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Research Article

Evaluation of Serum Anti-Mullerian Hormone Level before and after Laparoscopic and Surgical Intervention in Management of Endometriosis

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Abstract

Background: AMH is produced by the granulosa cells of the ovaries and is expressed by small antral follicles. Levels surge at the time of puberty to approximately 5–8 ng/mL but then gradually decline throughout reproductive life until they become undetectable by menopause.

Aim of the work: The aim of this study is to evaluate of anti-Mullerian hormone levels before & after laparoscopic and surgical intervention in endometriosis management.

Patients and Methods: This study included 100 women aged 18- 43 years with pelvic Pain and / or infertility who underwent laparoscopic or surgical treatment of suspected endometriosis or endometriomas. Ovarian reserve will be measured by AMH and compared before laparoscopic & surgical treatment and at 1 month and 6 months after treatment, the women were recruited to this research will be carried out in the Assisted Reproduction unit at the International Islamic Center for Population Studies and Research (IICPSR), Al Hussein University Hospital and Sayed Galal University Hospital.

Results: Main age was 29.28 in Laparoscopic group and 28.66 in surgical group and the Standard deviation of age was 4.96 in Laparoscopic group and 4.30 in surgical group. The relation between laparoscopic group and surgical group in present history (1ry and 2ry infertility) show no any different in data and data are very close to each other in different groups.

Conclusion: The result of this study demonstrates that laparoscopic and surgical management are effective on AMH levels but laparoscopic more than surgical.

Keywords: abdominal trauma; hemoperitoneum; pancreas trauma

Introduction

Endometriosis is a common gynecologic condition affecting 6% 10% of reproductive age women. It is defined as the presence of endometrial glands and stroma outside the uterine cavity, commonly found in the Ovary and on the peritoneum. It can be Superficial or deep ***(Dewailly and Laven, 2019).***Endometriosis is a sex steroid–dependent disorder, and symptoms originate from physiologic fluctuations in estrogen and progesterone that typically occur in women of reproductive age. Accordingly, the disease regresses with natural or pharmacologic menopause. However, amelioration of the symptoms can also be achieved with administration of estroprogestin preparations, which create a steady hormonal milieu and prevent the detrimental effects of ectopic menstruation ***(Wetzka et al., 2011).***

Ovarian endometriomas are ovarian cysts that are lined with endometrial tissue and contain Fluid that arises from accumulation of Menstrual debris. They are found in 17%– 44% of women with endometriosis. Theories regarding the origin of ovarian endometrioma include Invagination of the ovarian cortex with menstrual debris arising from bleeding endometrial implants and epithelial inclusions from the ovarian surface that invaginate and undergo metaplasia into endometrial tissue ***(Michael W Pankhurst, 2017).*** The pathogenesis of endometriomas had not been fully elucidated though several hypotheses had been proposed. Classically, retrograde menstruation into the pelvic cavity had been referred to as one of the major causes of endometriosis. Ovarian endometrioma may be the pseudo cyst that is formed by blood filled secretions from endometriotic lesion on ovarian surface adherent to broad ligament (pelvic peritoneum) ***(Alebić et al., 2018).*** On the other hand,

