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# Ovarian Reserve After Laparoscopic Ovarian Cystectomy For Endometrioma

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## **Abstract**

The outcomes of laparoscopic cystectomy of endometriomas have been the subject of numerous investigations. Endometriosis is the term used when endometrial glands and stroma are seen outside of the usual uterine cavity. Ectopic endometrial tissue growing inside the ovary leads to pseudocysts known as endometriomas. The best course of treatment for women with symptomatic or expanding endometriomas is first surgery. Analyzing the serum level of anti-mullerian hormone (AMH) can be used to estimate ovarian reserve.

This study's objective was to evaluate how laparoscopic ovarian cystectomy for endometrioma affected ovarian reserve.

**Methods:** This prospective interventional study on 96 patients of ovarian endometriomas candidate for laparoscopic ovarian cystectomy.

All patients included in the study were subjected to; detailed history taking and full examination, day 3 Follicular Stimulating hormone (FSH) and Antimullerian hormone (AMH) measurement the cycle before operation then subjected to laparoscopic cystectomy and histological examination then the same tests were repeated on day 3 of the cycle three months postoperative.

**Results:** There was a statistically significant reduction in postoperative mean value of AMH (2.04+ 1.69) when compared to the preoperative mean value of AMH (2.59+ 1.85) and a statistically significant rise in postoperative mean value of serum FSH (7.23+ 1.48), when compared to preoperative mean value of FSH (5.50+ 1.85).

In this study, patients with endometriomas > 5 cm in diameter compared to smaller ones saw larger post-operative AMH declines (p value 0.001 and 0.01 respectively), as well as those with bilateral endometriomas compared to those with unilateral ones. (p value <0.001, 0.02 respectively), so endometrioma size and bilaterality of endometriomas were significant risk factors for diminished ovarian reserve.

**Conclusion:** Laparoscopic cystectomy of endometrioma has an adverse effect on ovarian reserve reflected by Anti-mul-

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lerian hormone that decreases significantly after Laparoscopic ovarian cystectomy and FSH level that increases significantly after Laparoscopic ovarian cystectomy.

## **Introduction**

When the glands and stroma of endometrial are seen outside of the healthy uterine cavity, this referred to as endometriosis. It is equivalent to 0.8% to 2% of reproductive-age women (1).

Despite the lack of evidence linking endometriosis to infertility, the fact that over a third of endometriosis sufferers struggle with infertility suggests a connection (2).

Endometrioma is the term used to describe the development of an ovarian cyst lined by endometrial glands and stroma that is next to healthy ovarian tissue and is encased in a pseudocapsule. 20% to 40% of women with endometriosis have it. It might be connected to chronic pelvic discomfort, dysmenorrhea, and infertility (3).

Endometriomas affect the surrounding follicles in a way that is gonadotoxic, which results in fibrosis, diminished vascularization, loss of cortex-specific stroma, and atresia in the recruited follicles, all of which lead to a decrease in follicle number (4).

In order to treat ovarian endometrioma, laparoscopic excision of the cyst capsule using the stripping technique is typically used. Due to inadvertent loss or death of the healthy ovarian tissue near the pseudocapsule of the cyst, surgical removal may reduce ovarian reserve. Compared to standard surgery, laparoscopic surgery has the advantages of being quicker, requiring less time in the hospital, and causing less damage to the ovarian reserve (5).

Anti-Mullerian Hormone testing is the most accurate way to gauge ovarian reserve because it is menstrual cycle independent and unaffected by hormonal supplementation. Assuming that AMH is a good indicator of

the size of the ovarian follicle pool, a decline in the number of tiny developing follicles is followed by a decline in the amount of AMH that circulates in the body (6).

Ultrasonographic follicle count (AFC) is a valid alternative to AMH, which is a systemic blood marker and expresses the ovarian reserve of both ovaries. It is a direct indicator of the number of follicles and has a positive relationship with the ovarian reserve of a single ovary (7). The loss of ovarian reserve caused by surgery may be somewhat countered by an improved ability to detect small follicles after the endometriomas have been removed because ovarian reserve may be underestimated by AFC when endometriomas are present (8).

## **Aim of work**

to evaluate the impact on ovarian reserve after ovarian cystectomy performed laparoscopically for endometrioma.

## **Patients**

The 96 cases in this prospective interventional trial were selected from the period from January 2021 to December 2021.

### **Inclusion criteria:**

- Females who are sexually active (21-39 years).
- Had an endometrioma diagnosed by ultrasonography that was unilateral or bilateral and measured >3 cm.

