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Comparing the Effect of Hysterectomy with and without Salpingectomy on Preserving Ovarian Reserve

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ABSTRACT

Background and Objective: Ovarian cancer has the highest mortality rate among all types of women's cancers. Several malignancies currently classified as ovarian cancer may arise in the fallopian tube epithelium. Therefore, prophylactic removal of the tubes may result in a reduced risk of malignancy. Salpingectomy appears to reduce ovarian reserve, although some studies have suggested otherwise. The aim of this study is to investigate the effect of prophylactic salpingectomy on ovarian reserve.

Methods: This single-blind clinical trial was conducted on 53 women of reproductive age (<45 years) with FSH<10 who were candidates for abdominal hysterectomy with ovarian preservation and referred to Rouhani Hospital in Babol in 2020 and 2021. One group of patients underwent abdominal hysterectomy with ovarian preservation and simultaneous salpingectomy (27 patients) and the other group underwent no salpingectomy (26 patients). Ovarian volume and antral follicle count were measured by ultrasound, while FSH and AMH levels were measured in the laboratory before and three months after surgery and were compared.

Findings: According to the results, FSH significantly increased three months after surgery compared to before surgery in all patients and in both groups ($p<0.001$), but AMH, antral follicle count, and ovarian volume showed a significant decrease ($p<0.001$). There was no statistically significant difference between the two study groups in terms of mean FSH, AMH, ovarian follicle count, and ovarian volume three months after surgery.

Conclusion: Our results showed that decreased ovarian function after surgery was not associated with salpingectomy. Therefore, prophylactic salpingectomy can be recommended to prevent ovarian cancer.

Keywords: *Hysterectomy, Salpingectomy, Ovarian Reserve.*

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Introduction

Hysterectomy (surgical removal of the uterus) is the second major surgical procedure (after cesarean section) performed on women. Indications for hysterectomy include leiomyoma, abnormal uterine bleeding, pelvic organ prolapse, pelvic pain or infection (e.g., endometriosis and pelvic inflammatory disease), and malignant and premalignant disease (1). Ovarian cancer has the highest mortality rate among all types of women's cancers and is the fifth leading cause of cancer death in women. Invasive epithelial ovarian cancer accounts for at least 90% of all ovarian cancer cases and is responsible for 90% of ovarian cancer deaths. Opportunistic salpingectomy is increasing in gynecologic surgeries for benign causes (2). According to a survey by the American College of Obstetricians and Gynecologists, bilateral salpingectomy is performed in 77% of cases along with hysterectomy for benign indications (3). The rationale for this approach is that salpingectomy greatly reduces the risk of cancer and the need for future reoperation. Removal of the fallopian tubes in a patient at risk for ovarian cancer is called risk-reducing salpingectomy. Many malignancies currently classified as ovarian cancers may arise in the fallopian tube epithelium, so prophylactic removal of the fallopian tubes in patients undergoing hysterectomy for benign reasons may result in a reduced risk of malignancy (4).

In one study, women who underwent bilateral salpingectomy had a 65% reduced risk of ovarian cancer, and women who had tubal ligation had a 28% reduced risk of cancer compared with women who had no procedure (5). Several studies have been conducted on the effect of opportunistic salpingectomy on ovarian function, but overall, the results have been inconclusive. A systematic review conducted to examine the effect of prophylactic salpingectomy on ovarian reserve concluded that salpingectomy had no effect on ovarian function in the short term, but suggested that further studies be conducted to determine the long-term effect (6). A prospective cohort study in 2024 that examined ovarian reserve after salpingectomy concluded that salpingectomy had no effect on ovarian reserve in the short term (7). Another study concluded that bilateral salpingectomy does not impair ovarian reserve (8). A randomized controlled trial was conducted to investigate ovarian reserve after hysterectomy with bilateral salpingectomy, which ultimately showed that it did not have a negative effect on ovarian reserve (9). On the other hand, a meta-analysis to investigate the effect of opportunistic salpingectomy on ovarian function stated that this result is not definitive, but it seems that patients who underwent salpingectomy had a reduced level of ovarian reserve (10). Furthermore, a study investigating the effect of simultaneous salpingectomy during hysterectomy on ovarian reserve concluded that salpingectomy compromises ovarian reserve and that the damage is greater in younger patients (11). Given these contradictory results, we decided to conduct a study to investigate the effect of prophylactic salpingectomy on ovarian reserve. If, based on this research, we conclude that prophylactic salpingectomy has no effect on ovarian reserve, salpingectomy at the time of hysterectomy can be considered to prevent ovarian cancer.