endometriomas may also be formed from metaplasia of epithelial lining of invaginated inclusion cyst. Recent observation suggested that endometriomas may also be formed from metaplastic change of corpus luteum cyst ***(Ludovico et al., 2014).*** Evidence suggests that women with endometriosis are at higher risk of infertility, ovarian and breast cancer, melanoma, asthma, and some autoimmune, cardiovascular, and atopic diseases. Endometriosis is defined by the presence of endometrial-like tissue (lesions) outside the uterus. Three subtypes of endometriosis have been described: superficial peritoneal, ovarian (endometrioma or chocolate cysts), and deep ***(Roustan et al., 2015).*** Endometriomas are present in up to 44% of all women with endometriosis and have a detrimental effect on fertility. However, it is controversial whether endometriomas should be surgically removed before assisted reproduction technology. Our purpose was to evaluate whether surgical stripping of endometriomas in sub fertile women improves the chance of a live birth. Endometriosis affects between 6-10% of women in their reproductive age. Up to 20-50% of women affected by endometriosis, may present with infertility ***(Michael et al., 2018).*** Ovarian reserve is defined as the existent quantitative and qualitative supply of follicles that are found in the ovaries that can potentially develop into mature follicles that in effect determine a woman's reproductive potential. It is also used as a term to determine the capacity of the ovary to develop oocytes capable of fertilization, resulting in a healthy and successful pregnancy ***(Saad et al., 2017).*** Anti-Mullerian hormone predicts age at menopause. Given the posited fixed period of time between the end of natural fertility and menopause, AMH level might thus inform individual women about their reproductive lifespan and current reproductive capacity. However, no prior studies have directly compared AMH levels in couples with unexplained infertility vs. normal controls ***(Jusiakowska-Piputa and Kaczmarek, 2018).*** The ovary begins producing AMH from about 36 weeks of gestation up until menopause. The absence of AMH expression during the female fetal period is not only crucial for proper female reproductive tract development, but also for normal ovarian development. As expected, overexpression of human AMH under the control of the metallothionein promoter in transgenic mice leads to absence of a uterus and oviducts due to the action of AMH on the Mullerian ducts ***(Dominique et al., 2019).*** Serum AMH concentrations are known to significantly decrease after cystectomy for ovarian endometriomas. As evaluated by serum AMH concentrations, the reduction of ovarian reserve after ovarian cystectomy for endometriomas is inevitable. Serum AMH concentrations in patients who have intrinsically low AMH concentrations would be further diminished ***(Pranay and Adlakha, 2014).*** Laparoscopic surgery itself can temporally lower ovarian function, and thus the decline in AMH concentration might exceed 50% regardless of whether unilateral ovarian cystectomy or vaporization is performed. The European Society of Human Reproduction and Embryology reported that there is insufficient evidence available to determine whether surgical excision of moderate to severe endometriosis enhances pregnancy rates ***(George et al., 2010).*** Ovarian reserve is one of the imperative issues in looking at the laparoscopic methods in removing the ovarian endometrioma, AMH standout amongst the most dependable tests for ovarian reserve. In our study, we watched critical lessening in AMH in both groups worked upon either by stripping or by fenestration and end coagulation, serial follow up recorded early diminishment then later recovery following 6 months follow up when compared to 3 months follow up ***(Krzysztof et al., 2014).***

Aim of the Study

Aim of this study is to evaluate of anti-Mullerian hormone levels before & after laparoscopic and surgical intervention in endometriosis management.

Patients And Methods

Type of studies:

This is a prospective cohort study to evaluate of anti-Mullerian hormone levels before & after laparoscopic and surgical intervention in endometriosis management.

Study population:

Our study included 100 women aged 18- 43 years with pelvic Pain and / or infertility who underwent laparoscopic (n=50) or surgical (n=50) treatment of suspected endometriosis or endometriomas. Ovarian reserve will be measured by AMH and compared before laparoscopic & surgical treatment and at 1 month and 6 months after treatment, the women were recruited to this research will be carried out in Al Hussein University Hospital and Sayed Galal University Hospital and the Assisted Reproduction unit at the International Islamic Institute for Population Studies and Research (IICPSR).

Patients where be classified into two equal groups:

Group A: included 50 patients with laparoscopic treatment of suspected endometriosis or endometriomas.

Group B: included 50 patients with surgical treatment of suspected endometriosis or endometriomas.

All patients' groups where be subjected to the following:

I- Through history taking.

Detailed personal history (Name, Age, present history, menstrual history, obstetric history). General examination: each patient will be examined systemically (Weight and height BMI will be recorded).

II- Clinical examination:

All ovarian follicles measuring 3 mm to 10 mm on both ovaries were counted preoperatively in both groups using the largest cross-sectional sagittal view of the ovary, the averaged ovarian diameters for each patient were calculated by measuring two perpendicular diameters.

III- Laboratory investigations including:

Hormonal Profiles Determination: Blood sample (5 cc) will be collected through vein puncture, samples will be allowed to clot at room temperature for at least one hour. All samples will be centrifuged within 2 hours after withdrawal; samples will be stored at –20 0C until assayed of basal hormones.

Inclusion Criteria:

- Age: 18-43.
- Complain: pelvic pain or infertility.
- Bilateral or unilateral ovarian endometriosis diagnosed during US assessment.

Exclusion Criteria:

- Pregnant women.
- Patients with previous excision of ovarian cysts.
- Patients diagnosed with infertility (unless solely related to endometriosis or the male infertility).

