declare no conflict of interest.

Ethical Standards This is a prospective study involving human participants and was in accordance with the ethical standards of the institutional ethics committee and with the 1964 Helsinki Declaration and its later amendments.

Ethical Approval Taken from Institutional Ethics Committee (IEC).

Informed consent Taken from all the included subjects.

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