

Ovarian Cystectomy: Stitching or Cauterizing – A Comparison Study of Anti-Mullerian Hormone Level Pre- and Postoperatively

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Abstract

Objective: This study aimed to analyze the influence of laparoscopic management in an ovarian cyst as measured by serum anti-Mullerian hormone (AMH) levels, by comparing cautery and suturing techniques.

Subjects and Methods: This prospective cohort study was conducted in the Department of Obstetrics and Gynecology, Faculty of Medicine Hasanuddin University/Dr. Wahidin Sudirohusodo Hospital, and several private hospitals in Makassar, Indonesia, from January 1, 2016, to January 31, 2018. A total sample of 90 subjects diagnosed with ovarian cysts underwent cystectomy by laparoscopy. Serum AMH level was examined in all participants both preoperatively and 1-month postoperatively. Participants were divided into two groups based on cautery and suturing techniques used in the surgery. Serum AMH levels obtained were statistically analyzed and compared between cautery and suturing groups. $P < 0.05$ was considered statistically significant.

Results: The research result indicated a significant decrease of AMH level in each sample groups using cautery and suturing techniques; however, it was not significantly different if both methods were statistically compared (mean AMH: 1.13 ± 0.34 and 1.02 ± 0.15 , with $P > 0.05$). Both the groups showed a greater decrease with a significant result in endometriotic cyst type and when adhesion was present during laparoscopy ($P < 0.05$). Other parameters such as unilateral/bilateral cyst and variety of cyst size were not showing significant differences ($P > 0.05$).

Conclusions: This study showed that serum AMH levels clearly decreased after operative laparoscopy for different types of ovarian cysts in female patients; however, there is no significant difference regardless of surgical procedures.

Keywords: Anti-Mullerian hormone, electrocautery, laparoscopic cystectomy, ovarian reserve, suturing

INTRODUCTION

Growing mass of the ovaries is largely dominated by the cystic form. The incidence of ovarian cysts was reported between 5% and 15% of gynecological diseases.^[1] In general, the types of most established cysts are functional cysts and endometriosis. Definitive diagnosis is made by direct operative visualization either by laparoscopy or laparotomy and ideally with histological confirmation.^[2] The most

common procedures for the treatment of an ovarian cyst are either excision of the cyst capsule or electrocoagulation of the cyst wall. During excision, the ovarian cyst is aspirated followed by incision and removal of the cyst wall from the ovary cortex with maximal preservation of the normal ovarian tissue; however, the reduced number of retrieved oocytes for *in vitro* fertilization and premature ovarian failure after surgery reported in several papers have raised concerns.^[3]

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This number of remaining oocytes is expressed in term of ovarian reserve.

Ovarian reserve is defined as the functional potential of the ovary, and it reflects the number and quality of the follicles left in the ovary at any given time. At present, the ideal test reflecting ovarian reserve remains the serum anti-Mullerian hormone (AMH) level, which has equal sensitivity and specificity to the antral follicle count and is better than follicle-stimulating hormone (FSH), estradiol, luteinizing hormone (LH), FSH/LH ratio, or inhibin-B levels.^[4]

The greater the damage on ovarian tissue during laparoscopic cystectomy, the less remaining number of normal follicles that estimated by lower AMH levels after surgery.^[5]

The aim of this study was to analyze the influence of laparoscopic management in an ovarian cyst as measured by changes in pre- and postoperative serum AMH levels, by comparing cautery and suturing techniques, and to identify differences in ovarian cyst types and the determinants of surgery-related changes on ovarian reserve.

SUBJECTS AND METHODS

This prospective cohort study was conducted in teaching hospitals with laparoscopic surgery facility in Dr. Wahidin Sudirohusodo Hospital (Department of Obstetrics and Gynecology, Faculty of Medicine Universitas Hasanuddin) and several private hospitals in Makassar, Indonesia, from January 1, 2016, to January 31, 2018. This study was approved by local institution review board, and the IRB No. 02033/H4.8.4.5.31/PP36-KOMETIK/2016) was obtained on August 13th, 2016.

