ORIGINAL ARTICLE

A prospective cohort study on laparoscopic cystectomy of endometrioma and its effects on ovarian reserve

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Abstract

Objective: To study the effects of laparoscopic surgical resection of ovarian endometrioma on ovarian reserve.

Method: The prospective cohort study was conducted from March 2014 to March 2019 at private clinics and hospitals in the Kerbala province of Iraq, and comprised women aged 19-42 years complaining of chronic pelvic pain, dysmenorrhea and dyspareunia. The measurement of serum anti-Müllerian hormone and follicular stimulating hormone was done preoperatively on the third day of the menstrual cycle. The levels were compared to those at 1 week and then 3 months postoperatively. Data was analysed using SPSS 20.

Results: Of the 332 women with a mean age of 31.36±6.28 years, 9(2.7%) had minimal endometriosis, 23(6.9%) mild, 120(36.1%) moderate and 180(54.2%) had severe endometriosis. There was a significant decrease in serum anti-Müllerian hormone level and increase in follicular stimulating hormone level 1 week postoperatively ($p<0.0001$) and also at 3 months postoperatively ($p<0.0001$) compared to the baseline. There was a significant difference between the two cut-off points for both the markers ($p\leq0.001$) postoperatively.

Conclusion: Laparoscopic resection of ovarian endometrioma led to decrease in serum anti-Müllerian hormone level at one week postoperatively then there was gradual increase 3 months postoperatively. The increment serum follicular stimulating hormone level continued even three months postoperatively.

Keywords: Endometrioma, Laparoscopic ovarian cystectomy, Ovarian reserve, FSH, LH. (JPMA 71: S-8 [Suppl. 9]; 2021)

Introduction

Endometriosis is defined as the presence of endometrial tissue outside the uterus. It affects 8-10% of females generally aged 25-30 years.[1] Although there is uncertainty regarding its causes, it seems to be multifactorial: genetic with epigenetic influences and affected by environmental exposures.[2] The clinical presentation of the disease is variable and ranges from completely asymptomatic to subfertility, severe pelvic pain and is sometimes associated with bladder or bowel symptoms.[1] Endometrioma is one of the clinical varieties of endometriosis in a form of ovarian cyst affecting 17-44% of women.[3]

As part of workup of subfertile couple, woman's ability is tested to get pregnant, called the ovarian reserve, especially before in vitro fertilisation (IVF) cycle. It reflects the number and quality of the oocytes.[4] The idea behind measuring the reserve is to assess the risk of reduction in the reserve as it gives an idea about the possible line and success of treatment.[5]

An important method used to evaluate the ovarian reserve is to measure the levels of serum anti-Müllerian hormone (AMH) and follicular stimulating hormone (FSH). AMH imitates the size of the primordial oocyte pool as it is produced by the granulosa cells of primary, preantral and antral follicles.[6] AMH level remains relatively constant cross the menstrual cycle and can be measured at any time, and it is not affected by gonadotropin-releasing hormone (GnRH) agonists.[4]

The other marker is FSH which is secreted by the pituitary. High values of FSH indicate poor reproductive outcome.[5]

It is vital to know how endometriosis, especially ovarian endometrioma, affects fertility. The current study was planned to assess the effects of endometrioma on FSH and AMH levels, and to explore the relation between the severity of the disease and the effect on AMH and FSH levels.

Patients and Methods

The prospective cohort study was conducted from March 2014 to March 2019 at private clinics and hospitals in the Kerbala province of Iraq. After approval from the local ethics review committee, the sample size was calculated using the Cochrane formula.[7]

Those included were women aged 19-42 years with complaints of chronic pelvic pain, dysmenorrhea and dyspareunia. They were subjected to trans-vaginal ultrasound (TVUS) using a real time device (Philips 11*E) at "robe 5-7MHZ which revealed the pathognomonic feature

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of chocolate cyst (ground glass), normal AMH and FSH.

