ELSEVIER

JMIG
The Journal of Minimally Invasive Gynecology

Original Article

Long-term Follow-up of Sexual Quality of Life after Laparoscopic Surgery in Patients with Deep Infiltrating Endometriosis

María-Angeles Martínez-Zamora, MD, PhD, José Luis Coloma, MD, Meritxell Gracia, MD, PhD, Mariona Rius, MD, Camil Castelo-Branco, MD, PhD, and Francisco Carmona, MD, PhD

From the Department of Gynaecology, Institute Clinic of Gynaecology, Obstetrics and Neonatology, Hospital Clinic, Faculty of Medicine, Institut d'Investigacions Biomèdiques August Pi i Sunyer, University of Barcelona, Barcelona, Spain (all authors)

ABSTRACT **Study Objective:** We performed a long-term follow-up to quantify the impairment of sexual quality of life (SQL) and health-related QL (HRQL) in sexually active women after laparoscopic excision of deep infiltrating endometriosis (DIE).
Design: Prospective case-control study.
Setting: Hospital Clinic of Barcelona.
Patients: A total of 193 patients (after dropout and exclusions) were divided into 2 groups: one hundred twenty-nine premenopausal women with DIE (DIE group) and 64 healthy women who underwent tubal ligation (C group).
Interventions: All patients underwent laparoscopic surgery: laparoscopic endometriosis surgery in the DIE group and laparoscopic tubal ligation in the C group. All women were followed for at least 36 months, and they completed the Medical Outcomes Study 36-item short form questionnaire to assess their HRQL and 3 self-administered questionnaires that evaluate different aspects of SQL: the generic Sexual Quality of Life−Female questionnaire, the Female Sexual Distress Scale to evaluate "sexually related distress," and the Brief Profile of Female Sexual Function to screen hypoactive sexual desire disorder. The patients with DIE as well as the controls completed the 4 questionnaires before surgery, and the patients with DIE also completed the questionnaires at 6 and 36 months after surgery.
Measurements and Main Results: A comparison of the patients and controls before surgery showed a statistically significant impairment in SQL and HRQL among the patients with DIE. A statistically significant improvement in SQL and HRQL was observed in the DIE group 6 months after surgery, with scores being similar to those of the C group. An evaluation 36 months after surgery showed that SQL and HRQL were better than presurgical SQL and HRQL in the DIE group, with a slight reduction compared with the 6-month evaluation.
Conclusion: SQL and HRQL improved in patients with DIE undergoing complete laparoscopic endometriosis resection and were comparable to those of healthy women at 6 months after surgery, showing a slight reduction at 36 months of follow-up.
Journal of Minimally Invasive Gynecology (2021) 28, 1912−1919. © 2021 Published by Elsevier Inc. on behalf of AAGL.

Keywords: Deep infiltrating endometriosis; Laparoscopy; Quality of sexual life; Health-related quality of life

Sexual health is a critical aspect of health-related quality of life (HRQL) and is also influenced by medical conditions, especially when gynecologic disorders are involved [1]. Endometriosis is one of the most common gynecologic diseases during the reproductive years of women. The etiopathogenesis of endometriosis is a multifactorial process resulting in a heterogeneous disease. Genetic studies have confirmed that endometriosis is genetic in nature, and a growing body of evidence suggests that epigenetic processes have a key role in the pathogenesis and pathophysiology of endometriosis [2,3]. Many studies have reported that endometriosis, and deep infiltrating endometriosis (DIE) in particular, is associated with a significant reduction in HRQL [4−6]. Endometriosis should be considered a global disease, especially taking into account the fact that DIE presents the highest risk of sexual dysfunction [7−14]. It affects patients physically, psychologically, and sexually, and given its prevalence, the development of targeted prevention and early detection guidelines for associated

The authors declare that they have no conflict of interest.
Corresponding author: María-Angeles Martínez-Zamora, MD, PhD, Department of Gynaecology, Hospital Clinic of Barcelona, Villarroel 170, Barcelona 08036, Spain.
E-mail: mazamora@clinic.cat

Submitted January 22, 2021, Revised March 31, 2021, Accepted for publication April 30, 2021.
Available at www.sciencedirect.com and www.jmig.org

1553-4650/$ — see front matter © 2021 Published by Elsevier Inc. on behalf of AAGL.
https://doi.org/10.1016/j.jmig.2021.04.023

diseases and dysfunctions could have a significant impact on public health [5,6]. In recent years, some authors have demonstrated that sexual QL (SQL) is negatively influenced by endometriosis [15,16], especially by the symptoms of dyspareunia and chronic pelvic pain presented by patients with endometriosis [17]. In addition, although different hormonal or surgical treatments of endometriosis seem to have a positive impact on SQL [15,17,18], few studies have been carried out in patients with DIE, and most are short-term ones [7−14]. Moreover, there are few studies on hypoactive sexual desire disorder (HSDD) [19], with none on this disorder in patients with endometriosis. In contrast, there are several methods to assess SQL, the most common being validated questionnaires.