Methods

After approval by the Ethics Committee of Babol University of Medical Sciences with the code IR.MUBABOL.REC.1400.216 and registration in the Iranian Registry of Clinical Trials with the code IRCT20210911052439N1, this randomized single-blind clinical trial was conducted on 60 women of reproductive age who were candidates for abdominal hysterectomy with ovary preservation for benign reasons and referred to Ayatollah Rouhani Babol Medical Center in 2020 and 2021. Women of reproductive age (>45 years old) who were candidates for abdominal hysterectomy with ovary preservation for benign reasons were included in the study and were excluded if they had a history of genital and breast malignancy,

a history of oligomenorrhea, FSH greater than 10 units, the presence of ovarian cysts, and a history of taking hormonal drugs or OCPs within two months before surgery. Among the eligible women, 60 patients were randomly selected in blocks of six using computer-generated randomization, and were divided into two groups of 30. Written informed consent was obtained from all patients. Patient information remained confidential.

All patients underwent ultrasound (Samsung WS80, GE E8, and Mindray DC8 ultrasound devices) by a radiologist before surgery to examine the volume and antral follicles of the ovary. FSH and AMH levels were also measured by quantitative luminescence method using Abbott's diagnostics device in a single laboratory. Surgery was performed by an experienced team including obstetricians and gynecologists from Babol University of Medical Sciences. One group of patients underwent abdominal hysterectomy with preservation of one or both ovaries and simultaneous salpingectomy, and the other group underwent abdominal hysterectomy with preservation of one or both ovaries and without salpingectomy. The tests and ultrasound were repeated three months later. In the analysis, we used the number and percentage to express qualitative data, and the mean and standard deviation to express quantitative data that were normal, and the median and interquartile range to express quantitative data that were abnormal. We used the Kolmogorov-Smirnov test to check the normality of the data. Wilcoxon test was used to compare the values of study variables before and after surgery. We also used the Mann Whitney U test to compare the values of study variables before and after surgery between study groups. $P<0.05$ was considered significant.

Results

Of the 60 patients who entered the study, 7 were excluded from the study due to not referring for follow-up. 53 patients completed the study. 26 patients (49.1%) were in the no-salpingectomy group and 27 (50.9%) were in the salpingectomy group. The mean age of the patients was 41.67±2.90 years, with no statistically significant difference between the study groups (41.76±2.56 years for the no-salpingectomy group and 41.59±3.24 years for the salpingectomy group). Based on the results of Fisher's exact test, there was no statistically significant difference between the patients in the two study groups in terms of the number of pregnancies. Based on the Kolmogorov-Smirnov test, the values of AMH, FSH, follicle count, and ovarian volume before and after the operation were not normally distributed, and therefore, non-parametric tests were used to analyze these data ($p<0.001$).

According to the Mann Whitney U Test, serum FSH, AMH levels, antral follicle count, and ovarian volume did not differ significantly between the study groups before surgery (Table 1). According to the Wilcoxon signed-rank test, serum FSH, AMH levels, ovarian volume, and follicle count were significantly different three months after surgery compared to before surgery in all patients and in both groups (Table 2). According to the Mann Whitney U Test results, there was no statistically significant difference between the study groups in terms of the changes in serum FSH, AMH levels, follicle count, and ovarian volume three months after surgery compared to before surgery (Table 3).

Table 1. AMH, FSH values, follicle count, and ovarian volume before surgery in the study groups

Variable	All patients (n=53) Median (interquartile range)	Without salpingectomy (n=26) Median (interquartile range)	With salpingectomy (n=27) Median (interquartile range)	p-value*
FSH (IU/L)	3.70 (4.46)	3.60 (5.77)	3.80 (3.00)	0.749
AMH (ng/mL)	0.40 (1.55)	0.40 (0.80)	0.30 (1.70)	0.851
Follicle count	1.00 (1.75)	2.00 (2.00)	1.00 (1.00)	0.767
Ovarian volume (ml)	6.00 (3.50)	6.00 (4.25)	6.00 (3.00)	0.385

*Mann Whitney U Test

Table 2. Comparison of serum levels of FSH and AMH, follicle count, and ovarian volume before and after surgery

Variable	All patients (n=53)	Without salpingectomy (n=26)	With salpingectomy (n=27)
FSH (IU/L), median (interquartile range)			
Before the operation	3.70 (4.46)	3.60 (5.77)	3.80 (3.00)
After the operation	10.70 (9.93)	12.00 (13.60)	10.00 (4.90)
p-value*	<0.001	<0.001	<0.001
AMH (ng/mL), median (interquartile range)			
Before the operation	0.40 (1.55)	0.40 (0.80)	0.30 (1.70)
After the operation	0.10 (0.67)	0.10 (0.68)	0.10 (1.07)
p-value*	< 0.001	< 0.001	0.001
Ovarian follicle count, Mean±SD			
Before the operation	1.90±1.30	1.88±1.16	1.92±1.43
After the operation	1.21±1.01	1.28±1.02	1.14±1.02
p-value*	<0.001	0.008	0.001
Ovarian volume (ml), median (interquartile range)			
Before the operation	6.00 (3.50)	6.00 (4.25)	6.00 (3.00)
After the operation	5.00 (2.50)	5.70 (2.25)	5.00 (3.50)
p-value*	<0.001	<0.001	0.005

