Histopathologic and Sonographic Analysis of Laparoscopic Removal Ovarian Nonendometriotic Cyst: The Evaluating Effects on Ovarian Reserve

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Abstract- Currently, laparoscopic cystectomy is the first-line therapy for ovarian benign cysts that are resistant to current therapies. There are different studies that point to ovarian reserve damage due to laparoscopic cystectomy. In this study, we evaluate the ovarian damage following laparoscopic cystectomy for non-endometriosis cysts using ultrasound and pathology findings. This is a prospective cohort study conducted between 7 rd month of 2011 and 10th month of 2012 in Women hospital affiliated to Tehran university of medical sciences.45 non-endometriosis cysts (17 teratoma,7 mucinous, 10 simple serous and 11 simple cysts) underwent laparoscopic cystectomy with stripping technique. Amount of excised parenchyma, number of lost oocytes and cyst wall fibrosis thickness were histopathologically studied. Before and 3 months after surgery antral follicle count was evaluated by ultrasound. AFC after cystectomy for teratoma and simple serous was significantly reduced $P<0.05$. By larger teratomas and more parenchyma inadvertently removed during their excision (1.64, 0.255) reduced AFC was seen and in simple serous cysts with more removed parenchyma amount (1.5) reduced AFC occurred. In our study simple cysts excision led to a loss in AFC that was not associated with any other cyst parameters. Mucinous cysts resection led to no specific ovarian reserve damage. Laparoscopic cystectomy for non-endometriosis leads to reduced ovarian reserve.

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Keywords: Non-endometriosis cyst; Cystectomy; Ovarian reserve; Ultrasound; Histopathology; Laparoscopy

Introduction

Currently, Laparoscopic cystectomy is the first-line therapy for ovarian benign cysts including symptomatic endometriomas, dermoid cysts and serous cystadenomas and there is a growing trend among gynecologic surgeons toward using it (1-4). In comparison with laparotomy postoperative hospital stay, pain, total hospital costs and time to normal activity in laparoscopy are lower(5,6). Different studies have shown a faster pain recovery and raised fecundity rate after laparoscopy versus other modalities. Yet whether laparoscopy leads to ovarian damage or not is a debated subject. In different studies, it was shown that patients who previously have undergone unilateral cystectomy have a lower follicle count and number of retrieved oocytes in response to ovulation induction, in the operated ovary in comparison with the contralateral ovary (7-11). Although ovarian response to ovulation stimulation is considered to be the best reflection of ovarian reserve, it is not possible to perform this test in all patients. Therefore, some other tests have been introduced for this purpose including serum level of FSH, estradiol, LH, AMH, inhibin-B, LH/FSH ratio and ultrasound findings including stromal blood flow, ovarian volume and antral follicle count (AFC)(8,11).

Different studies have shown that anti Mullerian hormone level and ultrasound findings are affected by

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cystectomy (8,11).

There are also histopathologic studies showing normal ovarian parenchyma inadvertently removed with the cyst wall especially in endometriosis cysts (13). Possible mechanism of ovarian damage following cystectomy may be normal adjacent ovarian parenchyma removal, local inflammation or vessel damage following electrocautery (14-16).

Severity of ovarian damage is an important factor. A small reduction in ovarian reserve may have no clinical effect while severe damage may cause folliculogenesis or fecundity impairment.

Therefore, we conducted a prospective cohort study to evaluate the ovarian damage following laparoscopic cystectomy for non-endometriosis cysts using ultrasound and pathology between 2011 and 2012 in Tehran Women Hospital affiliated to Tehran University of Medical Sciences.

Materials and Methods

This is a prospective cohort study conducted between7st month of 2011 and 10th month of 2012 in women hospital affiliated to Tehran University of Medical Sciences. 45 patients with non-endometriosis cysts (17 teratoma, 7moucinous, 10 simple serous and 11 simple cysts) were included and studied by ultrasound and pathology.

Inclusion criteria were as follows: 1) Age between 5-40, 2) Having regular menses, 3) Benign cysts, 4) having no history of endocrine disease, 5) having no history of surgery on ovaries, 7) Consent for being included in the study.

After obtaining informed consent from the patients demographic data was collected using a questioner.

Transvaginal ultrasound with an 8 mega Hz probe was performed by one particular radiologist during the follicular phase (before day 10 of the menstrual cycle). Size and morphology of cysts and antral follicle count (all follicles less than 10 mm) in both ovaries were reported. Laparoscopic cystectomy using stripping technique was carried out by 3 gynecology professors, and if hemostasis was needed bipolar cautery was used. The excised ovarian specimen was sent for pathological analysis. The same pathologist recorded kind of cysts,amount of parenchyma, ovarian oocyte loss and fibrosis in cyst's wall. 3 months postoperative patients underwent ultrasound by the same blinded radiologist and the numbers of antral follicles were reported.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 18.0. Mean and standard deviation for quantitative parameters were calculated. Qualitative variables were expressed in frequency and percentage.

Correlation between quantitative parameters and reduced number of antral follicles were calculated by general linear model (univariate –multivariate).

Numbers of follicles per ovary before and after surgery were compared using nonparametric signed - rank Wilcoxon test.