The aim of this study was to perform a long-term follow-up to quantify the impairment of SQL and HRQL in sexually active women after laparoscopic excision of DIE.

Materials and Methods

Study Design and Patients

This prospective case-control study was designed to perform a long-term follow-up to evaluate SQL after laparoscopic surgery for DIE. Two groups of patients were recruited: patients with DIE who underwent laparoscopic endometriosis surgery (DIE group) and healthy women undergoing laparoscopic tubal ligation (C group) from January 2014 to October 2016 at the gynecology department of the Hospital Clinic, a tertiary referral center in Barcelona, Spain, and they were followed for at least 36 months. All the patients recruited were aged 18 years or older and premenopausal. Only sexually active women having penile −vaginal intercourse at least once during the month before counseling were invited to participate. Patients and controls were recruited during the same period. The study was approved by the local ethical committee of Hospital Clinic of Barcelona, according to prevailing regulations (registration number: HCB/2015/0478). Informed consent was requested from all patients before inclusion in the study. The DIE group consisted of patients with clinical and radiologic diagnosis of DIE who underwent surgery owing to painful symptoms. In all these patients, a preoperative workup was performed, including clinical examination and transvaginal ultrasonography [20]. Magnetic resonance imaging was also performed when indicated. During surgery, DIE was confirmed, and the endometriosis findings were always confirmed by histologic study. The C group included healthy women who requested tubal sterilization by laparoscopy, with no presurgical suspicion of endometriosis and without endometriosis or other clinically significant findings during surgery.

The exclusion criteria included history of past or present malignancy; endocrine, cardiovascular, or systemic diseases; pregnancy or breastfeeding in the last 6 months; premature ovarian failure or menopausal status; uterine disorders, including endometrial hyperplasia, polyps, adenomyosis, and uterine leiomyomata; patients with pelvic floor dysfunction, irritable bowel syndrome, vestibulitis, or painful bladder syndrome; patients receiving the gonadotropin-releasing−hormone analog in the past 6 months; and patients with hysterectomy and/or bilateral adnexectomy. The exclusion criterion for the C group was the finding of any type of endometriosis by laparoscopy.

Before surgery, clinical and epidemiologic data were collected from all the individuals participating in the study. The patients were asked to quantify dysmenorrhea, dyspareunia, dyschezia, dysuria, and chronic pelvic pain according to a 0- to 10-point numeric rating scale, with “0” indicating no pain and “10” indicating the worst possible pain. There were no cutoff numbers for different types of pain to be included in the study. The reporting of hematuria or rectal bleeding was also registered.

Operative laparoscopy was performed in all patients by insertion of a 12-mm umbilical trocar and 2 or 3 5-mm trocars in the lower abdomen, as previously described [21]. An inspection of the pelvic organs and peritoneum was performed, followed by the surgical procedure indicated in each case. All tissue excised was sent for pathologic examination to confirm or exclude endometriosis. The patients were definitively assigned to 1 of the 2 study groups (C or DIE) after undergoing laparoscopy and histologic study. All the laparoscopic interventions were performed by 1 of 3 experienced laparoscopic surgeons using the same technique and instruments. The surgical team and operating theater staff have extensive experience with advanced gynecologic laparoscopy and instrumentation. An expert gynecologic pathologist performed all the histopathologic analyses. Complete laparoscopic resection of endometriosis lesions was achieved in all patients.

Methods: SQL and HRQL Questionnaires

To assess SQL, 3 validated questionnaires evaluating 3 different aspects of sexual functioning were administered: the generic Sexual Quality of Life−Female, the Female Sexual Distress Scale (FSDS), and the Brief Profile of Female Sexual Function (B-PFSF). The Sexual Quality of Life−Female was developed to explore the relationship between female sexual dysfunction and QL. It consists of 18 items rated on a 6-point response scale: completely agree, moderately agree, slightly agree, slightly disagree, moderately disagree, and completely disagree. The response categories are scored from 1 to 6 for a total score range of 18 to 108. A higher score indicates better SQL [22]. FSDS was developed to provide a standardized, quantitative measure of sexually related personal distress in women using 12 items (regarding, for instance, guilt, frustration, stress, inadequateness, and embarrassment over the last 4 weeks), with a maximum score of 48 [21]. An FSDS score ≥15 corresponds to clinically significant sexual distress. Finally, the B-PFSF questionnaire was developed and

validated to provide good discrimination between women who have HSDD and those who do not [23]. The questionnaire consists of 7 items, and each is scored on a 6-point Likert scale, from "always" to "never." A total score ranging from 0 to 35 is obtained, with a cutoff point of 20 having been found to be clinically relevant for categorizing women as possibly having HSDD or not.

In addition, the general HRQL was evaluated using the Medical Outcomes Study 36-item short form (SF-36) questionnaire translated into Spanish. We used the SF-36v2 Health Survey 2000 adapted by Vilagut et al in 2003 [24]. The questionnaire comprises 36 items and assesses 8 health concepts: physical functioning, role limitations owing to physical health issues, body pain, energy/fatigue, role limitations owing to emotional problems, emotional well-being, social functioning, and general health perception.

