IMPACT OF OPEN OVARIAN CYSTECTOMY TO LAPAROSCOPIC CYSTECTOMY ON THE OVARIAN RESERVE IN INDIAN FEMALES

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Abstract

Background: In females of reproductive age, ovarian cysts are a common finding. Treating them by laparoscopic cystectomy compared to laparotomy is gaining popularity for ovarian cystectomy. However, the literature data is scarce with no consensus concerning which approach is better for ovarian cysts.

Aim: The present clinical study was aimed to comparatively assess the effect of open ovarian cystectomy to laparoscopic cystectomy on the parameters of ovarian reserve in Indian females.

Methods: The present study assessed 80 females of age 18 to 36 years, reproductive age group having benign ovarian cysts. The subjects underwent either open ovarian cystectomy in 40 females or laparoscopic ovarian cystectomy in another 40 subjects. In all subjects, preoperatively and postoperatively, FSH (Follicular Stimulating Hormone), AFC (Antral Follicle Count), and AMH (Anti-Müllerian Hormone) levels were assessed preoperatively and 3 months postoperatively.

Results: At 3 months postoperatively, serum AMH levels showed a significant decrease in both open ovarian cystectomy and laparoscopic cystectomy groups. The AFC levels showed a significant increase in both open ovarian cystectomy and laparoscopic cystectomy groups after 3 months postoperatively. However, no significant difference was seen in the levels of FSH from baseline to 3 months postoperatively in both study groups.

Conclusion: The study concludes that no difference in ovarian reserve results postoperatively from the ovarian cystectomy performed by either the open or laparoscopic approach.

Keywords: Antral Follicular Count (AFC), Anti-Müllerian Hormone (AMH), Laparoscopic Cystectomy, Ovarian Cystectomy, Ovarian Reserve

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INTRODUCTION

Mucinous or serous cystadenomas, mature cystic teratomas, and/or endometriomas comprising benign ovarian cysts are common findings seen in females of reproductive age groups. It has been reported that nearly 7% of females globally have one or another asymptomatic ovarian cyst in their lifespan.[1] Simple or functional ovarian cysts of dimension <5 cm in maximum diameter usually needs no treatment and are cured on their own during 2-3 menstrual cycles without any management. In the surgical treatment modalities for these benign ovarian cysts, it has been noted that minimally invasive techniques including mini-laparotomy, stripping of the cyst walls, fenestration, and dehiscence with laparoscopy have gained popularity in recent times becoming commonly performed procedures. However, the data in the literature is scarce concerning the safety of these laparoscopic techniques in causing ovarian damage to the treated ovary.[2]

Ovarian reserve describes the functional potential of the ovary which is assessed by the quality and number of the remaining primordial follicles at the assessment time. A vast variety of biomarkers and diagnostics tests are used to determine the ovarian reserve at any given time.[3] However, no single biomarker or diagnostic test has proven to be ideal, gold-standard, and completely reliable to determine the ovarian reserve. Previous literature data showed a vital role of AFC and AMH in assessing ovarian reserve compared to the FSH. AMH and AFC have been widely used as reliable predictors to assess ovarian response before ovarian stimulation in ARTs (assisted reproductive technologies).[4]

AMH or the anti-Mullerian hormone is generated from the granulosa cells of small, preantral, and primary antral follicles. The levels of AMH present as a useful and reliable biomarker to predict the ovarian reserve where a proportional decrease of AMH is seen with increasing age before changes in estradiol, FSH, and AFC are noted.[5] Also, AMH is not affected by the use of gonadotropin-releasing hormone agonists, oral contraceptive intake, and menstrual cycle like FSH. In comparison to laparotomy, cystectomy by laparoscopy has gained large popularity recently with wide acceptance in cases with ovarian cystectomy. However, the literature data do not indicate which approach is better concerning ovarian reserve.[6]

The present clinical study aimed to comparatively assess the effect of open ovarian cystectomy to laparoscopic cystectomy on the parameters of ovarian reserve including the follicular stimulating hormone, antral follicular count, and anti-mullerian hormone in Indian females.

MATERIALS AND METHODS

The present prospective clinical study aimed to comparatively assess the effect of open ovarian cystectomy to laparoscopic cystectomy on the parameters of ovarian reserve including the follicular stimulating hormone, antral follicular count, and anti-mullerian hormone in Indian females. The study was done at Department of Obstetrics and Gynecology, Era Medical College And Hospital Lucknow Uttar Pradesh. The study population was the females visiting the Department of Gynecology of the Institute. Informed consent was taken in verbal and written format from all the subjects before study participation.

The study assessed 80 females in the reproductive age group (18-36 years) with the presence of benign ovarian cysts. The subjects were randomly divided into two groups of 40 females each where Group I females, underwent open cystectomy through laparotomy as shown in figure 1 and Group II females were treated with laparoscopic cystectomy for benign ovarian cysts as shown in figure 2. The females were randomly allocated into the two treatment groups.

