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# Original Research Paper
# IMPACT OF OPEN CYSTECTOMY TO LAPAROSCOPIC CYSTECTOMY IN INDIAN FEMALES

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## ABSTRACT

**Background:** ovarian cysts are frequently discovered in reproductive females. For ovarian cystectomy, treating them using a laparoscopic cystectomy rather than a laparotomy is becoming more common.

**Aim**: The current clinical investigation set out to evaluate, in comparison, how open ovarian cystectomy and laparoscopic cystectomy affected the parameters of ovarian reserve in female Indian patients.

**Methods**: In the current study, 80 women in the reproductive age range of 18 to 36 years who had benign ovarian cysts were evaluated. Forty of the female individuals had an open ovarian cystectomy, whereas the remaining forty received a laparoscopic procedure. FSH (follicular stimulating hormone), AFC (anterral folicle count), and AMH (anti-Müllerian hormone) levels were measured in all participants both preoperatively and three months after surgery.
**Results:** Serum AMH levels significantly decreased in both the laparoscopic and open ovarian cystectomy groups three months after surgery. Three months following surgery, the AFC levels significantly increased in both the laparoscopic and open ovarian cystectomy groups. Nonetheless, there was no discernible variation in the FSH levels between the two research groups' preoperative and three-month postoperative values.

**Conclusion**: The study reveals that neither the open nor the laparoscopic technique to ovarian cystectomy causes a postoperative change in ovarian reserve.

Keywords: Ovarian cystectomy, laparoscopic cystectomy, ovarian reserve, antral follicular count

## INTRODUCTION

In females of reproductive age, mucinous or serous cystadenomas, mature cystic teratomas, and/or endometriomas consisting of benign ovarian cysts are often seen abnormalities. It has been estimated that around 7% of women worldwide may experience at least one asymptomatic ovarian cyst over their lifetime.1. Simple or functioning ovarian cysts with a maximum diameter of less than 5 cm typically heal on their own in two to three menstrual cycles without the need for intervention. It has been observed that minimally invasive techniques such as mini-laparotomy, cyst wall stripping, fenestration, and dehiscence with laparoscopy have become more popular in recent times and are now routinely

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performed procedures in the surgical treatment modalities for these benign ovarian cysts. There is, however, a lack of information in the literature about the safety of these laparoscopic procedures in terms of ovarian injury to treated ovary tissue.2

The term "ovarian reserve" refers to the ovary's functional potential, which is determined by the quantity and quality of primordial follicles that are still present at the time of evaluation. The ovarian reserve at any one moment is ascertained using a wide range of indicators and diagnostic techniques.3.

To ascertain the ovarian reserve, however, no one biomarker or diagnostic procedure has shown to be optimal, the gold standard, or totally trustworthy. Data from earlier research indicated that, in contrast to FSH, AFC and AMH were crucial in determining ovarian reserve. In order to evaluate the ovarian response prior to ovarian stimulation in assisted reproductive technologies (ARTs), AMH and AFC have been frequently employed as accurate predictions.4

Small, preantral, and primary antral follicles' granulosa cells produce anti-Mullerian hormone, or AMH. AMH levels show promise as a valuable and accurate biomarker for ovarian reserve prediction, with a proportionate decline in AMH observed with advancing age before changes in FSH, AFC, and estradiol are detected.5

Furthermore, unlike FSH, AMH is unaffected by the menstrual cycle, oral contraceptive usage, and gonadotropin-releasing hormone agonist use. When it comes to ovarian cystectomy situations, laparoscopic cystectomy has become far more common and well accepted than laparotomy in recent times. The statistics from the literature, however, do not suggest whether strategy is superior in terms of ovarian reserve.6

The objective of the current clinical study was to compare the impact of laparoscopic and open ovarian cystectomies on the markers of ovarian reserve in Indian female patients, such as follicular stimulating hormone, antral follicular count, and anti-mullerian hormone.

## MATERIALS AND METHODS

The current prospective clinical investigation sought to evaluate, in comparison, how open ovarian cystectomy and laparoscopic cystectomy affected the ovarian reserve parameters in Indian girls, namely the follicular stimulating hormone, antral follicular count, and anti-mullerian hormone. The study was conducted at Department of Obstetrics & Gynecology, Chandulal Chandrakar Memorial Government. Medical College, Kachandur, Durg, Chhattisgarh. The female visitors to the Institute's Department of Gynaecology made up the study population. Prior to research participation, written and verbal informed permission was obtained from each participant.