All patients completed the 4 self-administered questionnaires, which have been validated in Spanish, in a quiet room before surgery and 6 and 36 months after surgery. Two authors (M-A.M-Z. and J.L.C.) were available to clarify any aspect of these questionnaires.

Sample Size and Statistical Analysis

The sample size was calculated on the basis of previous studies on SQL in patients with endometriosis [25,26] and was established as 60 patients so as to observe a difference of 20% in SQL between the 2 groups. Because patients in the DIE group were to be followed for 36 months, the size of this group was doubled to minimize the impact of possible loss to follow-up. During patient recruitment, the controls comprised the next patient without endometriosis undergoing surgery after including 2 patients with endometriosis.

Statistical analysis was performed using SPSS v.25.0 (IBM Corp., Armonk, NY). Continuous variables were compared using the independent or paired samples *t* test or analysis of variance, as appropriate, and presented as mean ± standard deviation. Categorical variables were compared using the chi-square test and presented as total count and relative percentages. Statistical significance was defined as $p < .05$.

Results

Sample Description

A total of 200 patients were prospectively invited to participate in the study. Fig. 1 shows the flow chart of patient inclusion and dropouts in the study. One patient with DIE did not give informed consent, and 6 patients in the C group had peritoneal endometriosis and were excluded (Fig. 1). Finally, 129 premenopausal women with DIE (DIE group) and 64 healthy women who underwent tubal ligation (C group) were evaluated. A few patients were lost to follow-up (Fig. 1). The demographic and clinical data of the 2 groups are shown in Table 1.

In the DIE group, 65 patients had concomitant ovarian endometriomas (OEs): 18 cases of right OEs, 32 cases of left OEs, and 15 cases of bilateral OEs. The following DIE forms were recorded: vesical (n = 37), ureteral (n = 31), retrouterine (n = 72), fallopian tubes (n = 18), retrocervical (n = 61), uterosacral ligaments (n = 89), sigmoid (n = 51), rectovaginal septum (n = 15), other intestinal location (n = 13), and vaginal (n = 11). All DIE implants were excised during surgery. Superficial peritoneal endometriosis was recorded in 76% of the patients in the DIE group. Twelve rectosigmoid bowel resections were performed, and 2 patients required transient prophylactic colostomies. One ureteral and 1 intestinal leak requiring subsequent surgery were reported as complications in the postsurgical follow-up.

As expected, the DIE group presented more pain symptoms and more infertility than the C group. Ninety-seven (76.4%) patients in the DIE group and 31 (48.4%) in the C group were under hormonal treatment (combined oral contraceptives or progesterone alone) ($p < .001$). Both groups were comparable in terms of either having or not having a stable relationship and educational status (Table 1).

