### Original Article Comparison of complete and incomplete excision of deep infiltrating endometriosis

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Abstract: Objective: To compare the efficacy and safety of complete and incomplete excision of deep infiltrating endometriosis (DIE). Methods: Ninety-three women who underwent complete excision (n=55) or incomplete surgery of DIE (n=38) between January 2011 and December 2013 were included in this retrospective cohort study. Surgical data, and follow-up information of the patients were analyzed. Results: Eighty-five women (91.4%) returned for their follow-up after the operation. The mean follow-up time was 18.3±8.7 months. The complete excision group had a significantly higher complication rate than the incomplete excision group (9.1% VS 0%, P<0.001). The decrease of visual analog scale (VAS) scores were more significant (5.6±3.9 VS 2.9±3.3, P=0.001), and the postoperative recurrence rate is significantly lower (3.9% VS 35.3%, P=0.000) in the complete excision group than that in the in-complete surgery group. The palliative incomplete excision had a comparable pregnancy rate and comparable quality of life in most aspects, except psychological score. And in the in-complete excision patients, administration of post-operative GnRH agonist had a post-treatment improvement of VAS score similar with the complete excision patient (4.5±3.2 versus 5.6±3.9, P=0.272). However, the recurrence rate were still significantly higher (29.4% VS 3.9%, P=0.000). Conclusions: Comparing with incomplete excision, the complete excision of DIE significantly decreased the post-operative pain and the recurrence rate. Although incomplete excision with post-operative GnRHa is efficient with respect to pain, the side effects of the drugs and the recurrence rate after cessation of the drugs must be considered. So complete excision of DIE is the first surgical treatment of choice.

Keywords: Deep infiltrating endometriosis, laparoscopic surgery, complete excision, incomplete excision

#### Introduction

Endometriosis, defined as presence of ectopic endometrial gland tissue outside the uterine cavity, is a benign condition that commonly affects women of reproductive age, but it can seriously worsen quality of life [1]. Deep infiltrating endometriosis (DIE) is characterized by endometriosis implants that penetrate for more than 5 mm in the affected tissue [2, 3]. Although in most patients the disease is limited to the genital organs, endometriosis may diffusely involve pelvic structures including bowel and urinary tract [4-6]. These lesions develop in the form of retroperitoneal nodules that consist histologically of endometrial epithelium and stroma, surrounded by muscular hyperplasia and fibrosis [7]. DIE nodules are rich in nerve fibers [8] and are commonly associated with severe cyclic or acyclic pelvic pain such as dysmenorrhea, deep dyspareunia, and nonmenstrual pain and organ-specific symptoms related to bladder or intestinal dysfunction (dyschezia, constipation, diarrhea, rectal bleeding, frequency of micturition, and hematuria) [9, 10].

Infiltrating lesions respond to various hormonal compounds and considerable improvement in pain symptoms can be obtained with medical treatments [11]. However, symptoms usually recur after drug withdrawal and surgical treatment may be required for a more definitive management of highly symptomatic patients.

The best therapeutic approach is still controversial. Recent studies suggest that complete excision of DIE lesions leads to a reliable and per-

Parameter, n (%) or n (range)	Patients
Age (y)	34.99±7.15 (24-55)
rAFS Staging	
1	4 (4.3%)
II	17 (20%)
III	27 (31.8%)
IV	37 (43.5%)
Affected locations	
Cervical stump (after subtotal hysterectomy)	3 (3.2%)
Vaginal stump (after total hysterectomy)	1 (1.1%)
Pelvic sidewall	4 (4.3%)
Bladder	4 (4.3%)
Ureter	5 (5.4%)
Rectum	16 (17.2%)
Cul-de-sac	18 (19.4%)
Rectovaginal septum	15 (16.1%)
Posterior fornix	32 (34.4%)
Uterosacral ligaments	39 (41.9%)

**Table 1.** Clinical characteristics of the patients with deep infiltrating endometriosis (DIE)

sistent relief of pain symptoms, improvement of quality of life and acceptable postoperative fertility rates [12-14]. However radical surgical excision of deep endometriosis increases the risks of complications and is associated with severe morbidity. It is unclear whether a greater or similar health improvement can be achieved with less aggressive surgery [15].