The inclusion criteria for the study were subjects with no suspicion of malignancy clinically or radiographically, having unilateral ovarian cysts of dimension >5 cm, regular menstrual cycle of 21 to 35 days, and those who gave consent for study participation. The exclusion criteria for the study were subjects with premature menopause, premature ovarian failure, history of previous ovarian surgery, hyperprolactinemia, thyroid disease, other endocrine anomalies, oral contraceptives, hormonal therapy, and subjects not willing to participate.

After final inclusion, detailed history was recorded for all the study subjects followed by physical examination and laboratory assessment for routine preoperative investigations, FSH, and AMH assessment. For all the study subjects, transvaginal ultrasonography was performed preoperatively on 2nd day of the menstrual cycle to assess the ovarian cyst location and size. AFC

was assessed as a total number of antral follicles in size 2mm to 10mm in the affected ovary.

On day 2 of the menstrual cycle, serum FSH was assessed using the Automated Immunoassay. AMH in the serum was assessed using ELISA (enzyme-linked immunosorbent assay) kit with expected values of 0.9-9.5 ng/ml. The reassessment of the ovarian reserve including AFC on day 2, FSH, and AMH was done at 3 months after cystectomy. Ultrasound preoperatively and postoperatively was done by a single examiner expert in his field.

Forty subjects were managed with ovarian cystectomy using laparoscopy with the stripping technique by making an incision of the ovarian cyst with cold scissors followed by identification of the cystic wall and striping the cyst wall off from healthy surrounding tissue using counter traction and traction with two grasping forceps. Following cyst wall excision, bipolar diathermy was used for coagulation and hemostasis, and the sutures were not given for residual ovarian tissue. By laparotomy, ovarian cystectomy was done using a Pfannenstiel incision in 40 study subjects. Microsurgical instruments and techniques were used for cleavage planes. Following cyst wall excision, thorough reconstruction was done and hemostasis was achieved using sutures. All the surgical specimens were sent for histopathological examination.
The data gathered were subjected to statistical analysis using SPSS software version 21.0 along with unpaired t-test and ANOVA. The data were expressed in mean and standard deviation. Mann-Whitney test was used for quantitative variables. Categorical data were compared using the Chi-square test. The level of significance was kept at $p<0.05$.

RESULTS

The present prospective clinical study aimed to comparatively assess the effect of open ovarian cystectomy to laparoscopic cystectomy on the parameters of ovarian reserve including the follicular stimulating hormone, antral follicular count, and anti-mullerian hormone in Indian females. The study assessed 80 females in the reproductive age group (18-36 years) with the presence of benign ovarian cysts. The subjects were randomly divided into two groups of 40 females each where Group I females, underwent open cystectomy through laparotomy and Group II females were treated with laparoscopic cystectomy for benign ovarian cysts. The mean age of study subjects in Group I and II was 26.73±3.52 and 26.13±4.57 years which was statistically non-significant with p=0.73. The BMI was 28.76±6.32 and 26.61±2.64 kg/m2 in Group I and II respectively which was non-significant with p=0.15. Preoperative AFC, FSH, and AMH were non-significant between the two groups with respective p-values of 0.82, 0.44, and 0.55. Cyst diameter was 7.12±2.99 and 8.02±2.23 cm respectively for the two groups which was non-significant with 0.26. The parity was nullipara in 60% (n=24) and 70% (n=28) subjects respectively in the laparotomy and laparoscopy group, whereas, multipara was reported in 40% (n=16) and 30% (n=12) study subjects in laparotomy and laparoscopy group respectively. In the laparotomy group, mucinous, hemorrhagic, mature cystic teratoma, serous cyst, and endometrioma were seen in 15% (n=6), 10% (n=4), 30% (n=12), 30% (n=12), and 15% (n=6) study subjects respectively. In the laparoscopy group, mucinous, hemorrhagic, mature cystic teratoma, serous cyst, and endometrioma were seen in none, 20% (n=8), 20% (n=8), 40% (n=16), and 20% (n=8) study subjects respectively (Table 1).

On assessing the antral follicular count, in the laparotomy group, it increased to 3.4±1.4 postoperatively from 2.6±0.6 preoperatively, whereas, in the laparoscopy group, AFC increased postoperatively to 3.5±1.4 from 2.7±0.6. The difference was statistically non-significant preoperatively and postoperatively with p=0.86 and 0.79 respectively. FSH preoperatively was 5.6±0.7 and 5.3±0.6 mIU/ml respectively in the laparotomy and laparoscopy group which was non-significant with p=0.44 and postoperatively was 5.5±0.4 and 5.4±0.7 mIU/ml respectively with p=0.96. The mean AMH level was 2.5±1.2 and 2.7±1.2 ng/ml respectively in laparotomy and laparoscopy groups which were non-significant with p=0.59 which postoperatively decreased to 2.2±1.2 and 2.3±1.2 ng/ml respectively in laparotomy and laparoscopy groups which were non-significant with p=0.56.