QL and SQL

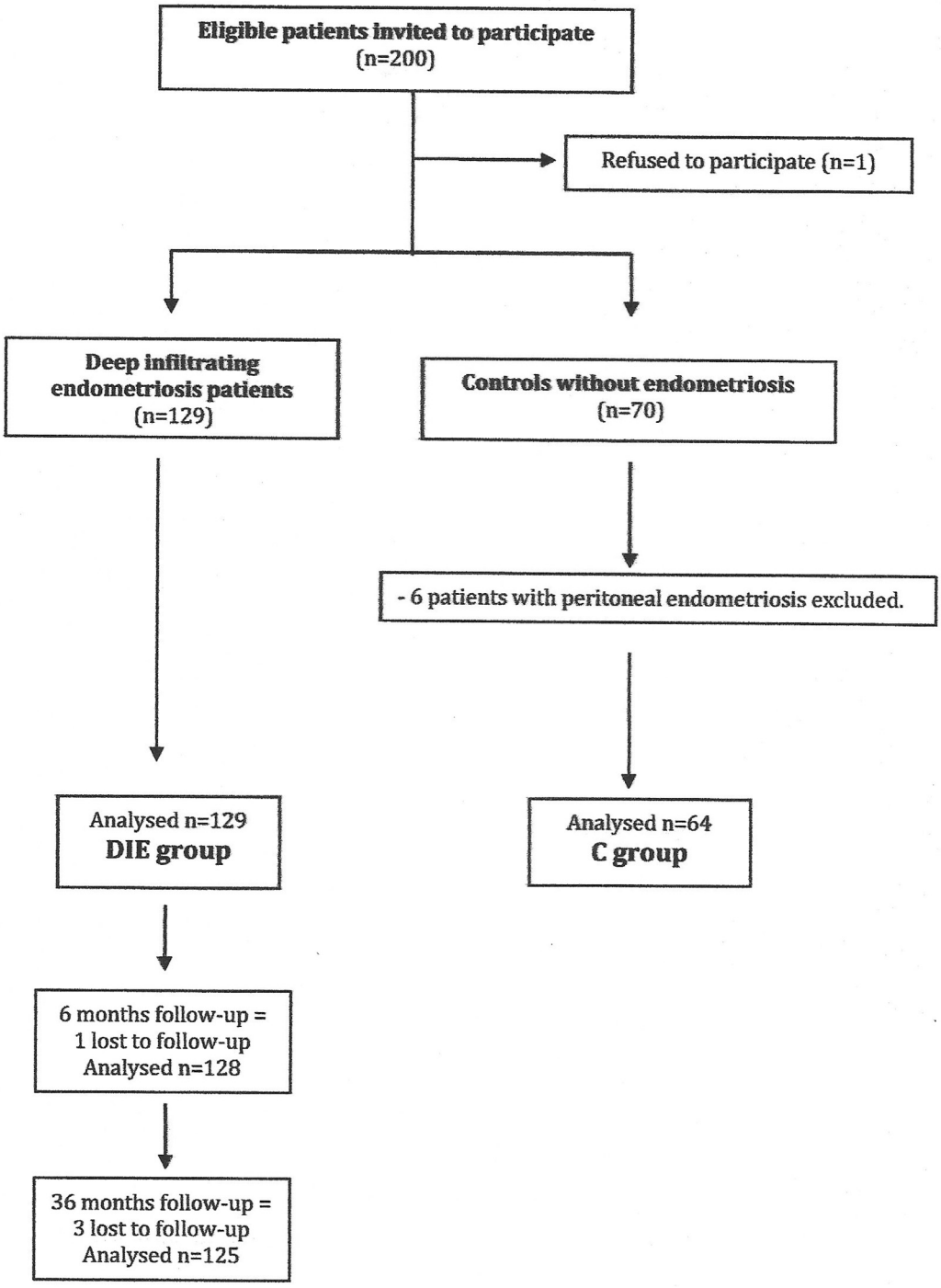
Table 2 shows the mean scores of the 8 domains of the SF-36v2 Health Survey 2000 in healthy controls and patients with DIE before surgery and in patients with DIE at 6 and 36 months of follow-up. Fig. 2 shows the scores of the 3 SQL questionnaires administered in both groups at baseline before laparoscopic surgery and the results in the DIE group at 6 and 36 months of follow-up. As expected, comparison of the DIE group with the controls before surgery showed a statistically significant impairment of SQL among patients with DIE as assessed by the 3 SQL questionnaires as well as in HRQL. The DIE group showed a statistically significant improvement in SQL and HRQL 6 months after surgery, achieving scores similar to those of the C group with normalization of SQL and HRQL (Fig. 2 and Table 2). Evaluation at 36 months of follow-up in the DIE group showed SQL and HRQL to be better than the scores before surgery, but with a slight, albeit statistically significant, reduction in these scores compared with those of the C group.

In relation to the FSDS questionnaire, 65 women (50.4%) in the DIE group showed clinically significant sexual distress (FSDS score ≥ 15) compared with none in the C group (0%) ($p < .001$) at baseline. However, at the 6-month follow-up, the FSDS scores improved in all the women in the DIE group. Likewise, before surgery, 109 (84.5%) patients in the DIE group showed a B-PFSF score ≤ 20 compared with none in the C group (0%) ($p < .001$), whereas at 6 and 36 months after surgery, 15 (11.7%) and 28 (22.4%) patients with DIE, respectively, presented a B-PFSF score ≤ 20.

Subanalysis did not reveal a significant effect of hormonal therapy on any of the main outcome variables ($p > .05$).

Fig. 1

Flow chart showing the inclusion of patients and dropouts in this study. C group = women who underwent tubal ligation without surgical findings of any form of endometriosis; DIE group = women with deep infiltrating endometriosis undergoing surgery for endometriosis.



Discussion

According to the results of our study, SQL and HRQL improved in patients with DIE undergoing complete laparoscopic endometriosis resection and were comparable to those of healthy women at 6 months after surgery. Nonetheless, there was a partial decline in this improvement at 36 months of follow-up.

Sexual functioning is an important dimension that can affect the physical and psychological health and HRQL of women [1]. Female sexual functioning can be negatively affected by a variety of factors and life stressors related to

Table 1

Demographic and clinical characteristics of the study and control groups before surgery

Characteristics	DIE group (n = 129)	C group (n = 64)	p value
Age (yrs)*	33.5 ± 6.04	34.7 ± 4.5	NS
BMI (kg/m^2)*	23.1 ± 4.3	22.91 ± 3.9	NS
Educational status†			NS
Primary	27 (20.9)	11 (17.2)	
Secondary	29 (22.5)	23 (35.9)	
University	73 (56.6)	30 (46.9)	
Without education	0 (0)	0 (0)	
In a stable relationship†			NS
Yes	102 (79.1)	54 (84.4)	
No	27 (20.9)	10 (15.6)	
Live births†	40 (31.0)	64 (100)	<.001
Sterility†			<.001
Yes	45 (34.9)	2 (3.1)	
No	84 (65.1)	62 (96.8)	
Type of pain (NRS score)*			
Dysmenorrhea	8.9 ± 3.9	0.4 ± 1.2	<.001
Chronic pelvic pain	5.1 ± 2.8	0.0 ± 0.0	<.001
Dyspareunia	6.2 ± 3.2	0.0 ± 0.0	<.001
Dyschezia	5.2 ± 2.5	0.0 ± 0.0	<.001
Dysuria	2.1 ± 2.0	0.0 ± 0.0	<.001