- Patients who had received hormonal treatment during the prior 36 months.
- Patients diagnosed with endocrine disorders.
- Patients suffering from chronic diseases.
- Patients with history of malignancy.
- Liver function tests

Protocol and treatment:

No restrictive diet was recommended, and none of the women studied engaged in intensive aerobic activity during the study. All women examined agreed to participate in the present study, and a written informed consent was obtained from each woman. No financial support was provided for this study by either of the drug companies that manufacture drug. The institutional review board approved the study.

Patient preparation:

The patients who enrolled in the study were submitted to the following criteria; age between 18 and 43 years old, BMI < 30, no other pelvic pathology or previous ovarian surgery and size of endometrioma > 5 cm in average diameter. All patients had undergone laparoscopic ovarian cystectomy (LC) which preceded by AMH estimation. Six months after group to group comparisons were done as regard all parameters. laparoscopic surgery, AMH were re-estimated. Paired and All group to group comparisons were done as regard all parameters.

Statistical analysis:

Descriptive statistics: Qualitative data was expressed in: Number (No) and percentage (%), while quantitative data was expressed in: mean (and standard deviation (SD). Analytic statistics: Chi square test (X2): was used to study association between two qualitative variables. Whenever any of the expected cells were less than five, Fischers Exact test was used. ANOVA test: was used for comparison of quantitative variables between more than two groups of normally distributed data with LSD test as post Hoc test. P value: P value of > 0.05 was considered statistically non-significant, P value of < 0.05 was considered statistically significant, P value of < 0.001 was considered statistically highly significant.

Results

General examination	Laparoscopic				Surgical			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Age	29.28	4.96	20	38	28.66	4.30	20	39
Weight	72.42	9.04	55	89	73.28	8.34	56	92
Height	168.68	4.33	156	178	168.06	4.92	155	176
BMI	25.50	3.43	17.75	33.98	26.03	3.36	20.17	35

Table (1): General examination distribution in study population

The total number of Patient selected for the tests was 100 Patient. The data showed at previous table are mostly the same, the mean of all parameter and standard deviation show the data are random distributed there is no bias in any group. main age was 29.28 in Laparoscopic group and 28.66 in Surgical group and the Standard deviation of age was 4.96 in Laparoscopic group and 4.30 in Surgical group.

Table (2):

	All cases	N (%)	Laparoscopic	N (%)	Surgical	N (%)	P value	Statistically significant
Total	69	100	34	49	35	51		
Present history								
1ry infertility	42	61	20	40	22	44	0.8075	N.S
2ry infertility	27	39	14	28	13	26		

Table (2): Present history distribution in study population

The relation between Laparoscopic group and Surgical group in Present history (1ry and 2ry infertility) show no any statistically significant of data.

Table (3):

	All cases	N (%)	Laparoscopic	N (%)	Surgical	N (%)	P value	Statistically significant
Total	100	100	50	50	50	50		
Obstetric history								
No History	71	71	33	66	38	76	0.5138	N.S
Normal vaginal delivery	18	18	11	22	7	14		
Caesarean section	11	11	6	12	5	10		

Table (3): Obstetric history distribution in study population

The relation between Laparoscopic group and Surgical group in Obstetric history (No History, Normal vaginal delivery and Caesarean section) show no any statistically significant of data.

	All cases	N (%)	Laparoscopic	N (%)	Surgical	N (%)	P value	Statistically significant
Total	60	100	26	43	34	57		
Menstrual history								
Regular	21	21	6	12	15	30	0.1085	N.S
Irregular	39	39	20	40	19	38		

Table (4): Menstrual History distribution in study population

The relation between Laparoscopic group and Surgical group in Menstrual history (Regular and Irregular) show no any statistically significant of data. History of patients are normally distributed due to no any significant data between different groups.

Table (5):

	All cases	N (%)	Laparoscopic	N (%)	Surgical	N (%)	P value	Statistically significant
Total	89	100	46	52	43	48		
Ultrasound examination								
Chocolate cyst right ovary normal uterus	43	43	19	38	24	48	0.3187	N.S
Chocolate cyst left ovary normal uterus	34	34	19	38	15	30		
Chocolate cyst Bilateral vary normal uterus	12	12	8	16	4	8		

Table (5): Ultrasound examination distribution in study population

The relation between Laparoscopic group and Surgical group in Ultrasound examination (Chocolate cyst right, left and bilateral ovary with normal uterus) show no any statistically significant of data.

