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Comparing the Changes of AMH Level Following Two Methods of Laparoscopic Cystectomy for Evaluating Ovarian Reserve in Patients with Endometrioma

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ABSTRACT

Background & Objective: Anti-mullerian hormone indicates ovarian reserve. The objective of this study was to compare the changes of AMH level following two methods of laparoscopic cystectomy in order to evaluate ovarian reserve in patients with endometrioma.

Materials & Methods: To this end, 86 patients with endometrioma were selected on the basis of inclusion and exclusion criteria, divided into two groups, and subjected to laparoscopic cystectomy. The mean hormone levels were measured before and after surgery and the changes were compared between the two groups using the repeated measures tests. The data were also analyzed using the SPSS 22.

Results: The mean number of childbirth was 2.06 in patients with a standard deviation of 1.64. Out of 86, 42 patients (48.8%) were treated with complete removal of cysts and the rest underwent partial removal. The length of cysts in patients undergoing complete removal was significantly larger than that in patients with partial removal (P=0.011), while the width of cysts was not significantly different between the two groups of patients (P=0.084). The AMH levels in patients undergoing complete removal significantly decreased from 2.22 before surgery to 1.96 after surgery (P<0.001). The AMH levels in patients undergoing partial removal was also decreased from 2.47 before surgery to 2.14 after surgery, representing a statistically significant difference (P<0.001).

Conclusion: Regarding the results of the study, the type of ovarian cyst removal has not any effect on after-surgery consequences.

Keywords: Antimullerian hormone, Endometrioma, Ovarian reserve

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Introduction

Anti-mullerian hormone (AMH) that is a glycoprotein dimer is a member of the family of transcription growth factors. In women, AMH is secreted by granulosa cells into the primary and antral follicles (4-6 mm) and its secretion gradually decreases during the follicle growth stages and clearly is undetectable in follicles larger than 8 mm. Serum AMH concentration is associated with the number of small follicles at first and then with ovarian reserve. Therefore, AMH may be a very useful indicator of the extent of ovarian reserve damage and endometrioma or ovarian cystectomy **(1)**.

Endometriosis refers to the implantation of endometrial stromal glands and tissue outside the uterine cavity. Due to its association with hormonal disorders, this disease is widely influenced by the women's fertility age. Although endometriosis is considered a benign gynecological disease, in many cases it is a potential cause of pelvic pain and infertility **(2, 3)**. Numerous studies have shown that the rate of endometriosis is higher in tall and thin women compared to obese ones **(4)**.

Endometrioma is often diagnosed during infertility; 20 to 40% of women with endometriosis have endometrioma **(5-7)**.

In patients with endometriosis, the rate of pregnancy is lower than normal; this can related to endometrial disorders so that the rate of fetal implantation in the uterine cavity is reduced, and this may be due to changes in mitotic activity, production of toxic factors for the fetus, increased apoptosis, and inflammatory reactions **(8)**.

Previous studies have shown that endometriosis can have a negative effect on the rate of spontaneous ovulation and reduce the number of follicles, as well as decreasing the activity of tissues around the ovary. Although surgical treatment is often appealed to remove / drain the endometrioma, there is still debate about the indication for surgery and its possible complications **(9, 10)**.

It seems that Laparoscopy still is the preferred treatment for ovarian endometrioma. Many techniques have been proposed, including laser evaporation of the cyst wall, drainage, and then coagulation of the cyst wall and removal of the endometrioma. However, the conducted researches have not yet been able to identify the best method with greater effectiveness and less damage to ovarian tissue **(11, 12)**.

Oxygen surgery using the stripping technique compared to the drainage and ablation method is associated with a more desirable clinical outcome and the lowest recurrence rate; so this method has been usually preferred **(13, 14)**.

However, removal of endometrium by the stripping technique leads to a further reduction in ovarian reserves, which is determined by the concentration of serum AMH level **(15, 16)**.