A total sample size of 90 subjects diagnosed with ovarian cysts underwent cystectomy by laparoscopy. Eligible criteria for ovarian cysts are either unilateral/bilateral in location, sized either below 5 cm/above 5 cm, and not showing any malignancy by clinical examination and ultrasonography. Participants were randomly divided into two groups based on cautery and suturing techniques used in hemostasis procedure during surgery, 45 participants in each group. Cystectomy was performed by removing cyst walls from the surrounding tissue and managing any tissue bleeding afterward using either two methods. Electrocautery or thermal cautery is performed by passing direct or alternating current through wire electrode to generate heat, which causes hemostasis to active bleeding sites. The authors used bipolar cautery by Olympus™ UES-40, 40-watt setting, suturing device by Olympus™ needle holder and suture material by V-Loc™ 90 Absorbable Device 3-0. Serum AMH level was examined in all the participants both preoperatively and 1-month postoperatively, by drawing blood samples from the ventral part of the cubital fossa region,

regardless of menstrual cycle dates. Blood samples were taken to Prodia Laboratory, Makassar, in no longer than 1 h and examined using enzyme-linked immunosorbent assay.

Serum AMH levels obtained were statistically analyzed and compared between cautery and suturing groups by Chi-square and Student's *t*-test using SPSS 20 (IBM Corporation, New York, USA) for Windows computer software. All values were described as mean ± standard deviation and categorical variables were presented as percentage. *P* < 0.05 was considered statistically significant. Any patient who was not willing to give consent to this study or those who lost to follow-up were excluded from the study.

RESULTS

Tables 1 and 2 show that most patients who underwent cauterization technique are from 20 to 40 years age group (93.3%), had high school education (48.9%), and are married (88.9%) with zero parity (46.6%). Patients' cyst types are mostly endometriosis (77.8%), which located unilateral (71.1%), in size of 5–10 cm (64.4%), and without adhesion (60%). Patients who underwent suturing technique are mostly from 20 to 40 years age group (95.6%), had high school education (55.6%), and are married (84.4%) with zero

Table 1: Sample distribution characteristics

Sample characteristics	n (%)
Age group (years)	
20-40	85 (94.4)
>40	5 (5.6)
Education	
Junior high school	11 (12.2)
High school	47 (52.2)
University	32 (35.6)
Marital Status	
Married	78 (86.7)
Single	12 (13.3)
Parity	
0	40 (44.4)
1	28 (31.1)
≥2	22 (24.5)
Cyst location	
Unilateral	64 (71.1)
Bilateral	26 (28.9)
Cyst type	
Endometriosis	66 (73.3)
Simple	24 (26.7)
Cyst size (cm)	
<5	44 (48.9)
5-10	46 (51.1)
Adhesion	
Yes	31 (34.4)
No	59 (65.6)

parity (42.2%). Mostly, the cysts consist of endometriosis cyst type (68.9%) which located unilateral (71.1%), have size <5–10 cm (66.7%), and found a presence of adhesion (57.8%).

There is no difference in samples' characteristics according to age group, education level, marital status, parity, cyst location, type, and presence of adhesion between cauterization and suturing groups.

Table 3 shows that in cauterization procedure group, the mean of preoperative AMH is 4.09 ± 2.95 and postoperative is 3.30 ± 2.49 . In suturing procedure group, the mean of preoperative AMH is 4.48 ± 2.64 and postoperative is 4.10 ± 2.58 . The mean change of AMH level in cauterization group is 1.13 ± 0.34 while in suturing technique is 1.02 ± 0.15 .