So the aim of this study was to compare the surgical outcomes, the short-term treatment benefits and complications between the complete surgical excision of DIE lesions and incomplete resection of DIE.

### Materials and methods

This retrospective cohort study protocol was approved by the hospital's Institutional Review Board. A total of 93 women diagnosed with DIE who underwent operation in the Obstetrics and Gynecology Hospital of Fudan University between January 2011 and December 2013. All patients were operated on by the same welltrained multidisciplinary team of laparoscopic gynecologists and colorectal surgeons. Additionally, in case of ureteral infestation urologic laparoscopic surgeons were consulted.

Selection of the procedure depended on the gynecologic surgeon's discretion at the time of surgery and the patients' approval, based on the patient's clinical picture and treatment goals. Data were collected by analysis of patient records. The criteria for the study included surgical history, symptoms, pre- and post-operative medical treatment, intraoperative assessment, duration of intervention, procedures performed, complications, recurrence, and impact on fertility. Staging was performed in accordance to the rAFS [16]. In the majority of the patients, the surgical procedure was totally performed in minimally invasive surgical technique. The rAFS Staging and locations of the lesions were as described in Table 1. The patients who preserved the ovaries were given a GnRH agonist (Zoladex depot; AstraZeneca, Sodertalje, Sweden; or Leuplin depot, Takeda, Osaka, Japan) followed contraceptive pills or merely contraceptive pills after surgery.

Preoperative and postoperative scoring of symptoms (dyspareunia, dysmenorrhea, dysuria, and pelvic or back pain) was considered using a 10-point visual analogue scale (VAS; 10-point rating scale: 0=absent, 10=unbearable) [17].

Shaving or Discoid excision was attempted for all rectosigmoid and rectal nodules. If too difficult for the level of expertise of the surgeon, bowel resection was performed.

A Chinese version of WHO Quality of Life-BREF (WHOQOL-BREF) was used to assess the quality of life [18]. It is a tool containing 26 questions that evaluate the QOL in the general population. The WHOQOL-BREF is made of four QOL domains-Physical, Psychological, Social, and Environmental; each domain aims to analyze physical capacity, psychological wellbeing, social relationships, and the environment where the individual is inserted. The higher the score is, the better quality of life it reflects.

Endometriosis fertility index (EFI) was used to evaluate patient's fertility ability [19, 20].

Operative details included operative time, estimated blood loss, operative complications, and any concomitant procedures. Postoperative data included length of hospitalization, complications of fever, infection, transfusion, reoperation, and readmission within 30-days. Postoperative complications, such as, anastomotic

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Parameter, mean ± SD or n (%)	Complete resection (n=55)	Incomplete resection (n=38)	P value
Operations			
Laparotomy	3	-	
Laparoscopy	47	38	0.006*
Conversion to laparotomy	4	-	
Transvaginal surgery	1	-	
Operators			
Gynecologists	11	35	0.000*
Gynecologists and surgeons	44	3	
Concomitant procedures			
Hysterectomy	3	-	0.022*
Hysterectomy with bilateral adnexectomy	4	-	
Bilateral salpingo-ovariectomy	2	1	
Operating time (min)	165.5±88.1	84.7±32.6	0.000
Blood loss (mL)	286.7±329.8	96.5±92.3	0.000
Hospital stay (d)	13.8±7.7	8±3.4	0.000
Complications	5 (9.1%)	0 (0%)	0.000*
Poor healing of incision	3 (5.5%)	0	
Colorectal anastomotic leakage	1 (1.8%)	0	
Ureter leakage	1 (1.8%)	0	

Table 2. Perioperative data of complete and incomplete excision group

\*P<0.05.

leakage, bowel stricture, the need for dilation, and the development of a fistula were also examined.