According to the 2008 ESHRE guidelines, it has been proposed that if there is an ovarian endometrium with a ≤ 3cm diameter and the patient has high-grade dysmenorrhea, a laparoscopic ovarian cystectomy should be performed which causes easier access to follicles for IVF and an increase in the likelihood of ovarian response. However, some studies have reported that ovarian reserves are damaged after endometrial resection **(7, 19)**.

The objective of this study was to compare the changes of AMH level following two methods of laparoscopic cystectomy in order to evaluate ovarian reserve in patients with endometrioma.

Materials and Methods

Sampling Method

This study was conducted in the years 2016-2017, during which 86 patients with endometrioma, who were referred to the hospital Obstetrics and Gynecology Clinic, were selected on the basis of inclusion and exclusion criteria. At the time of admission and being candidate for surgery, as well as based on the type of laparoscopy, the patients were randomly divided into two equal groups (43 patients in each) using a random number table, and were exposed to laparoscopic cystectomy. The study aimed to determine the mean difference between the AMH levels before and 3 to 6 months after laparoscopy.

First group: In this group, the patients underwent a complete laparoscopic cystectomy, meaning that the cyst wall was completely removed and homeostasis was established in this group by a bipolar technique using a meticulous method and then the cyst wall was switched to the intracorporeal method.

Second group: In this group, a cystectomy was performed up to the umbilical region and the cyst wall was removed up to the ovarian umbilicus; and then in the umbilical region, due to the possibility of the wall coming out, bipolar ablation was used on the bed of the cyst in this region, and after establishing homeostasis, the cyst wall was sutured. Afterward, AMH level was measured at intervals of 3 to 6 months after surgery and compared with it before surgery. Patients were not aware of the type of surgery. The researcher who collected the information and did laboratory technicians, was also unaware of the patients' assignment to either of the groups.

Data Analysis

The mean AMH levels before and after surgery and also the changes between the two groups were measured and compared by repeated measures tests. Analyses were performed using the SPSS software version 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp).

Results

In this study, 86 women with endometriomas who were eligible for the study were investigated. The age of the patients ranged from 16 to 30 years with a standard deviation of 4.83. The youngest and the oldest of the patients were 19 and 35 years old, respectively. The mean number of childbirth in patients was 2.06 with a standard deviation of 1.64. The lowest and the highest parity in patients were 0 and 4, respectively.

In this study, 35 patients (45.3%) had a history of drug use. Moreover, out of these patients, 87.2% had a history of LD and 12.8% had a history of progesterone use. It should be mentioned that all medications received by patients were discontinued 3-4 months before the laparoscopy.

The mean length of the studied cysts was 6 cm with a standard deviation of 9.5mm. The mean width and standard deviation of the cysts were 5 and 0/8, respectively (Table 1).

Table 1. Dimensions of the case-study patients cysts

Index	Cyst length	Cyst width
Mean	6	5
Standard deviation	9.5mm	0.8
Minimum	4.2	3
Maximum	9.1	6.8

Table 2 shows that the mean age of patients in the two groups with complete cyst removal and partial cyst removal was not significantly different (*P*=0.176). The length of cysts in patients undergoing complete removal was significantly larger than that in patients with partial removal (*P*=0.011).

The width of cysts were not different in patients undergoing complete removal and patients with partial removal (*P*=0.084). Body mass index was not also significantly different between the two groups (*P*=0.717).

Table 2. Comparison of characteristics of patients undergoing cyst complete and partial surgery

Variable	Surgical method	Mean	Standard deviation	P-value
Age	Complete removal	30.93	4.43	0.176
	Partial removal	5.12	29.43	
Cyst Length	Complete removal	10.72	11.59	0.011
	Partial removal	7.48	6.80	
Cyst width	Complete removal	8.37	10.77	0.084
	Partial removal	5.40	3.45	
BMI	Complete removal	22.47	1.84	0.717
	Partial removal	22.63	2.25	

The AMH level in patients undergoing complete removal surgery decreased from 2.22 before surgery to 1.96 after surgery, which was statistically significant (*P*<0.001). Moreover, the AMH level in patients undergoing partial removal surgery decreased from 2.47 before surgery to 2.14 after surgery, which was statistically significant (*P*<0.001). The AMH levels were not significantly different between the two groups before surgery, and three months and six months after surgery. Difference between the two groups in terms of changes in AMH level over time, and after adjustment in terms of ovarian size, and the AMH level before surgery was not statistically significant(*P*=0.805) (Table 3).