Eighty females in the reproductive age range of 18 to 36 years who had benign ovarian cysts were evaluated for the research. The individuals were split into two groups at random, each consisting of forty females: Group I received open cystectomy via laparotomy, as depicted in figure 1, and Group II underwent laparoscopic cystectomy for benign ovarian cysts, as seen in figure 2. The two treatment groups were assigned to the ladies at random.
Participants in the study had to meet the following requirements in order to be included: they had to have a normal menstrual cycle lasting between 21 and 35 days, have unilateral ovarian cysts measuring more than 5 cm, and have given their agreement to participate in the study.

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patients with hyperprolactinemia, thyroid illness, premature menopause, early ovarian failure, history of prior ovarian surgery, other endocrine abnormalities, oral contraceptives, hormonal medication, and patients unwilling to participate were excluded from the research.

Following final inclusion, each research participant had a thorough history taken, and then they underwent a physical examination, a laboratory evaluation for standard preoperative investigations, an FSH and AMH assessment, and a physical examination. On the second day of the menstrual cycle, transvaginal ultrasonography was done on all research participants prior to surgery in order to determine the size and location of ovarian cysts. The total number of antral follicles in the afflicted ovary, ranging in size from 2 to 10 mm, was used to calculate AFC. Using the Automated Immunoassay, serum FSH was measured on day 2 of the menstrual cycle.

With predicted values of 0.9-9.5 ng/ml, the AMH in the serum was measured using an ELISA (enzyme-linked immunosorbent test) kit. Three months following the cystectomy, the ovarian reserve was reevaluated, taking into account AFC on day two, FSH, and AMH. Preoperative and postoperative ultrasound was performed by a single, highly qualified examiner.

Using laparoscopy and the stripping technique, forty patients underwent ovarian cystectomy. First, the ovarian cyst was cut with cold scissors, and then the cystic wall was identified. The cyst wall was then separated from the surrounding healthy tissue using countertraction and traction with two grasping forceps.

Bipolar diathermy was employed for coagulation and hemostasis after cyst wall removal, and sutures were not used for any leftover ovarian tissue. In 40 research participants, an ovarian cystectomy was performed via laparotomy with a Pfannenstiel incision. For the cleavage planes, microsurgical tools and methods were employed. After the cyst wall was removed, extensive repair was carried out, and sutures were used to stop the bleeding. A histological investigation was performed on each surgical specimen.

The collected data were statistically analysed using the unpaired t-test, ANOVA, and SPSS software version 21.0. The mean and standard deviation of the data were reported. For quantitative variables, the Mann-Whitney test was applied. To compare categorical data, the Chi-square test was employed. At $p<0.05$, the significance threshold was maintained.

## RESULTS

The current prospective clinical investigation sought to evaluate, in comparison, how open ovarian cystectomy and laparoscopic cystectomy affected the ovarian reserve parameters in Indian girls, namely the follicular stimulating hormone, antral follicular count, and anti-mullerian hormone. Eighty females in the reproductive age range of 18 to 36 years who had benign ovarian cysts were evaluated for the research. The participants were split into two groups at random, consisting of forty girls each. Group I received open cystectomy via laparotomy, whereas Group II underwent laparoscopic cystectomy for benign ovarian cysts. Group I and II's mean age of study participants was 26.73±3.52 and 26.13±4.57 years, respectively. This difference was not statistically significant (p=0.73).

Group I had a BMI of 28.76±6.32 kg/m2, whereas Group II had a BMI of 26.61±2.64 kg/m2, both of which were non-significant at p=0.15. Preoperative p-values of 0.82, 0.44, and 0.55 for AFC, FSH, and AMH, respectively, did not indicate a significant difference between the two groups. The two groups'

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respective cyst diameters were 7.12±2.99 and 8.02±2.23 cm, with a non-significant 0.26. In the laparotomy and laparoscopic groups, parity was nullipara in 60% (n=24) and 70% (n=28) of the participants, respectively; in contrast, multipara was recorded in 40% (n=16) and 30% (n=12) of the research individuals, respectively, in the laparotomy and laparoscopy groups.

Mucinous, hemorrhagic, mature cystic teratoma, serous cyst, and endometrioma were observed in 15% (n = 6), 10% (n = 4), 30% (n = 12), 30% (n = 12), and 15% (n = 6) of the study participants in the laparotomy group, respectively. Table 1 shows that in the group of study individuals undergoing laparoscopy, the incidence of mucinous, hemorrhagic, mature cystic teratoma, serous cyst, and endometrioma was 0%, 20% (n=8), 40% (n=16), and 20% (n=8), respectively.