Table 2: Sample characteristics by technique

Characteristic	Technique		Total	P
	Cautery	Suture		
Age group, years				
20-40	42 (93.3)	43 (95.6)	85 (94.4)	1.055
>40	3 (6.7)	2 (4.4)	5 (5.6)	
Education				
Junior high	5 (11.1)	6 (13.3)	11 (12.2)	0.676
High school	22 (48.9)	25 (55.6)	47 (52.2)	
University	18 (40.0)	14 (31.1)	32 (35.6)	
Marital status				
Married	40 (88.9)	38 (84.4)	78 (86.7)	0.535
Single	5 (11.1)	7 (15.6)	12 (13.3)	
Parity				
0	21 (46.6)	19 (42.2)	40 (44.4)	0.423
1	12 (26.7)	16 (35.6)	28 (31.1)	
≥2	12 (26.7)	10 (22.2)	22 (24.5)	
Cyst location				
Unilateral	32 (71.1)	32 (71.1)	64 (71.1)	1.000
Bilateral	13 (28.9)	13 (28.9)	26 (28.9)	
Cyst type				
Endometriosis	35 (77.8)	31 (68.9)	66 (73.3)	0.320
Simple	10 (22.2)	14 (31.1)	24 (26.7)	
Cyst size (cm)				
<5	16 (35.6)	15 (33.3)	31 (34.4)	0.824
5-10	29 (64.4)	30 (66.7)	59 (65.6)	
Adhesion				
Yes	18 (40.0)	26 (57.8)	44 (48.9)	0.092
No	27 (60.0)	19 (42.2)	46 (51.1)	

^aValue given as number (%)

Based on statistical analysis, *t*-independent test shows $P = 0.051$, confidence interval (CI) 95%, which stated that there is no significant difference of AMH level from cauterization group compared to suturing group. Statistical analysis using paired *t*-test showed that *P* values in cauterization and suturing cyst groups were 0.021 and 0.043, respectively. These results show that there is a significant difference in AMH level from samples before and after operative procedure in both operation technique groups.

Table 4 explains that in endometriosis cyst type, the mean of preoperative AMH is 3.73 ± 2.56 and postoperative is 3.15 ± 2.27 . In simple cyst group, the mean of preoperative AMH is 5.82 ± 2.88 while postoperative is 5.22 ± 2.73 . Statistical analysis using paired *t*-test showed that *P* values in endometriosis and simple cyst group were 0.046 and 0.031, respectively, with CI 95%. These results show that there are significant differences in AMH level from samples before and after operative procedure in both endometriosis and simple cyst groups.

Table 5 shows data of cyst location, cyst type, and size found during laparoscopy and also the presence of adhesion and their comparison with AMH changes. From statistical analysis using independent *t*-test, it is found that $P < 0.05$ applies for endometriosis type cyst and the presence of adhesion, meaning that there is a significant change of AMH level in those groups, between cauterization and suturing groups. However, in unilateral–bilateral cyst location, simple cyst without adhesion, and cyst size groups, although AMH level has a larger decrease in cauterization group, comparison of cauterization and suturing technique found no significant AMH level change.

DISCUSSION

AMH level examined after cystectomy shows a significant decrease on both cauterization and suturing groups, regardless of initial value of preoperative AMH. However, after the mean decrease value from cauterization and suturing groups was statistically compared, no significant difference was found ($P = 0.051$). This result shows different outcomes compared to a study by Zhang *et al.*, who reported the use of an ultrasonic scalpel or bipolar cauterization hemostasis associated with significant decrease in AMH as compared to suture technique. Cauterization as a part of hemostatic

Table 3: Difference of pre- and postoperative anti-Mullerian hormone level according to the operation technique

Technique	Duration	AMH (ng/ml) ^a	P	AMH changes (ng/ml) ^a	P
Cautery	Preoperative	4.09 ± 2.95	0.021	1.13 ± 0.34	0.051
	Postoperative	3.30 ± 2.49			
Suturing	Preoperative	4.48 ± 2.64	0.043	1.02 ± 0.15	
	Postoperative	4.10 ± 2.58			

^aValue given as mean±SD. SD: Standard deviation, AMH: Anti-Mullerian hormone

Table 4: Difference of pre- and postoperative anti-Mullerian hormone level according to the cyst type

Cyst type	Duration	AMH (ng/ml) ^a	P
Endometriosis	Preoperative	3.73±2.56	0.046
	Postoperative	3.15±2.27	
Simple	Preoperative	5.83±2.88	0.031
	Postoperative	5.22±2.73	