Patients were reviewed at 1 month, 3 months, and then every 6 months during the first 2 postoperative years and then yearly thereafter. Patients were followed up by a gynecologist for clinical examination and functional evaluation, which included the assessment of pelvic pain, bowel symptoms, dysmenorrhea, pregnancy, quality of life and recurrence.

One-way ANOVA was performed to compare all variables in the two study groups. Categorical variables were compared by using  $\chi^2$  test. Wilcoxon Signed Rank test was adopted to compare paired scale variables. Statistical analyses were performed using SPSS for Windows 16.0 package (SPSS Inc., Copyright IBM Corporation 2010 IBM Corporation, Route 100 Somers, NY).

### Results

In the 93 patients, 85 women (91.4%) returned for their follow-up after the operation. Among them, 51 patients underwent complete excision of endometriosis and 34 underwent incomplete surgery. The mean follow-up time was 18.3±8.7 months (3-36 months).

Perioperative findings and postoperative complications of the complete and incomplete excision group

In the majority of patients, the surgical procedure was totally performed in minimally invasive surgical technique. According to the completeness of endometriosis excision, the patients were divided into two groups: complete (radical) resection group and incomplete (nonradical) resection surgery group.

Thirty-eight patients underwent laparoscopic non-radical resection. Partial excision of the lesions of the lesions were done, as the patients were eager to preserve the intact of the organs or afraid of the possible complications, or the patients had no bowel symptoms and specifically refused resection of the colorectal endometriosis.

Fifty-five patients underwent radical resection surgery. In the majority of patients (85.5%) the resection was completed laparoscopically. Four patients (4.3%) converted to laparotomy because of difficulties with the laparoscopic tech-

	Complete ex	xcision (n=55)	Improvement	P value (Pre- vs.	Incomplete excision (n=38)		loop rouge on the	P value (Pre- vs.	P value (Complete
	Preoperative	Postoperative	Improvement	Postoperative)	Preoperative	Postoperative	Improvement	Postoperative)	vs. incomplete)
Physical score	74.2±7.8	66.5±8.5	7.6±3.4	0.000	74.6±9.5	65.9±10.2	6.5±2.7	0.001*	0.164
Psychological score	76.8±7.3	71.8±7.5	4.9±2.4	0.001	75.2±8.1	70.8±7.8	4.4±1.2	0.024*	0.034*
Social score	73.5±8.9	69.7±8.6	1.4±1.6	0.033	73.0±7.7	69.1±7.7	1.4±1.2	0.040*	0.755
Environmental score	74.7±7.4	71.3±7.2	0.97±2.6	0.021	71.2±6.9	67.9±7.2	1.2±2.9	0.053	0.223
Self-assessment	78.9±6.6	71.1±7.9	7.8±4.1	0.000	83.5±10.7	75.1±10.3	8.4±2.9	0.002*	0.281
*P<0.05.									

Table 3. Pre- and postoperation quality of life

	Complete ex-	Incomplete ex-	P-
	cision (n=12)	cision (n=15)	value
Age (y)	33.7±5.4	32.1±5.0	0.434
Infertility patient (n)	7 (58%)	10 (67%)	0.431
Infertility time (y)	2.6±1.1	2.3±1.1	0.621
Ratio of EFI≥5	100%	80%	0.050
Pregnancy rate	33.3%	60%	0.165
Time from surgery to conception (m)	8.3±6.7	6.4±2.4	0.181

 Table 4. Pre- and postoperative conception situation of two groups

nique and lack of experience had to be performed, including 2 ureteral implantation into the bladder, 1 segmental resection of ureter with end to end anastomosis and 1 bowel segmental resection. Three patients (3.2%) underwent primary laparotomy due to extensive adhesions. One patient underwent vaginal excision. Complete excision included 46 rectovaginal septum lesion resection and 5 uterosacral ligaments resection. In most cases the affected location included the bowel, bladder or ureter, so 3 partial cystectomy, 2 segmental resection of ureter with end to end anastomosis, 3 ureteroneocystostomy, 6 shaving resection, 3 discoid resection and 6 segmental rectum resection were performed with the help of the urologists or colorectal surgeons. Nine patients underwent concomitant gynecological surgery as shown in Table 2.

