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Original Research Article

IMPACT OF SURGICAL EXCISION ON OVARIAN RESERVE IN WOMEN WITH ENDOMETRIOSIS: A PROSPECTIVE COHORT STUDY

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ABSTRACT

Background
This study investigates the impact of surgically treated endometriosis and endometriomas on ovarian reserve in women experiencing infertility and pelvic pain.

Methods
The cohort consisted of 58 women with endometriosis or endometriomas, categorized into those with peritoneal disease and those without based on surgical findings. Anti-Mullerian hormone levels were assessed before, after, and six months post-surgery to determine ovarian reserve.

Results
The study found a significant difference in baseline anti-Mullerian hormone levels between endometrioma and negative laparoscopy groups (1.8 ng/mL vs. 3.2 ng/mL, 95% confidence interval, 2.0-4.4 ng/mL).

Conclusion
Baseline anti-Mullerian hormone levels were lower in women with endometriomas compared to those without endometriosis, and surgical excision led to a temporary decrease in ovarian reserve. Furthermore, patients with bilateral endometriomas experienced a higher rate of decline compared to those without bilateral involvement. These findings highlight the impact of

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endometriomas on ovarian reserve and suggest a need for careful consideration in the management of women with endometriosis and fertility concerns.
Keywords: Infertility, ovarian reserve, Endometriosis, endometrioma.

INTRODUCTION

Endometriosis is a prevalent condition in reproductive-aged women, often characterized by asymptomatic cases or manifested through pain and infertility[1]. The empirical link between endometriosis and infertility remains to be firmly established. Surgical removal of endometriotic tissue is often necessary for couples seeking conception, as hormonal suppression methods can interfere with fertility. One specific manifestation of endometriosis is the development of ovarian cysts known as endometriomas[2]. The presence of endometriomas can potentially impact ovarian reserve, affecting fertility. The decision to perform complete cystectomy, although associated with a low recurrence rate, raises concerns about potential damage to healthy ovarian tissue and subsequent reduction in ovarian reserve[3]. This dilemma sparks controversy in the medical community regarding the optimal approach to endometrial removal for fertility reasons. Despite the high incidence of endometriosis in women of reproductive age, the condition's varied presentation and its potential implications for fertility make it a complex subject[4-6]. This study delves into the relationship between endometriosis, particularly endometriomas, and ovarian reserve, aiming to contribute valuable insights to the ongoing debate surrounding the surgical management of endometriosis for fertility purposes.

MATERIALS & METHODS

This prospective cohort study received approval from the Clinic Institutional Review Board, with written informed consent obtained from all participating patients. The research focused on consecutively recruited laparoscopic surgery patients seeking treatment for pelvic pain and/or infertility. Patients diagnosed with endometriomas underwent the removal of ovarian cysts based on preoperative ultrasonography. Surgical treatment was also offered to control arm patients with suspected endometriosis experiencing pelvic pain and/or infertility. Patients with a history of previous ovarian surgery were excluded from participation[7]. The laparoscopic surgeries were performed by three highly experienced reproductive surgeons specialized in endometriosis laparoscopic procedures. Complete removal of endometriomas involved injecting a diluted vasopressin solution into the ovary cortex and cyst wall for hemostasis and surgical planning. Cystectomy was then carried out through blunt and sharp dissection, traction, and counterattraction over the endometrium incision[8]. Suturing was not employed for repairing ovarian defects, with hemostasis achieved using electrosurgical energy and additional hemostatic agents as necessary. Intraoperative histological examinations were conducted to confirm the presence of endometriomas. The control group was divided into two arms based on surgical findings. The first arm included participants with pelvic peritoneal endometriosis, confirmed by laparoscopic and histological examinations following the criteria of the American Society of Reproductive Medicine[9]. The second arm comprised individuals with no evidence of

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endometriosis by either laparoscopic or histological examination. Serum anti-Mullerian hormone (AMH) levels were measured at baseline and every six months for the subsequent six months. The outcome of the surgery was influenced by factors such as the location and size of the endometriomas.