### **Exclusion criteria:**

- Younger than 20 years and older than 40 years.
- Previous chemotherapy, pelvic radiation, or ovarian surgery.
- Unusual menstrual cycles.
- The existence of additional ovarian abnormalities in addition to polycystic ovary syndrome.

- Using any drugs that might impair ovarian function in the three months before to the surgery, such as oral contraceptives or GnRH analogues..

**All cases were subjected to the following:**

- 1. Complete history taking**
- 2. Physical examination**
- 3. Transvaginal ultrasound (TVS)**
- 4. Hormonal assay:**

For AMH and day3 FSH in the cycle before laparoscopic cystectomy.

All hormonal measurements of hormonal were performed in the same reference laboratory.

**5. Laparoscopic ovarian cystectomy**

**6. Histopathologic Analysis:** All resected cyst walls were sent to the pathology laboratory to confirm endometrioma and exclude any possibility of malignancy.

**7. Follow up of** all cases till 3 months post-operative then reassay of AMH and FSH at the day 3 of the cycle for the patients had endometriomas confirmed by histopathology.

**Outcome measures:** Measurement of AMH and day3 FSH before and 3months after ovarian cystectomy.

**Statistical Analysis:** The data were coded, entered and processed on computer using SPSS (version 18).

**Results**

Table (1) shows demographic data of included women whose age mean 28+ 5.53years and their BMI mean 27.65+ 5.53 kg/m2

The chief complain in many cases in this study was infertility by 83.3% either primary by 58.3% or secondary by 25%(table 2).

During laparoscopy, Endometrioma was

present either unilateral in 66.7% or bilateral by 33.3% in the studied cases, its mean size was(5.84+ 1.60cm) and there was other endometriotic lesions in uterus by 6.25%, douglas pouch by 8.33 and adhesions by 25% (table 3).

There was statistically significant reduction in postoperative mean value of serum AMH compared to preoperative measurement (2.04, 2.59 respectively, p <0.001) and statistically significant rise in postoperative mean value of serum FSH compared to preoperative measurement (7.23, 5.50 respectively, p <0.001) (table 4).

**Table (I): Demographic data of included women.**

		patients	
Age (years)	Range	21 – 39	
	Mean +SD	28+5.53	
BMI (kg/m <sup>2</sup> )	Range	18.69- 42.97	
	Mean +SD	27.65+5.53	
Parity		No.	%
	Nulligravida	64	66.7
	P1	16	16.7
	P2	18	16.7

**SD** standard deviation **BMI** body mass index

**Table (2): Clinical presentation of the studied women.**

	Patients (No=96)	
	16	16.7
Pain	8	8.3
Pain + Infertility	80	83.3
Infertility	56	58.3
• Type of infertility	24	25.0
- Primary		
- Secondary	1 – 10	
• Duration of Infertility (years)		
- Range		
- Mean +SD	2.96+1.76	

**Table (3): Distribution of laterality of endometrioma, average dimension of endometrioma and other endometriotic lesions assessed during laparoscopy among the studied women (Operative Findings).**

		Patients	
		No.	%
Laterality of Endometrioma	Unilateral	32	66.7
	Bilateral	64	33.3
Average dimension of Endometrioma (cm)	Range	3.50-10	
	Mean +SD	5.84+ 1.60	
Associated other endometriotic lesions	uterus	6	6.25
	Pelvis (Douglas pouch)	8	8.33
	Adhesions	24	25

**Table (4): Comparison between preoperative measurement and postoperative measurement among the studied women.**

Hormone		Mean +SD	Range	Paired t.test	P. value
AMH	Preoperative	2.59+ 1.85	0.29 - 8	13.50	<0.001
	Postoperative	2.04+ 1.69	0.15- 7.14		
FSH	Preoperative	5.50+1.85	3.55- 8.80	20.97	<0.001
	Postoperative	7.23+ 1.48	4.70- 9.50		

## **Discussion**

Infertility and pelvic pain are the typical complaints of endometriosis, a frequent benign condition that impacts fecundity rates. However, it may be asymptomatic and unintentionally discovered during laparoscopy or any other exploratory operation (9).

A variety of surgical procedures, including de-roofing, stripping, excision, and ablation using either a "cold knife,"electrosurgery, or laser, have been suggested to treat ovarian endometriomas (10).

In this study, the laparoscopic cystectomy was done for ovarian endometriomas. A total of 96 women had ovarian endometriomas were included in the study. The mean age of included women was 28+5.53years and it was found in this study that endometrioma was mostly present in women whose age ranged between 20 to 25 years by 41.6%. The mean BMI was 27.65+ 5.53kg/m2

and endometrioma was mostly present in overweight women by 66.7%.

The included women complained of infertility, pain or both. The majority of the studied cases complained of infertility that represented 83.3%, either primary that represented 58.3% or secondary that represented 25.0%.