BMI = body mass index; C group = control group; DIE group = women with deep infiltrating endometriosis; NS = not significant; NRS = numeric rating scale.
*Mean ± standard deviation.
† Number (%).

medical illness [1,19]. Among these stressors, endometriosis is associated with a 9-fold increased risk of dyspareunia in women with the disease compared with the general female population [27]. Deep dyspareunia caused by endometriosis has frequently been linked to specific types of DIE lesions such as those infiltrating the uterosacral ligaments, the posterior vaginal fornix, and the anterior rectal wall [7]. Dyspareunia is also associated with others forms of sexual dysfunction such as HSDD, decreased lubrication, and arousal and orgasm difficulties [4]. Furthermore, previous studies have highlighted that when DIE lesions are associated with deep dyspareunia and/or chronic pelvic pain, this has strong negative effects on several domains of female sexual functioning such as desire, orgasm, satisfaction with sex, and frequency of sexual intercourse [28].

Research investigating the association between endometriosis and global female sexual functioning has outlined an even more complex clinical scenario, suggesting that dyspareunia is not the only sexual problem associated with the disease. It has been estimated that approximately two-thirds of the women with endometriosis suffer from some type of sexual dysfunction such as pain at intercourse, low satisfaction, lack of desire, low arousal, and orgasm difficulties with negative impact on the women's psychological health and intimate relationships [15,17]. Because endometriosis affects 10% of the women of reproductive age, it is possible that during the most sexually active period of their life a large proportion of young women present with sexual dysfunction caused by the disease, which may interfere with both SQL and HRQL. For this reason, sexual dysfunction associated with endometriosis represents a major clinical problem as well as an important outcome of endometriosis treatments, and the best treatment program should be provided by multidisciplinary teams composed of gynecologists, sexologists, and psychologists/psychotherapists [15,17,29].

Given the multifaceted aspects of sexual health and HRQL in patients with endometriosis, the question of whether surgery might affect sexual function and HRQL is highly pertinent. Extensive surgery for endometriosis is feasible and effective, but it may be associated with significant complication rates. Nevertheless, the rate of complications

Table 2

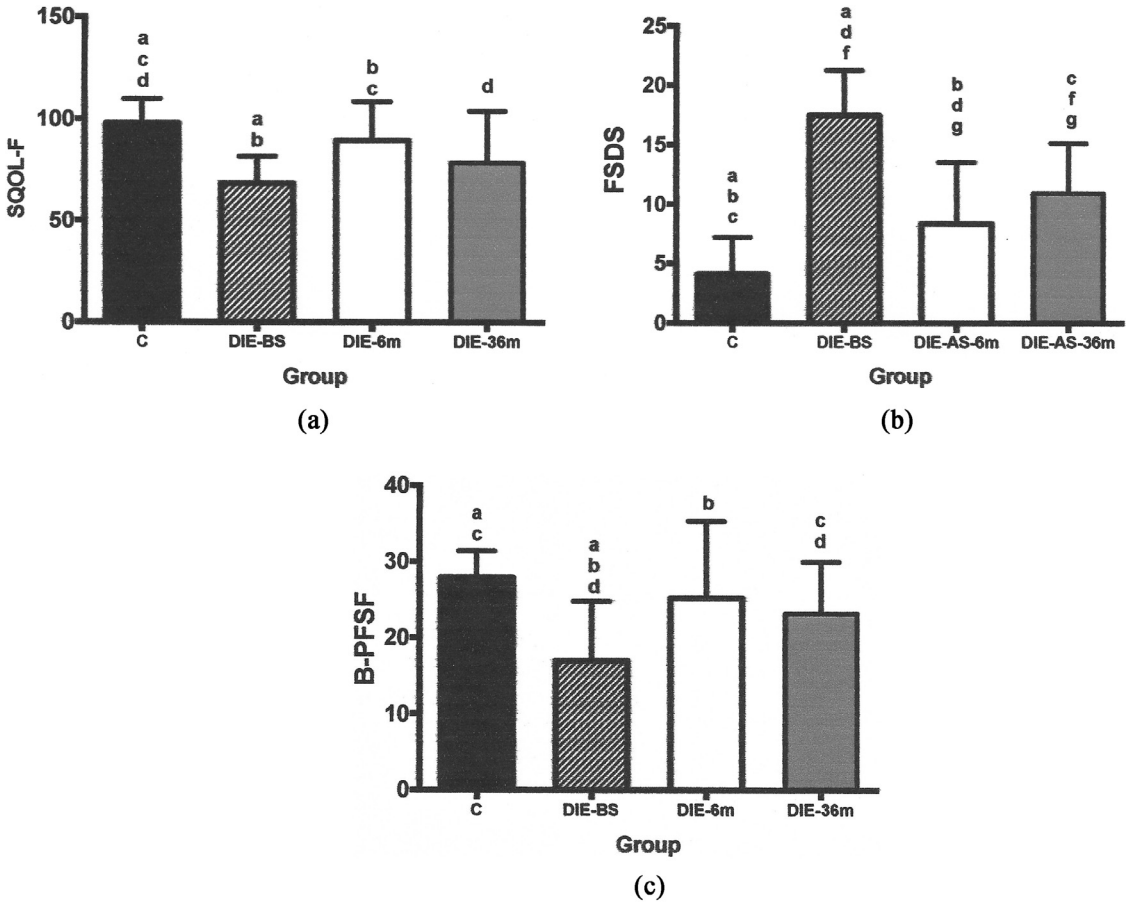
The mean score of the 8 domains of the SF-36v2 Health Survey 2000 in healthy controls and in patients with DIE before surgery and in patients with DIE at 6 and 36 months of follow-up