Perioperative data of the two groups were summarized in **Table 2**. The mean operating time was 165.5 minutes for the complete resection, 84.7 minutes for incomplete operation (P= 0.000). Intraoperative blood loss was 286.7 ml in the complete resection group, 96.5 ml in the incomplete operation group (P=0.000). The hospital stay was significantly shorter in the incomplete resection group than the complete resection group.

The complications included 3 cases (5.5%) of poor healing of incision, 1 (1.8%) colorectal anastomotic leakage and 1 (1.8%) ureter leakage in the complete excision group.

## The impact of the complete and incomplete excision on pain symptom

A substantial decrease in pain symptom (VAS score) after surgery was observed in all the patients ( $0.89\pm1.6$  vs  $5.4\pm3.9$ , P<0.001). In the complete excision group, the mean VAS score fell from  $6.4\pm3.8$  at baseline to  $0.82\pm1.5$  at the end of the study period (P<0.001). Co-

rresponding data in the incomplete excision group were  $3.9\pm$ 3.7 and  $1.0\pm1.7$  (P<0.001), respectively. The decrease of VAS scores of the complete excision group were more significant than that of the noncomplete surgery group (5.6± 3.9 VS 2.9±3.3, P=0.001).

The impact of the complete and incomplete excision on

### recurrence

Endometriosis recurrence was checked by rectovaginal examination and transvaginal Ultrasonography or MRI. Recurrence is defined as follows: [21, 22] the symptoms or signs of DIE appeared again after sugery; ultrasound or MRI indicated the relapse of the mass of DIE; a second laparoscopic surgery found the DIE lesions, with or without the pathological evidence.

Postoperative recurrence rate is lower in complete excision group than in incomplete excision group (3.9% VS 35.3%, P=0.000). The mean recurrence time is  $12.0\pm8.5$  months in the complete excision group and  $3.5\pm2.4$  months in the incomplete excision group respectively (P=0.392).

# The impact of the complete and incomplete excision on pregnancy rate

Twenty-seven patients in this study desired for pregnancy. The mean age of these patients was  $32.8\pm5.2$  years (24-42 years). Seventeen patients had primary or secondary infertility, lasting for a mean of  $2.4\pm1.1$  years (ranging from 1-5 years). The patients were followed for a mean of  $16.2\pm8.6$  months (3-32 months). Thirteen patients (48.1%) became pregnant. Among these patients, there were 12 spontaneous conceptions and one conception after ovulation induction. The mean time from surgery to conception was  $7.0\pm4.0$  months (3-18 months). There was no difference between the conception characteristics in women who underwent complete and incomplete excision (**Table 4**).

We then analyzed the correlation between EFI score and pregnancy. Among the 27 patients, the highest EFI score was 9 and the lowest was 3. The pregnancy rate in the patients whose EFI score  $\geq$ 5 was higher than that in those whose EFI score  $\leq$ 5 (0% VS 54%, P=0.038).