Endometrioma in the included women by laparoscopy were bilateral in 66.7% or unilateral 33.3% in and its mean size was 5.84+ 1.60.

There was a statistically significant reduction in post-operative mean value of AMH ( 2.04+ 1.69 ) when compared to the preoperative mean value of AMH ( 2.59+ 1.85 ) and a statistically significant rise in postoperative mean value of serum FSH ( 7.23+1.48 ), when compared to preoperative mean value of FSH ( 5.50+1.85 ).

The current study's findings are consistent with a systematic review by Kitajima et al.

(2014) that found that surgical removal of endometriomas had a detrimental impact on ovarian reserve as measured by AMH levels. AMH levels considerably decreased from preoperative values ( $3.86 \pm 3.58$  ng/mL) in the first week ( $1.66 \pm 1.92$  ng/mL), third month ( $2.06 \pm 2.5$  ng/mL), and ninth month ( $1.77 \pm 1.76$  ng/mL) after surgery, according to a larger follow-up research by Alborzi et al. (2018), which included 193 women. FSH levels significantly increased during the course of a three-month follow-up from baseline to the third postoperative month because FSH was underestimated in endometrioma patients. Three months after surgery, the FSH levels had dramatically increased from the preoperative level ( $6.28 \pm 3.79$ ) to ( $6.99 \pm 3.92$ ) postoperatively (11).

Ergun et al. (2015) showed in his study that after a laparoscopic ovarian cystectomy, serum AMH levels dropped, and this finding might be interpreted as a sign of a depleted ovarian reserve. Postoperative AMH levels were statistically significantly lower after operations for ovarian endometrioma or other ovarian cysts than endometrioma. The rate of AMH level drop for both groups was comparable. A reduction in ovarian reserve was not consistently supported by pre- and postoperative serum FSH and E2 levels (12).

Then, Saliholu et al. (2016) supported these results, showing that removal of the endometrioma resulted in a non-significant change in FSH levels but a significant decrease in AMH levels ( $P < 0.001$ ). Saliholu explained this result by stating that FSH is irrelevant to ovarian reserve and the clinical outcomes of fertility (13).

Studies have evaluated that ovarian reserve markers, follicle-stimulating hormone and estradiol, were not impacted by laparoscopic surgery, according to certain studies that assessed the impact of endometrioma removal on these markers (14).

Ercan et al. (2016) failed to demonstrate how surgery adversely impacts the ovarian reserve

and claimed that this is a safe approach when carried out by a trained physician who recognizes the cleavage of the cyst capsule and appropriately excises the endometrioma (15).

Then, the disagreement to our results based on revising the literatures which documented that the mere presence of benign ovarian cysts was already shown to be associated with low serum AMH levels from the start, particularly with endometriomas.

In a study conducted on 102 women with ovarian endometriomas and 48 women with mature cystic teratoma, Kim et al. (2013) showed that preoperative serum AMH levels were significantly low in such two groups of women, when compared to age- and BMI-matched control group of women (16).

In a second study conducted on 172 women with benign ovarian cysts (122 with endometriomas and 50 with nonendometriotic cysts), Somigliana et al. (2014) showed that serum AMH was significantly low in bilateral ovarian cysts (17).

The pathogenesis underlying the adverse impact of surgical management of ovarian endometrioma has been a matter of research. The most accepted explanation by Matalotakis et al. (2017) and Bongioanni et al. (2018) is the use of electrocoagulation for hemostasis after ovarian cystectomy (18,19).

In the present study, post-operative AMH decrease was greater in patients with endometriomas  $> 5$  cm in diameter compared with smaller ones ( $p$  value  $< 0.001$ ,  $0.01$  respectively) and in patients with bilateral endometriomas compared with unilateral ones ( $p$  value  $< 0.001$ ,  $0.02$  respectively).

These results are in agreement with Kashi et al. (2017) who concluded from his study that Laparoscopic cystectomy was associated with post-operative decrease in serum AMH, particularly with bilateral involvement ( $p$  value in bilateral =  $0.029$  and in unilateral =

0.046) and endometriomas at least 50 mm in diameter ( p value in  $\geq 50$ mm was  $< 0.001$  and in  $<50$ mm was 0.015) (20).

## **Conclusion**

Laparoscopic cystectomy for endometrioma has an adverse impact on ovarian reserve reflected by Anti-müllerian hormone that decreases significantly after laparoscopic ovarian cystectomy and FSH level that increases significantly after laparoscopic ovarian cystectomy.

Bilaterality and size of endometrioma increase the adverse effect of laparoscopic ovarian cystectomy on the ovarian reserve.

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