Characteristics	C group(n = 64)	DIE-BS group (n = 129)	DIE-6m group (n = 128)	DIE-36m group (n = 125)	p value
General health	85.6 ± 11.5	51.9 ± 21.1	80.2 ± 23.8	68.3 ± 17.2	<.001
Physical functioning	99.7 ± 28.9	80.6 ± 20.7	99.2 ± 26.7	91.2 ± 25.6	.001
Role limitations (physical)	99.8 ± 28.9	42.8 ± 25.7	99.4 ± 26.7	78,6 ± 16,3	.001
Role limitations (emotional)	93.7 ± 15.9	52.1 ± 17.5	77.8 ± 20.2	65.7 ± 22.7	.006
Social functioning	93.7 ± 9.6	54.7 ± 19.5	87.5 ± 209	73.1 ± 17.0	.001
Bodily pain	87.5 ± 14.4	36.6 ± 19.8	80.8 ± 12.1	62.7 ± 19.1	.001
Vitality	95.3 ± 14.5	71.0 ± 11.8	85.2 ± 15.2	78.1 ± 16.3	.001
Mental health	81.8 ± 19.8	54.07 ± 16.7	79.3 ± 11.4	73.4 ± 12.7	0.010

C group = control group; DIE-BS group = patients with deep infiltrating endometriosis before endometriosis surgery; DIE-6m group = patients with deep infiltrating endometriosis 6 months after endometriosis surgery; DIE-36m group = patients with deep infiltrating endometriosis 36 months after endometriosis surgery; SF = Short Form.
Values are given in mean ± standard deviation.

Fig. 2

Bar charts showing scores of the 3 questionnaires administered before surgery in patients with deep infiltrating endometriosis and healthy patients requesting tubal ligation and in patients with deep infiltrating endometriosis at 6 and 36 months of follow-up after surgery. (A) Bar chart showing scores of the SQOL-F (a, b, c, d = p <.001). (B) Bar chart showing scores of the FSDS (a, b, c, d, e, f = p <.001). (C) Bar chart showing scores of the B-PFSF (a, b, c, d = p <.001). B-PFSF = Brief Profile of Female Sexual Function; C group = control group; DIE-BS group = deep infiltrating endometriosis group before surgery; DIE-6m group = patients with deep infiltrating endometriosis 6 months after surgery; DIE-36m group = patients with deep infiltrating endometriosis 36 months after surgery; FSDS = Female Sexual Distress Scale; SQOL-F = Sexual Quality of Life−Female. Values are given in mean and standard deviation.



in our series was low and in concordance with other studies [30]. The debate on the appropriate standard of care in surgical treatment of intestinal DIE is ongoing. A patient-tailored approach is required, and the least invasive radical option should be chosen. A colorectal surgeon expert in intestinal endometriosis should make the most proper decision regarding whether to perform a full-thickness excision, shaving, or bowel resection [31]. Mesenteric vascular-sparing surgery can be combined with pelvic nerve−sparing surgery as an effective approach to improve intestinal symptoms after radical surgery for DIE that requires segmental intestinal resection [32]. Previous studies have evaluated the effect of conservative surgery of DIE on SQL using different questionnaires and reported an improvement of sexual function in the short-term follow-up (no longer than 6−12 months in most studies) [8−14], which is in keeping with our findings. We designed a prospective case-control study to evaluate HRQL and SQL among patients with DIE with a long-term follow-up after laparoscopic surgery. The inclusion and exclusion criteria were designed to attempt to avoid bias. This means that we wanted to ensure that patients with DIE only had endometriosis and that healthy controls did not have any other gynecologic or nongynecologic illness. The characteristics of our tertiary referral center with an endometriosis referral unit, which provides all types of surgery for the general population, allowed comparison of DIE patients with checked healthy controls who underwent laparoscopy for tubal ligation. In this sense, patients who requested tubal ligation and were healthy were considered the best candidates to be "healthy controls" or "patients without endometriosis" after confirming the absence of endometriosis lesions by laparoscopy. Because we did not know the impact of other types of endometriosis such as peritoneal

endometriosis, we decided to exclude patients with any type of endometriosis findings by laparoscopy from the control group. Furthermore, although the questionnaires used have published normal values, we evaluated a control group to ensure that the healthy controls did not have endometriosis or other pelvic disorders evaluated by laparoscopy and to analyze patients within the same age range. Moreover, although patients could be considered their own controls at baseline, we found it useful to include patients without endometriosis confirmed by laparoscopy to obtain objective information about how different HRQL and QSL are in patients with DIE and in healthy women without baseline endometriosis. It also allowed the possibility of comparing the improvement after surgery not only with the baseline disease but also with healthy women, thereby demonstrating how important the improvement was in the follow-up.