GnRH agonist	Pre-operative	No	No	Yes	Yes	Dualua
	Post-operative	No	Yes	No	Yes	P value
Patients number		10	30	1	10	-
QOL improvemen	t					
Physical score		8.8±4.3	7.4±2.8	5.6	7.6±4.3	0.675
Psychological s	score	5.8±1.4	4.9±2.2	2.6	4.9±1.8	0.371
Social score		3.2±1.5	3.9±1.9	4.7	3.9±1.4	0.637
Environmental sc	ore	3.0±3.7	3.6±2.4	4.6	3.1±3.9	0.899
Self-assessment		8.1±2.5	7.8±4.8	10	7.5±3.2	0944
VAS improvement	t	6.9±3.6	5.5±3.8	0	4.8±4.5	0.317
Recurrence rate		10% (1/10)	0% (0/30)	0% (0/1)	10% (1/10)	0.276
Postoperative pre	egnancy rate	0% (0/1)	22% (2/9)	-	100% (2/2)	0.057

 Table 5. Correlation between GnRH agonist and prognosis in complete excision group who preserved the ovaries

Table 6. Correlation	between GnRH agonist and prognosis in
incomplete excision	group who preserved the ovaries

GnRH agonist	Pre-operative	No	No	Dvaluo	
	Post-operative	No	Yes	r value	
Patients numb	er	17	17	-	
QOL improvem	ent				
Physical sco	re	6.5±3.2	6.4±2.1	0.891	
Psychologica	al score	4.2±1.3	4.7±1.1	0.201	
Social score		$1.4 \pm 1.1$	1.5±1.4	0.961	
Environment	al score	1.2±3.0	1.2±3.0	0.960	
Self-assessn	nent	8.5±3.5	8.3±2.4	0.841	
VAS improveme	ent	1.2±2.7	4.5±3.2	0.003*	
Recurrence rat	e	41.2% (7/17)	29.4% (5/17)	0.472	
Postoperation pregnancy rate		75% (3/4)	55% (6/11)	0.465	

\*P<0.05.

## The impact of the complete and incomplete excision on quality of life

The impact of surgery on the quality of life of the two groups was analyzed (**Table 3**), and the results showed that it was improved in both groups postoperatively. All aspects of WHOQOL-BREF were significantly improved in the complete excision group postoperatively. While in the incomplete excision group, the physical, psychological, social and self-assessment aspects, except the environmental score were improved postoperatively.

The improvement in each aspect (The physical, psychological, social, environmental and selfassessment aspects) of the two groups after surgery was also analyzed (**Table 3**). There was a greater improvement in psychological score in complete excision group than in in-complete excision group  $(4.9\pm2.4 \text{ VS } 4.4\pm1.2, \text{ P=0.034})$ . And the difference in the other 4 aspects was not of statistical significance.

### The impact of peri- and post- operative GnRH agonist administration

We then investigated whether Gn-RH agonist could improve the outcomes of surgery. The patients who preserved the ovaries were given GnRH agonist followed by contraceptive pills or merely contraceptive pills after surgery. We analyzed the effect of peri-operative GnRH agonist administration on the VAS score, QOL, recurrence

and pregnancy. As shown in **Table 5**, in the complete excision group, peri-operative GnRH agonist administration did not improve the post-operative VAS score, while in the in-complete excision group, peri-operative GnRH agonist administration could decrease the VAS score (**Table 6**). Incomplete excision patients with postoperative GnRH agonist therapy obtain more pain relief than those with no postoperative drug therapy ( $4.5\pm3.2$  VS  $1.2\pm2.7$ , P= 0.003).

And in the in-complete excision patients, administration of post-operative GnRH agonist had a post-treatment improvement of VAS score similar with the complete excision patients with or without post-operative GnRH agonist ( $4.5\pm3.2$  versus  $5.6\pm3.9$  P=0.272). However, the recurrence rate in the in-complete excision patients with post-operative GnRH agonist

	GnRH agonist for 3 months	GnRH agonist for 6 months	P value
Number	41	16	-
VAS improvement	5.7±3.4	3.6±4.1	0.051
QOL improvement			
Physical score	6.8±2.4	8.1±3.9	0.227
Psychological score	4.9±2.1	4.3±2.3	0.403
Social score	1.3±1.8	1.6±1.1	0.491
Environmental score	0.69±3.3	1.8±1.8	0.219
Self-assessment	7.4±3.6	9.3±4.5	0.102
Complications			
Hot flash and Sweat	56.1% (23/41)	75% (12/16)	0.179
Mood fluctuation	17.1% (7/41)	12.5% (2/16)	0.664
Insomnia	14.6% (6/41)	31.3% (5/16)	0.167
Osteoporosis	2.4% (1/41)	25% (4/16)	0.011*
Recurrence rate	14.6% (6/41)	0% (0/16)	0.040*
Postoperation pregnancy rate	53.3% (8/15)	33.3% (2/6)	0.403
*P<0.05.			