Result

45 patients underwent laparoscopic cystectomy for non -endometriosis cysts. No complications during and after surgery occurred, and the patients were discharged within 24 hours post operative. Patients' demographic data, information related to cysts, Ultrasound and pathologic data regarding cyst kind are illustrated in table 1.

Table 1. The variables associated with cysts before and after Surgery

	Mean± Std. Deviation			
	Tratoma	**Mucinous**	**Simple serous**	**Simple**
Number	17	7	10	11
Age	25.18±5.040	25.00±6.377	29.90±3.510	24.91±7.077
Size of cyst	5.29±1.795	4.86±1.345	4.80±1.476	5.00±1.732
AFC pre-surgery	3.94±.899	3.71±1.380	3.80±1.033	3.55±1.293
AFC post-surgery	2.76±1.200	3.43±1.397	2.60±1.265	3.18±1.250
Contralateral ovary	4.12±.857	3.86±2.116	4.20±1.317	4.00±1.000
Parenchyma	0.59±0.712	0.00	0.40±0.843	0.05±0.151
Oocyte	1.00±2.958	0.00	4.10±9.960	0.00
Fbrosis	0.24±0.752	0.00	0.00	0.00

Teratoma

Average AFC before surgery in teratomas was 3.94±0.899 and after surgery was 2.76±1.20 which had a statistically significant reduction $P<0.05$.

Increase in cyst diameter and amount of normal adjacent parenchyma removed during cystectomy resulted in reduced antral follicle count. Each unit increase led to 1.64, 0.255 reduction in AFC respectively. This relationship was not detected with ovarian oocyte loss.

Each centimeter increase in cyst diameter led to an increase in removed supplementary thickness of the ovarian parenchyma averaging 0.121mm.

Age was another factor, an increase of 1 year led to 0.41 losses in AFC.

We haven't found any significant correlation between variants in mucinous cysts.

Simple serous cyst

Average AFC before surgery in simple serous cyst was 3.80±1.033 and after surgery was 2.60±1.265 which had a statistically significant reduction $p<0.05$.

Increase in removed parenchyma amount due to cystectomy led to reduced AFC. Each unit led to 1.5 AFC reductions.

Increased cyst diameter was not related with the amount of removed parenchyma, ovarian oocyte loss and AFC reduction.

Simple cyst

Average AFC before surgery in simple serous cyst was 3.55±1.293 and after surgery was 3.18±1.250 which had a statistically significant reduction $p<0.05$.

Cyst size and reduced AFC had a relationship, but it was not statistically significant ($P>0.05$). Other variables regarding AFC loss were not significant.

Cyst wall fibrosis amount had no significant correlation with any of the variables in any cyst type.

Discussion

On the basis of our findings, cystectomy for teratoma, simple serous and simple cysts leads to reduction in antral follicle count. This reduction is more significant in teratomas with larger diameter. In our study on mucinous cysts, no injury to ovarian reserve was detected using ultrasound and pathology findings.

In agreement and contrast with our results, there are some trials conducted, measuring ovarian volume and AFC difference in non-endometriosis cysts.

Exacoustos *et al.* (2003) studied 77 endometriosis cysts and 55 dermoid cysts and reported that ovarian volume was decreased in endometrioma group only. He also noticed that cysts with 8 cm diameter or larger led to decrease in ovarian reserve in both groups and this injury was greater in them (17).

Somigliana *et al.* (2006) studied 17 patients with non endometriosis cysts (mucinous, serous, dermoid and fibroma) and concluded that surgery in all groups led to deterioration in ovarian reserve. AFC before surgery was 4.69±2.5 and after surgery was 2.79±2.4, P=0.010 (with a reduction of 42%). So he reported that laparoscopic excision of non-endometriosis cysts lead to a significant reduction in ovarian reserve (2).

In our study resection of mucinous cysts was not associated with the loss of ovarian reserve while cystectomy for teratoma, simple serous and simple cysts was associated with injury to ovarian reserve.

Different histopathologic studies have reported inadvertent ovarian parenchyma removal during cystectomy (17,18)

Muzzi *et al.* (2002), reported that in only 6% of cases with well-defined cysts including dermoid cysts, serous cysts and mucinous cystadenomas, Ovarian tissue was inadvertently excised during cystectomy , and this rate for endometriomas was 54%-69% (5,16) Maneschi *et al.* study results in 1993 is in agreement with this.

Dogan et al. (2011), reported that in 127 cysts including 61 endometrioma and 66 non-endometriosis cysts underwent cystectomy and in 92% and 82% of samples normal ovarian tissue adjacent to cyst was detected respectively,the amount of removed tissue was more in endometriomas (1.64±1.35 versus 1.11±1.22, $p=0.022$). In our study normal ovarian parenchyma was removed in 47% of dermoid cysts, 20% of simple serous cysts and 10% of simple cysts inadvertently. Our findings are compatible with the result that laparoscopic cystectomy for non-endometriosis cysts (teratoma, simple serous, simple) with stripping technique is associated with a decreased ovarian reserve and in teratomas the amount of removed parenchyma is in great association with cysts diameter and ovarian reserve damage. Cystectomy for mucinous cysts was not associated with any specific ovarian reserve damage.

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