The present study has several strengths. First, we performed a prospective long-term follow-up of a minimum of 36 months, including patients with histologically confirmed DIE and healthy controls who were confirmed as not having endometriosis implants by laparoscopy. Previous studies in the same research area had shorter follow-ups, usually <12 months, or included patients with different types of endometriosis without evaluating the results according to the type of endometriosis or had a lack of healthy controls in which endometriosis implants were excluded. Second, we used 3 different questionnaires to evaluate different areas of SQL, and the results of all 3 were concordant. Moreover, our study provides data about HSDD among patients with DIE before and after surgery. Third, the study was designed to specifically evaluate SQL and HRQL as the main measure and not as a secondary aim. Finally, all patients evaluated in the study, including the healthy controls, underwent surgery, and therefore all the patients were correctly classified, and healthy controls with any form of endometriosis or other pathologic findings were excluded.

The current study also has some limitations. First, healthy patients were evaluated only at baseline because the study setting was a tertiary referral center. Second, the tertiary hospital setting may mean that the included patients with DIE may have had more severe disease than the general endometriosis population. Finally, the DIE group received hormonal treatment more frequently than the healthy controls, reflecting daily clinical practice. Nevertheless, previous reports have shown that the use of oral contraceptives has no negative impact on overall sexual function in healthy patients [33]; moreover, hormonal treatments have been reported to ameliorate sexual outcomes among patients with endometriosis [15,17]. However, there is limited evidence on the efficacy of hormonal therapy on endometriosis-related sexual dysfunction.

To conclude, patients who underwent complete laparoscopic DIE resection showed improvements in SQL and HRQL comparable to those in healthy women at 6 months after surgery, with a slight reduction in these values at 36 months of follow-up.

Acknowledgments

This study was supported in part by a grant from the Hospital Clinic of Barcelona and in part by a donation from the Asociación de Afectadas de Endometriosis de Cataluña.

References

1. Langer A, Meleis A, Knaul FM, et al. Women and health: the key for sustainable development. *Lancet*. 2015;386:1165–1210.
2. Laganà AS, Garzon S, Götte M, et al. The pathogenesis of endometriosis: molecular and cell biology insights. *Int J Mol Sci*. 2019;20:1–42.
3. Filipchiuk C, Laganà AS, Beteli R, et al. BIRC5/Survivin Expression as a non-invasive biomarker of endometriosis. *Diagnostics (Basel)*. 2020;10:533.
4. Di Donato N, Montanari G, Benfenati A, et al. Do women with endometriosis have to worry about sex? *Eur J Obstet Gynecol Reprod Biol*. 2014;179:69–74.
5. Coloma JL, Martínez-Zamora MA, Collado A, et al. Prevalence of fibromyalgia among women with deep infiltrating endometriosis. *Int J Gynaecol Obstet*. 2019;146:157–163.
6. Nnoaham KE, Hummelshoj L, Webster P, et al. Impact of endometriosis on quality of life and work productivity: a multicenter study across ten countries. *Fertil Steril*. 2011;96:366–373.e8.
7. Vercellini P, Somigliana E, Consonni D, Frattaruolo MP, De Giorgi O, Fedele L. Surgical versus medical treatment for endometriosis-associated severe deep dyspareunia: I. Effect on pain during intercourse and patient satisfaction. *Hum Reprod*. 2012;27:3450–3459.
8. Di Donato N, Montanari G, Benfenati A, et al. Sexual function in women undergoing surgery for deep infiltrating endometriosis: a comparison with healthy women. *J Fam Plann Reprod Health Care*. 2015;41:278–283.
9. Dubuisson J, Pont M, Roy P, Golfier F, Raudrant D. Female sexuality after surgical treatment of symptomatic deep pelvic endometriosis [in French]. *Gynecol Obstet Fertil*. 2013;41:38–44.
10. Fritzer N, Tammaa A, Haas D, et al. When sex is not on fire: a prospective multicentre study evaluating the short-term effects of radical resection of endometriosis on quality of sex life and dyspareunia. *Eur J Obstet Gynecol Reprod Biol*. 2016;197:36–40.
11. Kössi J, Setälä M, Mäkinen J, Härkki P, Luostarinen M. Quality of life and sexual function 1 year after laparoscopic rectosigmoid resection for endometriosis. *Colorectal Dis*. 2013;15:102–108.
12. Meuleman C, Tomassetti C, D'Hoore A, et al. Surgical treatment of deeply infiltrating endometriosis with colorectal involvement. *Hum Reprod Update*. 2011;17:311–326.
13. Morelli L, Perutelli A, Palmeri M, et al. Robot-assisted surgery for the radical treatment of deep infiltrating endometriosis with colorectal involvement: short- and mid-term surgical and functional outcomes. *Int J Colorectal Dis*. 2016;31:643–652.
14. Setälä M, Härkki P, Matomäki J, Mäkinen J, Kössi J. Sexual functioning, quality of life and pelvic pain 12 months after endometriosis surgery including vaginal resection. *Acta Obstet Gynecol Scand*. 2012;91:692–698.
15. Pluchino N, Wenger JM, Petignat P, et al. Sexual function in endometriosis patients and their partners: effect of the disease and consequences of treatment. *Hum Reprod Update*. 2016;22:762–774.
16. Shum LK, Bedaiwy MA, Allaire C, et al. Deep dyspareunia and sexual quality of life in women with endometriosis. *Sex Med*. 2018;6:224–233.
17. Barbara G, Facchin F, Meschia M, Berlanda N, Frattaruolo MP, VercellinI P. When love hurts. A systematic review on the effects of surgical and pharmacological treatments for endometriosis on female sexual functioning. *Acta Obstet Gynecol Scand*. 2017;96:668–687.
18. Fritzer N, Tammaa A, Salzer H, Hudelist G. Dyspareunia and quality of sex life after surgical excision of endometriosis: a systematic review. *Eur J Obstet Gynecol Reprod Biol*. 2014;173:1–6.