Those excluded were patients outside the age range, and those with ultrasound finding of ovarian cysts other than chocolate cyst. Also excluded were patients diagnosed as polycystic ovarian syndrome (PCOS) and with abnormal levels of AMH and FSH or having some medical co-morbidity that could affect fertility, such as thyroid problems.

After taking informed consent from the subjects, 5ml of peripheral blood was taken to measure AMH, FSH levels before operation on the third day of the menstrual cycle, and then the measurement was repeated one week and then again at three months after the operation. FSH level was measured using an enzyme-linked immunosorbent assay (ELISA) kit (Elegance FSH ELISA Kit; Bioclone, Marrickville, Australia), and the AMH level was measured using an enzyme immunoassay kit (EIA AMH/MIS; Immunotech, Marseille, France).

All the operative laparoscopies were performed by the same senior gynaecologist after bowel preparation under general anaesthesia using Storz endoscopic instruments (Karl Storz, Tuttlingen, Germany). Briefly, following prep and drape, a subumbilical incision was done, pneumoperitoneum was achieved with carbon dioxide (CO2) using a veress needle. A 10mm trocar telescope was inserted and secondary trocars were inserted through another 10mm and two 5mm punctures. Exploration of the abdomen and pelvic cavity and staging of the endometriosis was done according to the revised American Society for Reproductive Medicine (rASRM) classification.[1]

Endometriomas were either unilateral or bilateral and was resected and sent for histopathological evaluation. Meticulous haemostasis was accomplished using bipolar cauterisation and, if needed, by suturing. It was followed by irrigation with normal saline. Diagnosis of endometriosis was confirmed for all resected tissue samples by histopathological examination.

Data was analysed using SPSS 20. Variables were presented as mean ± standard deviation (SD) as well as frequencies and percentages. P<0.05 was considered statistically significant. Bivariate correlation analysis was performed to assess the correlation of preoperative AMH and FSH levels with age and endometriosis score of the patients, and the findings were expressed as Pearson correlation coefficients.

Results

Of the 332 women with a mean age of 31.36±6.28 years, 9(2.7%) had minimal endometriosis, 23(6.9%) mild, 120(36.1%) moderate and 180(54.2%) had severe endometriosis. There was a positive correlation between FSH level and the patient's age and endometriosis score, while the correlation was inverse regarding AMH (Table-1).

Table-1: Correlation of preoperative AMH and FSH levels with age and endometriosis score of the patients.

		Age	Score of endometriosis
Preoperative AMH (ng/ml)	Pearson Correlation	-0.368**	-0.183**
	Sig. (2-tailed)	0.000	0.001
	Number	332	332
Preoperative FSH IU/L	Pearson Correlation	0.163**	0.231**
	Sig. (2-tailed)	0.003	0.001
	Number	332	332

**Correlation is significant at the 0.01 level (2-tailed).
AMH: Anti-Müllerian hormone, FSH: Follicular stimulating hormone.

Table-2: Mean AMH values at basleine and two postoperative cut-off points for endometriosis.

	AMH level ng/ml	Mean	Number	Standard deviation	P
Pair 1	Preoperative	3.33	332	2.72	0.0001
	One week postoperative	1.40	332	1.30	
Pair 2	Preoperative	3.33	332	2.72	0.0001
	Three months postoperative	1.69	332	1.65	
Pair 3	One week postoperative	1.40	332	1.30	0.0001
	Three months post-operative	1.69	332	1.65	

P < 0.05 was considered significant, AMH: Anti-Müllerian hormone.

Table-3: Mean FSH values at baseline and two cut-off postoperative points for endometriosis.

	FSH level IU/L	Mean	Number	Standard deviation	P
Pair 1	Preoperative	5.73	332	4.06	<0.001
	One week postoperative	9.64	332	10.29	
Pair 2	Preoperative	5.73	332	4.06	<0.001
	Three months postoperative	10.34	332	11.41	
Pair 3	One week postoperative	9.64	332	10.29	<0.001
	Three months postoperative	10.34	332	11.41	

P < 0.05 was considered significant, FSH: Follicular stimulating hormone .