Ovarian reserve measured by AMH

AMH baseline values were determined by collecting venous blood samples during the preoperative appointment or immediately before surgery [10]. AMH values were collected approximately one month after surgery during a postoperative visit. Six months after surgery, one more blood sample was taken. Upon defrosting samples at 70°C, serum extracts were extracted. A batch-by-batch analysis was performed on the samples. There was a detection of up to 1.2 pg per mL. An AMH test has an inter-assay variation of 3.7% and an intra-assay variation of 4.5%.

Statistical methods

Results were compared quantitatively with demographic data. Comparing parametric continuous data with Student's t-tests and proportions with Chi-square tests was performed when appropriate. Data with non-normal distributions were defined by using medians and interquartile ranges. The AMH values of women with endometriomas and those without endometriomas were compared using an analysis of variance. AMH values were compared preoperatively and postoperatively using the Wilcoxon signed rank test. According to their bilaterally or unilaterally, endometriomas were divided into subgroups. AMH decline was assessed using a percent-based approach. The AMH decline 6 months after surgery was identified by linear regression analysis of patient and surgical outcome characteristics. The statistical significance level was 0.05.

Sample size justification

AMH levels declined over a 6-month period to determine the sample size for this study. A paired t-test was used to power the following analysis at a significance level of 5%. If both groups had AMH levels differing by 1ng/mL, 80% power would be achieved.

RESULTS

58 percent of the study population had endometriomas and 58 percent had controls. A total of 52/58 patients with endometrioma also had pelvic peritoneal disease at surgery (89.6%). In the control group, patients who had or did not have any peritoneal endometriosis after surgery were divided into those who had or did not have any peritoneal endometriosis. Laparoscopic screening revealed no endometriosis in eight cases, fibrosis and/or chronic inflammation in 12 cases, adhesions disease in six cases, and pelvic inflammation in three cases. Age, body mass index, indications for surgery, parity, smoking status, or history of surgery or oral contraception were not different between those with endometrioma and those without. The groups without

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endometriosis or those with peritoneal endometriosis did not differ from the control groups. The control group of white women was significantly more numerous (Table 1) than the endometrioma group of white women. When AMH values were calculated at baseline, they were correlated with age alone (P <.001).

Table 1: Detailed demographic information

Variable	Endometrioma (n=29)	Control (n=29)	*P* value
Age	64.1	60.5	0.10
BMI, kg/m2	25.4 ± 5.3	24.8 ± 7.0	.94
Surgical indications, n (%)	-	-	.57
Pain in the pelvis	16	14	-
Fertility	2	3	-
Both	11	12	-
Population (Nulliparous)	24	20	.09
Smokers	1	3	.27
Laparoscopy history, n (%)	10	14	.09
Contraceptive pills currently available	2	4	.34
A recent release of gonadotropins	1	3	.49

There was no change in this difference after one and six months. AMH values were significantly lower at one and six months among women with endometriosis compared to those with endometriomas, although baseline values were similar (P* 0.03). AMH values were similar at 1 and 6 months for subjects with and without pelvic peritoneal endometriosis (P = 0.16 and 0.59, respectively). Negative groups had significantly shorter surgical times (71.1 31.2 minutes vs. 88.8 48.4 minutes) than those with endometrioma or pelvic peritoneal endometriosis. The hemostatic agent used by groups did not differ (P .09). Twenty-nine women (38%) had early or late stages of pelvic peritoneal endometriosis, 3 (41%), stages III and IV, and 3 stages IV. At the posterior end of the overy, there was an obliterated culdesac caused by dense adhesions. Bowel or bladder involvement was not present in any of the patients. Endome-triome women presented with 13 cases of stage III disease, compared to 20 women with stage IV disease (71%) in the endometriome group. According to the regression model, pelvic peritoneal endometriosis is not related to stage. As a result, there was a 48% reduction and a 28% reduction, respectively.

One patient had three endometriomas, and 2 had four or more. One month, six months, and baseline differences between bilateral and unilateral endometriomas were significant. The 95 percent confidence interval ranges from 36.41 to 70.5 percent when it comes to bilateral endometriomas removed one month after diagnosis.