Table (6):

	All cases	N (%)	Laparoscopic	N (%)	Surgical	N (%)	P value	Statistically significant
Total	69	100	36	52	33	48		
Hysteroscope								
Normal uterus	49	49	24	48	25	50	0.4057	N.S
Endometriosis	20	20	12	24	8	16		

Table (6): Hysteroscope distribution in study population

The relation between Laparoscopic group and Surgical group in Hysteroscope (Normal uterus and Endometriosis) show no any statistically significant of data.

Ovarian reserve	Laparoscopic		Surgical		P value	Statistically significant
	Mean	SD	Mean	SD		
Before	3.82	1.78	3.65	1.70	0.5841	N.S
After 1 months	2.11	1.30	2.36	2.53	0.6821	N.S
After 6 months	1.16	0.66	1.71	0.99	0.0018	Sig.

Table (8): Ovarian reserve at different time

The relation between Laparoscopic group and Surgical group in Ovarian reserve (Before and After 1 months) show no any statistically significant of data, but in case of (After 6 months) show statistical different.

Discussion

Endometriosis is a disease of unknown origin characterized by the growth of endometrium-like tissue—stroma and glands—outside of the uterine cavity. The process can affect all organs, but is primarily encountered in pelvic organs, including the ovaries. Practically, endometriosis bears two primary clinical consequences, pain and infertility ***(Dewailly and Laven, 2019)*** Endometriosis is a chronic benign estrogen-dependent disease, characterized by the abnormal growth of endometrial-like tissue outside the endometrial cavity, and it is frequently associated with infertility. The localizations of the ectopic endometrial-like tissue include ovaries, fallopian tubes, rectovaginal space, uterosacral ligaments, peritoneal cavity, bladder, ureters and even lungs and brain. Moreover, in a rare case, endometrial glands and stroma can also be found in postsurgical scars. Based on the site and extension of the implants, the disease is classified as peritoneal, ovarian or deep infiltrating endometriosis, that can be roughly described as the presence of endometrial tissue expanding to a depth of more than 5 mm below the peritoneum ***(Wetzka et al., 2011).*** AMH, a dimeric glycoprotein, has been identified in the ovary in the granulosa cells of growing follicles up to the antral stage or to a diameter of approximately 6 mm. AMH production diminishes as the follicles become FSH dependent. Serum levels are not affected by the day of the menstrual cycle, are most probably not be manipulated by exogenous steroid administration, and are closely correlated with reproductive age. Hence, AMH has been used to predict poor as well as excessive response in IVF ***(Michael, 2017).*** Ovarian reserve (OR) is deined as the pool of follicles available to provide eggs cells throughout the fertile age in each woman. In reproductive medicine, OR relects the potential of fertility and also predicts the length of reproductive lifespan on female patients. The evaluation of OR allows to identify cases of premature ovarian insuiciency and provide the opportunity to design programs for egg freezing preservation and egg donation ***(Alebić et al., 2018).*** In previous study the total number of Patient selected for the tests was 100 patients.

The data showed at previous table are mostly the same, the mean of all parameter and standard deviation show the data are random distributed there is no bias in any group. Main age was 29.28 in Laparoscopic group and 28.66 in surgical group and the Standard deviation of age was 4.96 in Laparoscopic group and 4.30 in surgical group. In other study, demonstrated that postoperative AMH levels significantly decreased after surgery irrespective of age (≤38 years, P <0.001;> 38 years, P <0.001), Age was a negative factor that affected in this study ***(Michael et al., 2018).***

In other study, found that AMH was a better predictor of mature oocytes and reduced ovarian response than FSH and age during COH in women with endometriosis ***(Saad et al., 2017).***

In other study, preoperative AMH levels in patients with endometriosis (4.97 ±2.66 ng/mL) were lower than those in the other two groups (5.88 ± 3.17 ng/mL in those with teratoma, and 6.39 ± 3.61 ng/mL in those with other benign cysts), but, despite the higher age shown in endometrioma group, the differences were not statistically significant ***(Jusiakowska-Piputa and Kaczmarek, 2018).***In other study, reported that postoperative decline in serum AMH correlates with bilaterally, severity, and age of endometriosis. The former group showed that the rate of decline in the AMH at 1 month post-surgery was higher in the bilateral group than the unilateral group. It was also correlated to the revised American Society for Reproductive Medicine score, but not to the age, serum AMH level before surgery, or cyst diameter ***(Sadiqa-Tuqan et al., 2018).***In previous study the relation between laparoscopic group and surgical group in present history (1ry and 2ry infertility) show no any different in data and data are very close to each other in different groups.n other study Endometriosis is a chronic benign estrogen-dependent disease, characterized by the abnormal growth of endometrial-like tissue outside the endometrial cavity, and it is frequently associated with infertility ***(Dominique et al., 2019).***In other study, showed that the preoperative serum AMH levels in patients with endometriomas were significantly lower than in patients with tubal factor infertility or other benign ovarian cysts, and there was no significant difference between patients with other benign ovarian cysts and patients with tubal factor infertility. These results indicat that, in contrast to other benign ovarian cysts, endometriomas per se might damage the ovarian reserve ***(Pranay and Adlakha, 2014).***