When antral follicular count (AFC) was measured, it rose to 3.4±1.4 postoperatively from 2.6±0.6 preoperatively in the laparotomy group and to 3.5±1.4 postoperatively from 2.7±0.6 in the laparoscopy group. Preoperatively and postoperatively, the difference was statistically not significant (p=0.86 and 0.79, respectively). In the laparotomy and laparoscopy groups, FSH preoperatively was 5.6±0.7 and 5.3±0.6 mIU/ml, respectively, which was non-significant with p=0.44. Postoperatively, it was 5.5±0.4 and 5.4±0.7 mIU/ml, respectively, with p=0.96. After surgery, the mean AMH levels in the laparotomy and laparoscopy groups dropped to 2.2±1.2 and 2.3±1.2 ng/ml, respectively, which was also non-significant (p=0.56). The mean AMH levels were 2.5±1.2 and 2.7±1.2 ng/ml, respectively, in the laparotomy and laparoscopy groups.

The range was -23 to 73, -52 to 202, -31 to 298, 52 to 102, and -23 to 102, respectively. With regard to the decline in AMH and AFC in percentage of ovarian cysts assessed, the median of change in hemorrhagic, endometriotic, dermoid, mucinous, and serous for AFC change was 31, 48, 31, 0, and 31 respectively.

With p=0.53, this shift was statistically not significant. For hemorrhagic, endometriotic, dermoid, mucinous, and serous conditions, the median change in % for AMH was 8.2, 32.4, 14.4, 10.7, and 10.3, in that order. For a hemorrhagic, endometriotic, dermoid, mucinous, and serous cyst, the ranges were 7.4–12.2, 15.6-40.2, 9.4–22.4, 10.4–13.2, and 5.4–13.6, in that order. Table 3 shows that these results were statistically significant with $p<0.001$.

## DISCUSSION

The participants were split into two groups at random, consisting of forty girls each. Group I received open cystectomy via laparotomy, whereas Group II underwent laparoscopic cystectomy for benign ovarian cysts. Group I and II's mean age of study participants was 26.73±3.52 and 26.13±4.57 years, respectively. This difference was not statistically significant (p=0.73).

Group I had a BMI of 28.76±6.32 kg/m2, whereas Group II had a BMI of 26.61±2.64 kg/m2, both of which were non-significant at p=0.15.AFC, FSH, and AMH preoperatively did not differ significantly between the two groups (p-values of 0.82, 0.44, and 0.55, respectively). These results were in line with research conducted in 2015 by Ding Y et al. and in 2014 by Jang WK et al., where participants were evaluated using demographic information similar to that of the current study.
The results revealed that the two groups' respective cyst diameters were 7.12±2.99 and 8.02±2.23 cm, which were non-significant at 0.26. In the laparotomy and laparoscopic groups, parity was nullipara in 60% (n=24) and 70% (n=28) of the participants, respectively; in contrast, multipara was recorded in

40% (n=16) and 30% (n=12) of the research individuals, respectively, in the laparotomy and laparoscopy groups.

Within the group undergoing laparotomy, study participants with mucinous, hemorrhagic, mature cystic teratoma, serous cyst, and endometrioma comprised 15% (n = 6), 10% (n = 4), 30% (n = 12), 30% (n = 12), and 15% (n = 6) of the total. Mucinous, hemorrhagic, mature cystic teratoma, serous cyst, and endometrioma were observed in 0% (n=8), 20% (n=8), 40% (n=16), and 20% (n=8) of the study participants in the laparoscopy group, respectively. These findings corroborated those of studies by Fleming R et al. (10 in 2015) and Alammari R et al. (9 in 2017), whose authors reported findings for ovarian cysts that were comparable to those of the current investigation. In terms of the antral follicular count (AFC), it went from 2.6±0.6 preoperatively in the group that had laparotomy to 3.4±1.4 postoperatively in the group that underwent laparoscopy.

Preoperatively and postoperatively, the difference was statistically not significant (p=0.86 and 0.79, respectively). In the laparotomy and laparoscopy groups, FSH preoperatively was 5.6±0.7 and 5.3±0.6 mIU/ml, respectively, which was non-significant with p=0.44. Postoperatively, it was 5.5±0.4 and 5.4±0.7 mIU/ml, respectively, with p=0.96. After surgery, the mean AMH levels in the laparotomy and laparoscopy groups dropped to 2.2±1.2 and 2.3±1.2 ng/ml, respectively, which was also non-significant (p=0.56). The mean AMH levels were 2.5±1.2 and 2.7±1.2 ng/ml, respectively, in the laparotomy and laparoscopy groups. These findings were consistent with research conducted in 2013 by Urman B et al. and in 2016 by Mircea O et al., who noted comparable increases in FSH and AMH as well as antral follicular count after laparotomy and laparoscopic procedures.