Table 3. Comparison of characteristics of patients undergoing cyst complete and partial surgery

Type of surgery	AMH level			P-value	P-value*
	Before surgery	Three months after surgery	Six months after surgery	Over time	Between two groups
Complete removal	2.22(1.12)	1.81(1.08)	1.96(1.16)	<0.001	0.805
Partial removal	2.47(0.97)	2.04(1)	2.14(0.97)	<0.001	
P-value	0.282	0.311	0.425		

*After adjusting the effect of ovarian size and AMH before surgery

Discussion

Treatment of endometriosis has been a controversial issue, and its mere medical treatment is very limited. Danazol, progestins, Prevention pills and GnRH agonists have been proposed as medical treatment options, while there are other treatment options including follow-up, aspiration, cystectomy, and cyst wall removal **(18)**.

Despite all disagreements, there is general consensus on the surgical laparoscopy as the first option for the treatment of endometrium. However, debate over the type of laparoscopic procedure still continues.

In this study, the effect of type of cyst removal was assessed on the AMH levels. To this end, AMH levels were first measured in two groups. After complete removal and partial removal of the cyst, the AMH levels were measured again three months and six months after the surgery and the results were compared.

The results showed that the AMH level decreased significantly after both complete and partial removal of the cyst; however, this rate of change was the same for both groups. Therefore, the type of cyst removal did not significantly affect the AMH levels.

In a study Mirteymori *et al.*, (2020) natural childbirth after cesarean section has the risks such as uterine rupture and uterine adhesions **(20)**.

Numerous studies have assessed the effect of cyst removal on the AMH levels worldwide. In one study, the AMH level significantly decreased three months after surgery. Comparison of the AMH level before and after surgery showed that, regardless of the applied homeostasis method, a significant reduction of ovarian reserve was observed in both groups undergone complete and partial removal of the cyst **(21)**.

In a study by Nouri *et al.* in 2016, Laparoscopic treatment was successful in patients whom AMH level was lower prior to the treatment **(22)**.

In a study conducted by Moradi *et al.* (2016), considering age as an important factor in assessing ovarian reserve, it was found that the use of AMH level in determining ovarian reserve is a valuable test **(23)**.

In another study carried out by Alborzi *et al.* in 2014, the AMH level decreased after laparoscopic cystectomy of the endometrium, especially in the elderly patients, and those who had bilateral cysts **(24)**.

Similarly, Salic found that the serum AMH level significantly decreased sixth month after surgery **(28)**.

Decreased AMH level was more evident in patients with cysts > 5 cm. The decrease in the AMH level in bilateral endometrioma was greater than that in unilateral endometrioma. This study showed that laparoscopic ovarian endometrial cystectomy significantly and gradually decreased the serum AMH level **(25)**.

Chen *et al.* (2014) found out that the ovarian endometrium may itself damage the ovarian reserve, Damage to ovarian reserve had a positive relationship with bilateral endometrium, as well as cyst size (especially for cysts> 7 cm), but it had a negative relationship with serum AMH level before surgery. Age was a negative factor that affected the ovarian reserve **(26)**.

In various studies, the AMH level has decreased after laparoscopy. However, limited studies have focused on the type of laparoscopy, as well as other surgeries, and their effects on the AMH level. Hence further studies are required on the type of laparoscopic method with the least adverse effect and the most usefulness for patients **(27)**.

Conclusion

Our study showed that the type of cyst removal did not affect the after-surgery consequences.

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Conflict of Interest

The author have no conflict of interest.

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