

# Influence of Endometriotic Cyst Diameter and the Severity of Endometriosis on the Ovarian Parenchyma Excised During Laparoscopic Cystectomy

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## ABSTRACT

**Introduction:** Endometrioma is a common form of endometriosis and it is represented by endometriotic deposits within the ovaries which accounts for upto 17-44% of cases. Laparoscopic stripping of ovarian endometriotic cysts is an accepted technique owing to low recurrence rates. Decrease in residual ovarian tissue volume was noted in many studies followed cystectomy. This study aims at estimating whether the size of endometriotic cyst is related to ovarian parenchyma excised along with cyst wall.

**Material and Methods:** Prospective study was done at University teaching hospital for one year. A total of 56 women underwent laparoscopic endometriotic cystectomy. Cystectomy was done by stripping method and endometriosis was staged according to revised American Society of Reproductive Medicine classification (rASRM). The endometrioma wall was evaluated histologically and were categorised into 2 groups based on

semi-quantitative scale of 0-4. Group 1 and 2 showed grade 0, 1, 2 and 3, 4 in the cyst wall respectively.

**Results:** Mean age of patients was 31.4 years, duration of infertility was 4.1 years and cyst diameter measured 6.3 cm. 73.2% (n=41) were in Group 1 and 26.8% (n=15) were in Group 2, mean cyst diameter was being 4.3 cm and 5.0 cm respectively. There was no significant statistical correlation between preoperative cyst diameter and ovarian parenchyma removed (p=0.15). 93.3% (n=14) of group 2, and only 65.8% (n=27) of group 1 were found to have moderate to severe endometriosis, indicating there is correlation between disease severity and loss of ovarian tissue (p= 0.04).

**Conclusion:** Endometriotic cystectomy when performed with accurate surgical technique leads to no significant ovarian tissue removal. However, disease severity significantly determines the loss of normal ovarian parenchyma.

**Key words:** Endometriosis, cyst diameter, severity, ovarian parenchyma loss

## INTRODUCTION

Prevalence of endometriosis in the reproductive age group in a general population average around 6% [1] and most common form of the disease is ovarian endometrioma which account for upto 17-44% of cases [2]. Ovarian endometriosis affect the response to ovarian stimulation, oocyte recovery, fertilization and implantation [3]. The origin of ovarian endometrioma is unknown; however, the most reliable theory indicates that it may originate from the progressive invagination of the ovarian cortex after accumulation of menstrual debris derived from the shedding of superficial endometriotic active implants. The absolute cause-and-effect relationship between the presence of endometrioma per se and reproductive potential is difficult to determine [3, 4].

The ovarian tissue surrounding the endometrioma is often characterized by morphologic alterations that could represent the histologic expression of functional damage: a decreased number of follicles was found in ovarian cortical sections adjacent to endometriotic cysts, whereas the same finding was not noticed in cysts of other nature [5].

Laparoscopic stripping of ovarian endometriotic cysts is an accepted technique owing to low recurrence rates. The damage to ovarian reserve caused by surgery represents a major concern in the balance between reproductive risks and benefits [6].

Decrease in residual ovarian tissue volume was noted in many studies following cystectomy [6] and was supported by

histopathological examination which revealed significant removal of ovarian tissue [7].

In the current study, we have tried to identify the influence of endometriotic cyst diameter and the severity of endometriosis as per Revised American Society for Reproductive Medicine classification of Endometriosis [8] on the ovarian parenchyma excised during laparoscopic cystectomy which was identified by histopathological examination.

## MATERIAL AND METHODS

This was a prospective study which was done at University teaching hospital for one year. A total of 56 women underwent laparoscopic endometriotic cystectomy for the first time irrespective of their age, duration of infertility and body mass index was included in the study and all the cystectomies were performed by the same person. The patients who have undergone any pelvic surgery earlier were excluded from the study. Pre-operatively largest transverse diameter of the cyst was noted by with a real-time ultrasound imager, using a 5.0–7.5 MHz endovaginal probe. All the patients were operated in the post-menstrual phase before the ovulation.

Cystectomy was done by stripping method and endometriosis was staged according to revised American Society of Reproductive Medicine classification (rASRM) [8].