*Wilcoxon Signed Ranks Test

Table 3. Comparison of the change in serum levels of FSH and AMH, follicle count, and ovarian volume three months after surgery compared to before surgery between the two study groups

Variable	Without salpingectomy (n=26) Median (interquartile range)	With salpingectomy (n=27) Median (interquartile range)	p-value*
FSH (IU/L)	6.96 (9.59)	5.00 (6.80)	0.071
AMH (ng/mL)	0.20 (0.50)	0.28 (0.89)	0.898
Follicle count	1.00 (1.00)	1.00 (1.00)	0.957
Ovarian volume (ml)	1.50 (1.55)	1.00 (2.00)	0.163

*Mann Whitney U Test

Discussion

In this study, FSH significantly increased three months after surgery compared to before surgery in all patients and in both groups, and AMH, antral follicle count, and ovarian volume significantly decreased. No statistically significant differences were observed between the study groups in terms of mean FSH, AMH, ovarian follicle count, and ovarian volume three months after surgery. The results of our study are consistent with several studies conducted in this area. In their meta-analysis, Kobayashi et al. observed that in case-control studies, patients who underwent salpingectomy (unilateral, bilateral, and total) had lower AMH and AFC levels compared to patients who did not undergo surgery (10). However, a number of clinical trials have reported different results. Wang et al. (8) conducted a study to investigate the effect of prophylactic bilateral salpingectomy on ovarian reserve in patients undergoing laparoscopic hysterectomy. In their study, AMH, FSH, LH, estradiol (E2), and AFC were assessed before surgery and three and nine months after surgery. There was no statistically significant difference between the two groups in terms of

AMH, E2, FSH, LH, and AFC at three and nine months after surgery. Therefore, they concluded that prophylactic bilateral salpingectomy does not harm the ovarian reserve of women of reproductive age who have undergone laparoscopic hysterectomy. In another study by Asgari et al. (9), the effect of bilateral salpingectomy on surgical outcome and ovarian reserve was assessed using serum levels of anti-Müllerian hormone (AMH) and follicle-stimulating hormone (FSH) before and three months after surgery. At three-month follow-up, postoperative AMH levels were significantly lower and FSH levels were significantly higher in both groups compared to before surgery, but there was no significant difference between the study groups. In another study conducted by Song et al. (12), the amount of AMH reduction three months after the operation was 18.6% in the salpingectomy group and 10.4% in the non-salpingectomy group, which did not reveal a statistically significant difference. In another study conducted by Song et al. (13), in both groups with and without salpingectomy, postoperative AMH levels were significantly lower than preoperative AMH levels, but there was no difference between the two groups. The results of the mentioned studies are in line with our findings, which means that prophylactic salpingectomy during laparoscopic hysterectomy is not associated with negative effects on ovarian reserve.

However, different results were obtained in a study by Ye et al. (14). In their study, a number of patients who at least two years had passed since their salpingectomy were compared with a control group that had not undergone any surgery. The mean AMH level was significantly higher in women who did not undergo any surgery compared to women who had bilateral salpingectomy, and the mean FSH level was significantly lower in women without surgery compared to women who had bilateral salpingectomy. They concluded that salpingectomy is associated with decreased ovarian reserve. Perhaps the reason for the difference in findings was the follow-up period of patients after salpingectomy surgery. Most of the mentioned studies had a maximum follow-up period of three months after the operation, but considering that ovarian function after hysterectomy alone (without salpingectomy) can remain without reduction for six months or even later (14), it can be expected that salpingectomy will also show its effect on the decrease of ovarian function in a longer follow-up period. Therefore, conducting similar studies with a longer follow-up period may reveal other findings. The small sample size is one of the limitations of the research. The main reason for the small sample size was that the study was carried out during the COVID-19 pandemic. Although the majority of studies have considered the three-month follow-up period to be sufficient to investigate the effect of surgery on ovarian reserve, it seems that if the follow-up period is extended to nine months or one year, different results may be obtained. It is recommended to conduct a similar study with a larger sample size and a longer follow-up period.

The results of this study showed that FSH level increased and AMH and ovarian reserve decreased in both studied groups. These findings indicate a significant decrease in ovarian function after surgery. It seems that this decrease is due to hysterectomy and performing salpingectomy has not shown a significant relationship with this performance. These results show that prophylactic salpingectomy can be recommended to prevent ovarian cancer.

Conflict of interest: The authors declare that they have no competing interests.

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