19. Clayton AH. The pathophysiology of hypoactive sexual desire disorder in women. *Int J Gynaecol Obstet*. 2010;110:7–11.
20. Ros C, Martínez-Serrano MJ, Rius M, et al. Bowel preparation improves the accuracy of transvaginal ultrasound in the diagnosis of rectosigmoid deep infiltrating endometriosis: a prospective study. *J Minim Invasive Gynecol*. 2017;24:1145–1151.
21. Carmona F, Martínez-Zamora A, González X, Ginés A, Buñesch L, Balasch J. Does the learning curve of conservative laparoscopic surgery in women with rectovaginal endometriosis impair the recurrence rate? *Fertil Steril*. 2009;92:868–875.
22. Symonds T, Boolell M, Quirk F. Development of a questionnaire on sexual quality of life in women. *J Sex Marital Ther*. 2005;31:385–397.
23. Derogatis L, Clayton A, Lewis-D'Agostino D, Wunderlich G, Fu Y. Validation of the female sexual distress scale-revised for assessing distress in women with hypoactive sexual desire disorder. *J Sex Med*. 2008;5:357–364.
24. Vilagut G, Valderas JM, Ferrer M, Garin O, López-García E, Alonso J. Interpretation of SF-36 and SF-12 questionnaires in Spain: physical and mental components [in Spanish]. *Med Clin (Barc)*. 2008;130:726–735.
25. Ferrero S, Esposito F, Abbamonte LH, Anserini P, Remorgida V, Ragni N. Quality of sex life in women with endometriosis and deep dyspareunia. *Fertil Steril*. 2005;83:573–579.
26. Caruso S, Iraci M, Cianci S, Casella E, Fava V, Cianci A. Quality of life and sexual function of women affected by endometriosis-associated pelvic pain when treated with dienogest. *J Endocrinol Invest*. 2015;38:1211–1218.
27. Ballard KD, Seaman HE, de Vries CS, Wright JT. Can symptomatology help in the diagnosis of endometriosis? Findings from a national case-control study−Part 1. *BJOG*. 2008;115:1382–1391.
28. Cozzolino M, Magro-Malosso ER, Tofani L, Coccia ME. Evaluation of sexual function in women with deep infiltrating endometriosis. *Sex Reprod Healthc*. 2018;16:6–9.
29. Fritzer N, Hudelist G. Love is a pain? Quality of sex life after surgical resection of endometriosis: a review. *Eur J Obstet Gynecol Reprod Biol*. 2017;209:72–76.
30. Meuleman C, D'Hoore A, Van Cleynenbreugel B, Beks N, D'Hooghe T. Outcome after multidisciplinary CO2 laser laparoscopic excision fo deep infiltrating colorectal endometriosis. *Reprod Biomed Online*. 2009;18:282–289.
31. Laganà AS, Vitale SG, Trovato MA, et al. Full-thickness excission versus shaving by laparoscopy for intestinal deep infiltrating endometriosis: rationale and potential treatment options. *BioMed Res Int*. 2016;2016:3617179.
32. Raffaelli R, Garzon S, Baggio S, et al. Mesenteric vascular and nerve sparing surgery in laparoscopic segmental intestinal resection for deep infiltrating endometriosis. *Eur J Obsteet Gynecol Reprod Biol*. 2018;231:214–219.
33. Zethraeus N, Dreber A, Ranehill E, et al. Combined oral contraceptives and sexual function in women-a double-blind, randomized, placebo-controlled trial. *J Clin Endocrinol Metab*. 2016;101:4046–4053.