Stage I: Minimal

Stage II: Mild

Stage III : Moderate

Stage IV : Severe

For all the 56 participants, the endometrioma wall was evaluated histologically on multiple sections. The histologic slides of the excised endometriomas were reviewed by the same pathologist, who was blind to the clinical variables of the patient.

Every specimen obtained from the patients was examined histologically and confirmed as endometriotic cysts. Surgical specimens of the endometrioma cyst walls were fixed in 10% neutral-buffered formaldehyde, and tissue samples obtained at 0.5-cm intervals were embedded in paraffin. Routine haematoxylin and eosin staining was performed on the sections for histopathologic examination. For the diagnosis of endometriosis, the criteria of the technical bulletin on endometriosis of the American College of Obstetricians and Gynaecologists were followed. In particular, two or more of the following features had to be present to diagnosis endometriosis: endometrial epithelium, endometrial glands, endometrial stroma, or hemosiderinladen macrophages.

As per the histopathological evaluation of the cyst wall, the patients were categorized into two groups based on semi quantitative scale of 0-4 grades [5] [Table/Fig-1] and were divided into two groups. Group 1 included cyst walls showing grade 0,1,2 on HPE analysis which indicates no loss of follicles and Group 2 included cyst walls showing grade 3,4 on HPE analysis which indicates loss of follicles.

## STATISTICAL ANALYSIS

Comparison of variables between two groups were based on Independent sample test and Parametric test to find out the relation between pre-operative cyst diameter and ovarian parenchyma removed and chi-square test to note the correlation between disease severity and loss of ovarian tissue. The p value less than 0.05 was considered to be statistically significant. Statistical analysis was performed via SPSS version16 (SPSS, Chicago, IL, USA).

## RESULT AND OBSERVATIONS

The mean age of patients who underwent cystectomy was 31.4

Grades	Histopathological Analysis (Semi Quantitative Scale)**
0	Complete absence of follicles
1	Primordial follicles only
2	Primordial and primary follicles only
3	Primordial, primary and some secondary follicles
4	Primordial, primary and secondary follicle as in normal ovary

[Table/Fig-1]: Grades of follicular loss by histopathological analysis

n=56	Cyst diameter (cm) mean ± SD
Group 1 n=41 (73.2%)	4.34 ± 1.32
Group 2 n=15 (26.8%)	3.96 ± 1.46

[Table/Fig-2]: Relation between preoperative cystdiameter and ovarian parenchyma removed

Rasm Score	Group 1 (n=41)	Group 2 (n=15)
Minimal to mild endometriosis (n=15)	14 (93.3%)	1 (6.75%)
Moderate to severe endometriosis (n=41)	27 (65.9%)	14 (34.1%)

[Table/Fig-3]: Correlation between disease severity and loss of ovarian tissue

years and the mean duration of infertility was 4.1 years. There were 41 women (73.2%) in Group 1 and 15 were in Group 2 (26.8%).

The p value is 0.35 (>0.05) by independent sample test, and Parametric test which shows there is no statistical significance between pre-operative cyst diameter and ovarian parenchyma removed [Table/Fig-2].

[Table/Fig- 3] clearly shows that when the disease severity increases more ovarian tissue is removed and the p value by chi-square test is 0.04 (<0.05), which shows positive correlation between disease severity and loss of ovarian tissue.

## DISCUSSION

Several studies in the literature indicate that, when surgical treatment of ovarian endometriosis is indicated in women of reproductive age, laparoscopy should be considered as the method of choice, and the stripping procedure should be considered the preferred surgical approach [9].

This surgical technique may impair ovarian reserve, owing to the excision of ovarian tissue adherent to the cyst wall, with consequent loss of follicles [10].

In a retrospective investigation, 32 patients with unilateral ovarian endometrioma were previously treated with cystectomy and underwent 38 cycles of COH. This study demonstrated that surgery for ovarian endometrioma may damage ovarian reserve. It potentially results in a poor ovarian response to COH, compared with the response of the contralateral normal ovary in the same individual [11]. Also, another retrospective study in 32 patients and 46 cycles showed that excision of the endometriotic cyst was associated with a significant reduction in ovarian reserve [12].