In Previous study the relation between Laparoscopic group and Surgical group in Menstrual history the no. of patient in each group are (6 Regular and 20 Irregular) in Laparoscopic group and in Surgical group (15 Regular and 19 Irregular).

In other study AMH production diminishes as the follicles become FSH dependent. Serum levels are not affected by the day of the menstrual cycle, are most probably not be manipulated by exogenous steroid administration, and are closely correlated with reproductive age. Hence, AMH has been used to predict poor as well as excessive response in IVF ***(George et al., 2010).***In other study an interesting finding in our study was that AMH levels did not always decrease after cyst surgery, as a fifth of the women showed an increase in AMH levels at 6 months. It is possible that patients whose cysts were less adherent could maintain healthy ovarian tissue. Some recent studies have shown that AMH levels may change during the menstrual cycle in women presenting with AMH levels in the higher quartiles, which could partially explain the greater changes in AMH levels over time in the women with higher preoperative AMH levels in this study ***(Krzysztof et al., 2014).***In other study preoperative serum AMH levels are measured, irrespective of the menstrual cycle. For example, in the case of extremely low preoperative AMH levels, one could consider fertility preservation to attempt to minimize the ovarian damage during surgery ***(Marta et al., 2019).***In other study shows a significant decrease in OR after laparoscopic cystectomy, evaluated by means of AMH levels. We decided on AMH as a surrogate marker for OR, as it is independent from the menstrual cycle and seems not to be affected by the use of hormones ***(Spiros et al., 2010).***In Previous study the relation between Laparoscopic group and Surgical group in Ultrasound examination no. of patient in each group are (19 Chocolate cyst right, 19 left and 8 bilateral ovary with normal uterus) in Laparoscopic group and in Surgical group (24 Chocolate cyst right, 15 left and 4 bilateral ovary with normal uterus).In other study results surprisingly revealed significant difference between AMH level decline in dermoid cyst and the two other studied cyst types but no variation among mucinous and serous cystadenomas was observed. The same hypothesis can justify our finding regarding the impact of primary AMH level on the percentage of decline serum after the surgery. Statistical analysis showed significantly higher decrease in AMH level in the group whose primary AMH level was greater than 5 ng / ml vs. those with primary AMH level <5 ng / ml ***(Mohamed et al., 2019).*** In other study revealed greater decline in AMH level in the group of cases whose primary ovarian cyst size was larger than 90mm versus those with 45-60 mm cysts. The effect of primary cyst size on severity of damage to ovarian reserve may be explained by the fact that larger ovarian cysts mandate more surgical manipulations for resection and also result in more bleeding for which larger areas of the ovarian border should be cauterized ***(Wenjing Ding et al., 2015).*** In Previous study the relation between Laparoscopic group and Surgical group in Hysteroscope no. of patient in each group are (24 Normal uterus and 12 Endometriosis) in Laparoscopic group and in Surgical group (25 Normal uterus and 8 Endometriosis).

In other study showed that postoperative serum AMH decreased significantly compared with the pre-operative level in patients with endometriomas, whereas postoperative basal FSH did not change significantly compared with the pre-operative level. Taken together, it seems that serum AMH is superior to FSH for evaluating change in ovarian reserve. A limitation of this study is the inclusion of women who underwent myomectomy and hysterectomy with different approaches, although it is not considered that the different approaches would alter the impact on ovarian reserve significantly ***(Fariba Ramezanali et al., 2016).***In other study Hysterectomy, even if the ovaries are preserved, has been reported to possibly cause adverse effects on ovarian function, which might shorten the time to menopause ***(Sanjay K. Agarwal et al., 2019).***