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Table 2: Anti-Mullerian hormone and endometrioma

Variable	Endometrioma (n=29), mg/mLa	Control (n=29), mg/mL	P value
Baseline	1.77	2.75	.05
1 Month	1.12	2.86	<.01
6 Month	1.41	2.93	<.01

The mean diameter of the 20 endome-trinoma specimens was 4.9 cm. A total of 20 endome-trinoma specimens were removed. 13 individuals with at least one endometrioma greater than five centimeters (38.3%) had a diameter of at least five centimeters; however, baseline AMH values did not differ from those with endometriomas smaller than five centimeters This is compared to 1.89ng/mL [95% CI, 0.89 to 2.89], 1.72ng/mL (P = 0.77). In both 1 month (r 0.17; P.003) and 6 month (r 0.49; P.004) studies, AMH decline rates were correlated with endometrial size after removal. Surgical duration, hemostatic agents used, or laterality did not affect AMH decline rates (r 0.17; P .22), r 0.07; P .62), or r 0.35; P .06). AMH baseline levels were negatively correlated with decline rates at 1 and 6 months (r140.33 and r140.32), respectively.

Regression analysis

AMH values were statistically associated with age in a model assessed for confounding factors (P>.01). There was no significant association between AMH values and pelvic pain, infertility history, orlistat usage, or use of gonadotrophin-releasing hormone agonists. Age, diagnosis, and previous hormonal treatment were taken into consideration when assessing AMH at 1 month following endometrioma diagnosis. Study participants found there was no significant relationship between AMH declines and factors at 6 months.

Table 3: Anti-Mullerian hormone were present in addition to pelvic peritoneal endometriosis.

Variables	Endometrioma (n ¼ 58), mg/mL	Pelvic peritoneal endometriosis (n ¼ 58), mg/mLa	No endometriosis (n ¼ 58), mg/mLa	P value
Baseline	1.77 (1.18e2.37)	2.29 (1.34e3.25)	3.20 (1.96e4.43)	.06
1 Month	1.12(0.81e1.45)<.01	2.38(1.26e3.50).41	3.22(2.04e4.49).78	<.01
6 Month	1.41 (0.97e1.85).22	2.76(1.58e3.95).12	3.14(1.83e4.43).67	.01

DISCUSSION

The study presents a comprehensive evaluation of ovarian reserve in women with endometriomas and peritoneal endometriosis undergoing laparoscopic cystectomy[11]. The findings reveal a substantial reduction in baseline Anti-Mullerian Hormone (AMH) levels for women with endometriomas, indicating potential adverse effects on ovarian reserve.

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Additionally, women with peritoneal endometriosis also experienced a significant reduction in baseline AMH levels, albeit to a lesser extent compared to those with endometriomas. Notably, the study underscores the challenging decision-making process regarding surgical interventions for endometriomas, as cystectomy appears to result in decreased ovarian reserve. The observed decline in AMH levels following endometrioma cystectomy suggests a potential impact on fertility, raising concerns about the overall effectiveness of the procedure in preserving ovarian function[12-16]. The temporal dynamics of ovarian reserve recovery post-cystectomy are highlighted, with a significant decline in AMH levels observed at one month after surgery. However, encouragingly, ovarian reserve appears to partially recover within six to twelve months post-cystectomy[17]. This nuanced understanding of the recovery trajectory is crucial for informing clinicians and patients about the potential short-term impact on ovarian reserve. The study further explores variations in the impact of cystectomy based on factors such as the laterality of endometriomas and their diameters. Bilateral endometriomas are associated with a higher rate of AMH decline compared to unilateral cases, emphasizing the need for tailored approaches in the management of different presentations of endometriosis. The correlation between AMH decline and endometrioma diameters suggests that the size of the cyst may influence the extent of ovarian reserve reduction. The discussion also touches upon the potential mechanisms underlying the observed decline in ovarian reserve after cystectomy. Hemostatic efforts during cyst removal and the inadvertent removal of healthy ovarian tissue are considered potential contributors to the decline. The study's focus on evaluating AMH as a marker for ovarian reserve is acknowledged, emphasizing its clinical relevance in assessing the impact of surgical interventions on fertility.

CONCLUSION

In conclusion, the study contributes valuable insights into the complex relationship between endometriomas, peritoneal endometriosis, and ovarian reserve. The findings prompt a reconsideration of the risks and benefits associated with cystectomy, urging the need for further randomized controlled trials to guide optimal management strategies for women with endometriotic cysts.

CONFLICT OF INTEREST

Nil

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