The study's findings demonstrated that the range was -23 to 73, -52 to 202, -31 to 298, 52 to 102, and -23 to 102, respectively, for the decrease in AMH and AFC in percentage of ovarian cysts assessed. The median of change in hemorrhagic, endometriotic, dermoid, mucinous, and serous for AFC change was 31, 48, 31, 0, and 31 respectively. With p=0.53, this shift was statistically not significant. For hemorrhagic, endometriotic, dermoid, mucinous, and serous conditions, the median change in % for AMH was 8.2, 32.4, 14.4, 10.7, and 10.3, in that order. For a hemorrhagic, endometriotic, dermoid, mucinous, and serous cyst, the ranges were 7.4–12.2, 15.6-40.2, 9.4–22.4, 10.4–13.2, and 5.4–13.6, in that order. With p<0.001, this study demonstrated statistical significant results.

These results were consistent with the findings of Shaltout MF et al[13] in 2019 and Chun S et al[14] in 2016 where authors suggested similar percentage changes in AFC and AMH in their study subjects with ovarian cysts as in the present study.

## CONCLUSION

The present study, within its limitations, concludes that no difference in ovarian reserve results postoperatively from the ovarian cystectomy performed by either the open or laparoscopic approach. The study had a few limitations including the smaller sample size and short monitoring period warranting further longitudinal studies to reach a definitive conclusion.

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**TABLES**

| **Characteristics** | **Laparotomy group (n=40)** | **Laparoscopy group (n=40)** | **p-value** |
|---|---|---|---|
| **Mean age (years)** | 26.73±3.52 | 26.13±4.57 | 0.73 |
| **BMI (kg/m2)** | 28.76±6.32 | 26.61±2.64 | 0.15 |
| **AFC (preoperatively)** | 2.6±0.6 | 2.7±0.6 | 0.82 |

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| | | | |
|---|---|---|---|
| **FSH (preoperatively) (mIU/ml)** | 5.6±0.7 | 5.3±0.6 | 0.44 |
| **AMH (preoperatively) (ng/ml)** | 2.5±1.2 | 2.7±1.2 | 0.55 |
| **Cyst type n (%)** | | | |
| Mucinous | 6 (15) | 0 | 0/25 |
| Hemorrhagic | 4 (10) | 8 (20) | 0.68 |
| Mature cystic teratoma | 12 (30) | 8 (20) | 0.48 |
| Serous | 12 (30) | 16 (40) | 0.52 |
| Endometrioma | 6 (15) | 8 (20) | 1.00 |
| **Cyst diameter** | 8.02±2.23 | 7.12±2.99 | 0.26 |
| **Parity** | | | |
| Nullipara | 24 (60) | 28 (70) | 0.52 |
| Multipara | 16 (40) | 12 (30) | |

**Table 1: Demographic and disease characteristics in two groups of study subjects**

| Characteristics | Laparotomy group (n=40) | Laparoscopy group (n=40) | p-value |
|---|---|---|---|
| **AFC** | | | |
| Preoperatively | 2.6±0.6 | 2.7±0.6 | 0.86 |
| Postoperatively | 3.4±1.4 | 3.5±1.4 | 0.79 |
| **FSH** | | | |
| Preoperatively | 5.6±0.7 | 5.3±0.6 | 0.44 |
| Postoperatively | 5.5±0.4 | 5.4±0.7 | 0.96 |
| **AMH** | | | |
| Preoperatively | 2.5±1.2 | 2.7±1.2 | 0.59 |
| Postoperatively | 2.2±1.2 | 2.3±1.2 | 0.56 |

**Table 2: Change in antral follicle count and hormonal profile following surgery in two groups of study subjects**

| Characteristics | Number (n) | Median | Range | p-value |
|---|---|---|---|---|
| **AFC change (percentage)** | | | | |
| Hemorrhagic | 12 | 31 | -23-73 | 0.53 |
| Endometriotic | 14 | 48 | -52-202 | |
| Dermoid | 20 | 31 | -31-298 | |
| Mucinous | 6 | 0 | 52-102 | |
| Serous | 28 | 31 | -23-102 | |
| **AMH change (percentage)** | | | | |
| Hemorrhagic | 12 | 8.2 | 7.4-12.2 | **<0.001** |
| Endometriotic | 14 | 32.4 | 15.6-40.2 | |
| Dermoid | 20 | 14.4 | 9.4-22.4 | |
| Mucinous | 6 | 10.7 | 10.4-13.2 | |
| Serous | 28 | 10.3 | 5.4-13.6 | |

**Table 3: Decrease in AMH and AFC in percentage in ovarian cysts of the present study.**