In other study reported that serum AMH levels tended to decline more at 4 months after hysterectomy compared to those in controls who did not undergo hysterectomy (1.46 ± 2.02 to 0.62 ± 0.9 ng/mL in the hysterectomy group vs. 1.53 ±1.82 to 1.26 ± 1.78 ng/mL in the controls, mean ± SD, P = 0.73 and P = 0.262 before and after surgery, respectively) ***(Bedaiwy and Barker, 2012).*** In Previous study the relation between Laparoscopic group and Surgical group in Ovary Endometriosis no. of patient in each group are (24 Right, 18 Left and 8 Bilateral) in Laparoscopic group and in Surgical group (30 Right, 16 Left and 4 Bilateral). In other study reported that bipolar electrocoagulation of the ovarian parenchyma during laparoscopic removal of endometriotic ovarian cysts adversely affected ovarian function, this goes in line with our results, however in their study only FSH levels of endometrioma patients was checked which does not rule out the possible ovarian damage by endometriosis itself. The significant reduction of AMH after surgery confirms previous histological observations, suggesting that part of the healthy ovarian pericapsular tissue, containing primordial and preantral follicles, is removed or damaged despite every surgical effort to be atraumatic ***(Aboulghar et al., 2014).*** In other study AMH levels were not significantly different between patients with and without endometriosis. However, most studies do not agree with this finding. In a retrospective study, **Yoo et al.** found serum AMH levels to be significantly lower in

women with endometriosis. This finding is supported by **Hwu et al.** who found that the mean serum AMH level was significantly lower in women with endometriomas than in those without ***(Sherif M.M. Negm et al., 2012).*** In Previous study the relation between Laparoscopic group and Surgical group in Ovarian reserve the mean of AMH in serum in each group are (3.82 Before and 2.11 After 1 months and 1.16 After 6 months) in Laparoscopic group and in Surgical group (3.65 Before and 2.36 After 1 months and 1.71 After 6 months) but in case of (After 6 months) show statistical different in Laparoscopic group are decrease more than Surgical group. In other study Eleven studies were included in the analysis, and 9 of these showed a statistically significant reduction in serum AMH after surgery. The 2 studies that failed to demonstrate any significant modification in serum AMH were published by the same group of researchers. A second meta- analysis published by **Raffi et al** in the same year also looked at the effect of endometrioma on ovarian reserve using AMH as a marker ***(Ludovico et al., 2014).***

In other study results reveal the importance of the AMH as a predictor of the ovarian reserve and therefore of the folliculogenesis, in fact it shows only a slight decrease in the early postoperative phase. Moreover, our results show that an adequate surgical technique in skilled hands does not determine a significant damage of ovarian reserve ***(Owczarek et al., 2018).***In other study investigated the effect of the laparoscopic surgical technique on ovarian reserve assessing the AMH levels. Possible causes of the decrease of AMH levels have been proposed in many studies. In the present study, the evaluation of AMH levels during the 3-month follow up showed a slight decrease at time 2 (first month after surgery) ***(Brink Laursen et al., 2017).***In other study also revealed greater decline in AMH level in the group of cases whose primary ovarian cyst size was larger than 90mm versus those with 45-60 mm cysts. The effect of primary cyst size on severity of damage to ovarian reserve may be explained by the fact that larger ovarian cysts mandate more surgical manipulations for resection and also result in more bleeding for which larger areas of the ovarian border should be cauterized ***(Kirsten and Ian, 2012).*** In other study evaluating the effects of endometrioma excision on ovarian reserve have consistently found a significant decrease in the anti-Mullerian hormone (AMH) level shortly after surgery Therefore, endometrioma excision is currently not advisable in non-symptomatic infertile patients, due to the unfavourable effects on ovarian reserve ***(Tsolakidis et al., 2010).*** In other study the operation-related damage to the ovarian reserve was positively related to whether the endometriomas were bilateral, as well as to the cyst size (especially for cysts> 7 cm), but was negatively related to the pre-operative serum AMH level. Age was a negative factor that affected the ovarian reserve in this study ***(Ercan et al., 2010).*** In other study reported that severity of endometriosis might be correlated with the decline of ovarian reserve measured by serum AMH levels comparing to control women without endometriosis. On the other hand, in another study, endometriosis and ovarian endometrioma per se do not result in lowering AMH levels. AMH levels were decreased in women with previous endometrioma surgery independently of the presence of current endometriomas ***(Chang et al., 2010).***

Conclusion

The result of this study demonstrates that laparoscopic and surgical management are effective on AMH levels but laparoscopic more than surgical.

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