^aValue given as mean±SD. AMH: Anti-Mullerian hormone, SD: Standard deviation

Table 5: Changes of anti-Mullerian hormone level according to the cyst location, cyst type, presence of adhesion, and cyst size

Cyst	Cautery		Suturing		P
	n	AMH changes (ng/ml) ^a	n	AMH changes (ng/ml) ^a	
Location					
Unilateral	32	1.13±0.34	32	1.00±0.00	0.074
Bilateral	13	1.15±0.38	13	1.08±0.28	0.558
Type					
Endometriosis	35	1.17±0.38	31	1.03±0.18	0.040
Simple	10	1.00±0.00	14	1.00±0.00	-
Adhesion					
Yes	16	1.13±0.34	15	1.07±0.26	0.048
No	29	1.04±0.35	30	1.00±0.00	0.153
Size (cm)					
<5	18	1.22±0.43	26	1.00±0.00	0.072
5-10	27	1.07±0.27	19	1.05±0.23	0.778

^aValue given as mean±SD; n: Number of participants. AMH: Anti-Mullerian hormone, SD: Standard deviation

procedure using heat energy will cease not only bleeding from the target vessel but also damaging the surrounding tissue. As ovarian tissue is densely populated with healthy follicle cells, the heat energy will damage those cells and will be represented by decreasing AMH value.^[6]

Table 3 shows that AMH level is generally lower in endometriosis cyst groups whether before and after operative procedure. According to Shebl *et al.*, endometriosis causes disruption of the amount and function of granulosa cells, produce oxidative stress which eventually lower the quality of oocyte, making the AMH level expressed in patients with endometriosis cyst is generally lower than other cyst types.^[7]

Raffi *et al.* found that preoperative AMH levels of 3.1 ng/ml or greater showed a significant postoperative fall in serum AMH and suggested a negative impact of cyst wall excision of endometrioma as evidenced by significant postoperative fall in circulating AMH.^[8] This damage during excision was explained by Roman *et al.*, which stated that there are no clear boundaries histologically between the cyst wall and ovarian cortex. Any excision procedure could lead to the damage of ovarian cortex and reduce the number of

primordial cells.^[9] This is also confirmed by Kitajima *et al.*, who indicated the presence of normal ovarian tissue in the enucleated cyst as a significant factor influencing the rate of serum AMH decline.^[10] These previous studies support the result that samples from suturing hemostasis group also have significant decrease in AMH, as cystectomy procedure itself could removes healthy ovarian tissues regardless which hemostasis technique used.

The growing awareness that ovarian cyst stripping may be harmful to ovarian reserve has boosted the research on the identification of the most adequate surgical technique for the treatment of these cysts. Two randomized clinical trials and a meta-analysis showed that the stripping procedure was much more effective in improving pain, enhancing spontaneous pregnancy rate, and reducing disease recurrences. On the other hand, some evidence indicated that cyst drainage and vaporization or thermal coagulation may be less harmful to ovarian reserve.^[11]

Donnez *et al.* proposed a mixed technique consisting of the excision of a large part (80%–90%) of the cyst with stripping technique and subsequently, when approaching the functional part of ovarian tissue at the hilus, continued with the resection of the remaining tissue. After this partial cystectomy, carbon dioxide laser is used to vaporize the remaining 10%–20% of the cyst wall. As a result of no significant difference between cautery and suturing method in this study, many experts view that suturing was not only time-consuming but also needed special training. If cautery is preferable method, it should be used only on bleeding points and avoid excessive heat by setting minimal energy and water irrigation on tissues after heat exposure.^[12]

As many studies addressing surgical approach to treat ovarian cysts consistently support surgery-related damage to ovarian reserve, larger cohort studies aimed at clarifying risk factors for the damage are needed. A better understanding of mechanisms causing the damage and a longer follow-up period are required so that damage prevention by innovative surgical technique can be achieved.

Conclusion

This study showed that serum AMH levels clearly decreased after operative laparoscopy for different types of ovarian cysts in female patients; however, there is no significant difference regardless of surgical haemostatic procedures performed.

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Conflicts of interest

There are no conflicts of interest.

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