Concerning the decrease in AMH and AFC in percentage in 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, and the range was -23 to 73, -52 to 202, -31 to 298, 52 to 102, and -23 to 102 respectively. This change was statistically non-significant with p=0.53. The median for change of percentage for AMH for hemorrhagic, endometriotic, dermoid, mucinous,

and serous was 8.2, 32.4, 14.4, 10.7, and 10.3 respectively. The range was 7.4-12.2, 15.6-40.2, 9.4-22.4,10.4-13.2, and 5.4-13.6 respectively for a hemorrhagic, endometriotic, dermoid, mucinous, and serous cyst. These findings were statistically significant with p<0.001 as depicted in Table 3.

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
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.

DISCUSSION

The subjects were randomly divided into two groups of 40 females each where Group I females, underwent open cystectomy through laparotomy and Group II females were treated with laparoscopic cystectomy for benign ovarian cysts. The mean age of study subjects in Group I and II was 26.73±3.52 and 26.13±4.57 years which was statistically non-significant with p=0.73. The BMI was 28.76±6.32 and 26.61±2.64 kg/m2 in Group I and II respectively which was non-significant with p=0.15. Preoperative AFC, FSH, and AMH were non-significant between the two groups with respective p-values of 0.82, 0.44, and 0.55. These findings were consistent with the studies of Ding Y et al[7] in 2015 and Jang WK et

al[8] in 2014 where authors assessed subjects with demographic data comparable to the present study.

The findings showed that the Cyst diameter was 7.12±2.99 and 8.02±2.23 cm respectively for the two groups which were non-significant with 0.26. The parity was nullipara in 60% (n=24) and 70% (n=28) subjects respectively in the laparotomy and laparoscopy group, where as, multipara was reported in 40% (n=16) and 30% (n=12) study subjects in laparotomy and laparoscopy group respectively. In the laparotomy group, mucinous, hemorrhagic, mature cystic teratoma, serous cyst, and endometrioma were seen in 15% (n=6), 10% (n=4), 30% (n=12), 30% (n=12), and 15% (n=6) study subjects respectively. In the laparoscopy group, mucinous, hemorrhagic, mature cystic teratoma, serous cyst, and endometrioma were seen in none, 20% (n=8), 20% (n=8), 40% (n=16), and 20% (n=8) study subjects respectively. These results were in agreement with the studies of Alammari R et al[9] in 2017 and Fleming R et al[10] in 2015 where authors reported similar findings for ovarian cysts in their studies as in the present study.

Concerning the antral follicular count, in the laparotomy group, it increased to 3.4±1.4 postoperatively from 2.6±0.6 preoperatively, whereas, in the laparoscopy group, AFC increased postoperatively to 3.5±1.4 from 2.7±0.6. The difference was statistically non-significant preoperatively and postoperatively with p=0.86 and 0.79 respectively. FSH preoperatively was 5.6±0.7 and 5.3±0.6 mIU/ml respectively in the laparotomy and laparoscopy group which was non-significant with p=0.44 and postoperatively was 5.5±0.4 and 5.4±0.7 mIU/ml respectively with p=0.96. The mean AMH level was 2.5±1.2 and 2.7±1.2 ng/ml respectively in laparotomy and laparoscopy groups which were non-significant with p=0.59 which postoperatively decreased to 2.2±1.2 and 2.3±1.2 ng/ml respectively in laparotomy and laparoscopy groups which were non-significant with p=0.56. These results were in line with the studies of Urman B et al[11] in 2013 and Mircea O et al[12] in 2016 where authors reported similar antral follicular count and changes in FSH and AMH following laparotomy and laparoscopic surgeries.

The study results showed that for the decrease in AMH and AFC in percentage in 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, and the range was -23 to 73, -52 to 202, -31 to 298, 52 to 102, and -23 to 102 respectively. This change was statistically non-significant with p=0.53. The median for change of percentage for AMH for hemorrhagic, endometriotic, dermoid, mucinous, and serous was 8.2, 32.4, 14.4, 10.7, and 10.3 respectively. The range was 7.4-12.2, 15.6-40.2, 9.4-22.4, 10.4-13.2, and 5.4-13.6 respectively for a hemorrhagic, endometriotic, dermoid, mucinous, and serous cyst. These findings were statistically significant with p<0.001. 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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Fig 1: Open Ovarian Cystectomy

Fig 2: Laparoscopic Cystectomy