Studies in infertile patients undergoing ovarian stimulation reported that the reduction of functional reserve after surgery for ovarian endometriosis may be variably associated with the size of the endometrioma, the localization of the cyst within the ovary, and the thickness of the wall [13, 14]. Other studies did not confirm the decrease in number of dominant follicles in the operated ovary compared with the unaffected gonad. Few studies directly analyzed histologic aspects of follicular depletion related to endometrioma excision [13, 14].

The operated ovary shows a significant reduction in ovarian response to controlled ovarian hyper stimulation during in vitro fertilization cycles as compared with the contralateral ovary [12].

In a study by J Shi et al., the number of cysts showing follicles and the mean number of follicles per capsule were higher in the endometriotic groups than in the group with benign ovarian cysts. Owing to its invasive, inflammatory biologic activity and consequent adhesion formation and proximal ovarian tissue are inevitably removed along with the endometrioma wall during the procedure of laparoscopic stripping [15].

The absence of a clear plane of cleavage between the cyst and ovarian stroma could result in unintentional removal of the ovarian cortex and loss of follicles with potential reduction in follicular reserve. A histologic analysis on 26 ovarian endometriomas showed ovarian tissue removed with the cyst capsule in 54% of cases, although this is only an accidental finding in non endometriotic benign ovarian cysts [5,7].

In the present study, we analysed the relationship between endometriotic cyst diameter and disease severity and the ovarian parenchyma removed which was analysed histopathologically and concluded that there is a positive correlation between the ovarian tissue removed and the disease severity. This can be explained by the fact that when the disease severity is more, there will be extensive adhesions between the ovary and the other structures due to the invasive, inflammatory activity of the endometriotic tissue which results in inadvertent removal of ovarian tissue during the procedure [15].

Some studies state that the removal of the ovarian tissue can be minimised with surgeons' expertise [16]. In our study, this biasing was not there as all the cystectomies were done by the same team of operators. But in a study by HK Oh et al., showed that none of the surgeons avoided significant follicular loss, and that the thickness of the removed ovarian tissue did not differ among surgeons [17]. The same study also concluded that ovarian follicular loss was more common among younger patients and patients with stage 3 endometriosis. The thickness of the removed ovarian tissue did not differ among patients, despite varying clinical factors. In our study also we found ovarian tissue loss is more in later-stage endometriosis (stage 3 and 4), but we haven't studied the relation of age and the tissue removed. HK Oh et al., explained that more frequent ovarian follicular loss among younger patients is not because the removed ovarian tissue is thicker than that in older patients, but because the ovarian tissue was removed from younger patients has a greater number of follicles than that from older patients. Another study showed reduction in ovarian reserve is more marked among women who are older than 35 years [18].

The cleavage plane, which surgeons might identify around the cyst intra-operatively, is in fact not located between the fibrous wall of the endometrioma and the ovarian parenchyma, but rather within the ovarian tissue itself, and is due to the strong fusion between the ovarian parenchyma and fibrosis [19].

Roman et al., [20] recently reported a directly proportional relationship between endometrioma size and ovarian parenchyma inadvertently removed during cystectomy. A tendency for greater follicular loss with respect to medium-sized endometriomas (5–7 cm in diameter) as compared with smaller endometriomas (<5 cm in diameter) was also observed in the study by HK Oh et al., However, follicular loss was less frequently observed in endometriomas of 7 cm or greater in diameter, although this tendency did not reach statistical significance [17]. In our study, we did not find any positive correlation between cyst diameter and ovarian tissue removed.

## CONCLUSION

The removal of ovarian parenchyma inadvertently during laparoscopic stripping of endometriomas is more often in case of moderate to severe endometriosis (stage 3 and 4). So our aim should be to remove as much of the cyst wall without damaging the ovarian tissue and to release the adhesions so as to make the ovaries accessible for oocyte aspiration during assisted reproductive techniques (ART). If the cyst size is small (<3 cm) and if the ovaries are accessible for oocyte aspiration, it would be better to attempt at pregnancy by ART than subjecting them to cystectomy which might affect the ovarian reserve especially if the patient has had previous pelvic surgeries where you suspect severe adhesions.

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