 Table 7. Comparison of effect of GnRH agonist administration

 for 3 months VS 6 months

were still significantly higher than the complete excision patients with or without post-operative GnRH agonist (3.9% VS 29.4%, P=0.000), which implied that the recurrence rate were not improved by post-operative GnRH agonist administration.

Comparing post-operative GnRH agonist administration for 3 months with 6 months, we found that the patients who used GnRH agonist for 6 months have a higher incidence of osteoporosis and a lower recurrence rate than those who used for 3 months (**Table 7**).

### Discussion

In this retrospective cohort study, we compared the efficacy and safety of complete and incomplete excision of deep infiltrating endometriosis in 93 patients. Our findings showed that the complete excision group had a significant lower post-operative pain, a lower recurrence rate and a greater improvement in psychological aspect of the postoperative quality of life than the incomplete excision group. However, there was no difference in postoperative pregnant rate between the two groups. The results also showed that although incomplete excision with post-operative GnRH agonist was efficient with respect to pain, the side effects of the drugs and the recurrence rate after cessation of the drug should be considered.

Surgical management of colorectal endometriosis has increasingly become a topic of interest in gynecologic surgery, leading to much debate. Studies show that two surgical philosophies or approaches are usually used: the radical philosophy mainly based on colorectal resection, and the approach prioritizing conservation of the rectum. The latter may be performed without opening the rectum (shaving) or by removing the nodule along with surrounding rectal wall (full-thickness or disc excision) [23, 24].

However, when the lesion is too large, or when the lesion is multifocal, colorectal resection is needed to remove all the endometriotic lesions. In these cases, for low rectal resections, although quality of life is improved in most of patients

managed by colorectal resection [25-28], leaks increase to 15% or more and carry a lifelong risk of bowel, bladder, and sexual problems of 30%, 30%, and 40%, respectively [23, 24, 29]. It is unclear whether a greater or similar health improvement can be achieved with palliative surgery. Some author argued that endometriosis can be managed without excising these lesions, and these women may experience improvement merely by taking a low-dose contraceptive pill, an antiprostaglandin agent, and/or an aromatase inhibitor after conservative surgery [15]. The outcomes are most likely quite similar to those of more radical surgery, but carry less risk and morbidity. However, in these patients pathological diagnosis is needed to rule out the possibility of malignancy. Palliative surgery can excise the lesion as much as possible without destroy the intact of the rectum wall and nearby nerves, and has the advantage of getting pathological diagnosis. However, some author believed that performing inadequate primary surgery requires long time of post-operative drug administration until menopause, and the stop of drug maintainance will not only results in disease progression with persistence or aggravation of painful symptoms but also renders any future procedure difficult and potentially dangerous [30, 31]. So it is a dilemma for the gynecologist, as well as the patients, to choose between the complete surgery with high rate of complications and high risk of bowel, bladder, and sexual problems or the incomplete surgery and lifelong drug maintainance.

It is unclear from the literature when to use which procedure, and there are no available objective criteria to indicate the use of one procedure rather than the other. Furthermore, there are no studies available comparing the safety, efficacy, and short-term outcomes, pregnancy rate and recurrence rate of the complete and palliative imcomplete procedures.