There was a significant decrease in serum AMH level and increase in FSH level 1 week postoperatively (p<0.0001) and also at 3 months postoperatively (p<0.0001) compared to the baseline. There was a significant difference between the two cut-off points for both the markers (p<0.001) postoperatively (Table-2, 3).

Discussion

In the current study, there was a negative correlation between women's age and AMH level, while it was

positively correlated with FSH, which was reported earlier as well.[8,9]

The findings suggest that the more severe the stage is, the more is the effect on the ovarian reserve. This may be related to the inflammatory reactions that happen with endometriosis or the damage in normal ovarian tissue because of the disease. Muzii, L. et al.[10] revealed that endometrioma itself, even without excision, caused reduced AMH levels compared to other types of ovarian cysts and to healthy ovaries. The existence of an ovarian cyst has been a cause of decreased ovarian reserves in the form of increased FSH levels.

Romanski PA et al.[11] found no correlation between the endometriosis stage and AMH levels, suggesting that there was a pathological process in endometriosis which affects the ovarian reserves unrelated to the injury secondary to cystectomy.

Regarding the current findings related to the changes in AMH levels postoperatively compared to the baseline, similar results have been reported earlier.[12]

Tanprasertkul C et al.[8] revealed that the decrease in the reserves occurred directly and three months after cystectomy before recovery occurs at six months.

Biacchiardi CP et al.[13] demonstrated that the decrement in AMH concentrations occurred immediately after stripping of the endometrioma, and continues for up to 9 months postoperatively. They suggested that the cause was partial removal of healthy ovarian tissue.

Muzii, L. et al.[3] found that the AMH level continues to decrease postoperatively, especially in those with bilateral endometriomas, up to six months.

On the contrary, Ercan CM et al.[14] did not find significant changes in AMH level in patients with endometrioma even after cystectomy in short-term follow-up. This difference may be because of the small sample size and for the short postoperative follow-up.

Pacchiarotti A et al.[15] demonstrated the effect of endometriosis on ovarian reserve that leads to incipient failure of the ovary, which is reflected as an initial sign of ovarian consumption in young women. These outcomes suggest that AMH can be used to monitor patients with endometriosis in order to evaluate promptly the decrement in the reserves.

Vignali M et al.[16] followed the level of AMH for up to one year post-surgery, and found significant decrement in the ovarian reserves after the excision, but the recovery of the reserves soon followed.

Regarding the current findings related to the changes in FSH levels postoperatively compared to the baseline, Asgari Z. et al.[17] found that after cystectomy of endometrioma and the use of bipolar coagulation, the ovarian reserves decreased in the form of AMH and FSH three months after the surgery.

Zaitoun MM et al.[18] obtained similar findings in which the FSH level rose significantly after cystectomy of endometrioma using bipolar coagulation during the follow-up period for up to 18 months.

Alipour F et al.[19] showed that the level of AMH was more sensitive than the level of FSH in the diagnosis of premature ovarian failure, and this supports the current findings.

Iwase A et al.[20] presented contrasting results. They measured FSH and AMH levels two weeks preoperatively and one month postoperatively and the results indicated no changes in the FSH level. It is likely that the small sample size could have affected the results.

The current study's limitation is that it did not have a long-term follow-up to know why FSH was affected more than the AMH.

Conclusion

Laparoscopic ovarian cystectomy leds to immediate decrement in AMH level postoperatively, but there was gradual increase three months postoperatively. Regarding FSH, the increment in its level continued for three months postoperatively. AMH level can be used to time the recovery of ovarian reserves after surgery as it seemed more sensitive to reflect the ovarian function and it can be measured at any time during the cycle.

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