Our results showed that, comparing with complete excision, incomplete surgery had shorter operative time, less estimated blood loss, and shorter length of hospitalization. Both procedures had a high patient satisfaction rate and significant improvement in dyspareunia. Both groups have significant improvement in postoperative quality of life, with complete surgery group had tiny advantage than incomplete surgery group.

Deep endometriosis surgery is challenging and complication prone. The main complications reported in DIE are bleeding, infection, late ureteral or bowel perforation, or fistulae. For low rectal resections, leaks increase to 15% or more [29]. In our study, the complication rate in the complete excision group was 9.1% (5/55), and 0% (0/38) in the incomplete excision group. The complication rates in the complete excision group in our study were consistent with those described in the literature [12-14]. The morbidity remains low for such complex procedures.

Postoperative recurrence rates in our series were consistent with those described in the literature [32]. The rate of recurrence was predictably higher in the incomplete excision group. And our results showed that in the in-complete excision patients, administration of postoperative GnRH agonist could not improve the high recurrence rate of these patients, though it could improve the VAS score. So radical surgical ablation of DIE lesions is still the mainstay of treatment for this form of endometriosis.

For young patients who desire pregnancy, the two procedures were comparable in terms of conception, which is consistent with the reported literature [33, 34]. We found the patients whose EFI≥5 have more chance to conceive than those whose EFI<5, indicating that EFI has a role in predicting fertility outcomes.

Our results showed that postoperative OOL was improved in both groups, which was also in agreement with the previous study [29, 32-35]. The QOL in incomplete surgery is comparable with the OOL in the complete surgery group in the physical, social, environmental and selfassessment aspect. There was a greater improvement in psychological score in complete excision group than in in-complete excision group, which implicated that the reassurance of complete excision also had a psychological effect on the patients. In Angioni's study [35], at 1-year followup patients treated with complete resection showed significant improvement in physical function, general health, and vitality in comparison to 12 months follow-up of the patients who underwent an incomplete surgical treatment. This difference might due to that our patients were given GnRH agonist followed by contraceptive pills or merely contraceptive pills after surgery. The long term drug therapy decrease the difference between the 2 groups.

GnRH agonist is widely used in the treatment of endometriosis symptoms. Several articles have been published reporting the results of various trials comparing treatment of endometriosis and its recurrences with GnRH agonist alone with GnRH agonist plus add back therapy [36-38]. Following these results many surgical units propose the adjuvant use of GnRH agonist after surgery in all patients with deep endometriosis for at least 6 months. However, the long-term use of GnRH agonist is associated with hypo estrogenic side effects and a substantial reduction in bone mineral density [38]. In this study, we found that GnRH agonist decrease the VAS scores significantly only in the incomplete excision patients but not in the complete excision patients, and however, it had no significant effect on the recurrence rate of DIE in the incomplete excision patients. So although GnRH agonist is efficient with respect to pain. the side effects of the drugs and the recurrence rate after cessation of the intake must be considered. So our results suggest complete surgical excision of DIE is the first choice of surgical treatment, and that the use of GnRH agonist after complete excision should be cautious.

The major limitation of this study was non randomized study with the short length of followup (an average of 18.3 months, ranging from 3-36 months). It is clear, that the rate of recurrence, pregnancy and pain symptoms increased

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with an increase in the follow-up period. So randomized trials with long-term follow up and large sample size will be needed to address this issue more clearly.

In summary, compared with incomplete excision, the complete excision of DIE significantly decreased the post-operative pain and the recurrence rate, and improved the psychological aspect of the postoperative QOL. So complete excision of DIE is still the first surgical treatment of choice. However, the palliative incomplete excision had a comparable pregnancy rate and comparable quality of life in most aspects, and incomplete surgery with post-operative GnRH agonist followed by contraceptive pills was efficient with respect to pain, so incomplete surgery with long term post-operative drug maintainance is another option of treatment in DIE patients. But the side effects of the drugs and the recurrence rate after cessation of the drug should be considered.

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#### Disclosure of conflict of interest

None.

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