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THE EFFECT OF LAPAROSCOPIC TUBAL DISCONNECTION OR LAPAROSCOPIC SALPINGECTOMY ON OVARIAN RESERVE.

By

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ABSTRACT

Background: Fertility of a woman is the most important job in her life, thus preserving the elements of this fertility is much important. The biological age and ovarian reserve are of the most agonizing issues for women, especially in their late thirties and forties. The uterine tubal disconnection versus uterine tubal excision is usually indicated in subfertile patient suffering from tubal disease or indicated in surgical management of ectopic tubal pregnancy.

Objective: To study the effect of laparoscopic tubal disconnection or laparoscopic salpingectomy on ovarian reserve.

Patients and methods: This study is a prospective cohort study that was conducted at the Endoscopy Unit, Obstetrics and Gynecology Department, Al-Azhar University Hospitals, throughout the period from Oct. 2019 to Sep. 2020. It included 44 patients of the outpatient clinic with a diagnosis of tubal factor infertility or tubal ectopic pregnancy. 22 patients underwent laparoscopic proximal tubal disconnection, and 22 patients underwent laparoscopic salpingectomy. In both groups, basal antral follicle count (AFC) and mean ovarian volume (OVVOL) were evaluated by transvaginal sonography (TVS) before and 3 months after surgery.

Results: The mean of the basal AFC and mean OVVOL before and after laparoscopic tubal disconnection were the same suggesting no effect on ovarian reserve, while the mean AFC and OVVOL before and after laparoscopic salpingectomy were different. Both decreased, suggesting negative effect. It was insignificant negative difference in basal AFC and hardly significant negative difference in mean OVVOL.

Conclusion: Laparoscopic tubal disconnection does not affect ovarian reserve, while salpingectomy has a negative effect on ovarian reserve estimated by OVVOL three months after the surgical intervention.

Keywords: Laparoscopic tubal disconnection, Laparoscopic salpingectomy, Ovarian reserve, AFC, OVVOL.

INTRODUCTION

Ovarian reserve is an estimate of the quantity and quality of remaining ovarian follicles. The number of viable follicles continues to decline throughout the reproductive years. Ovarian reserve which is a primary determinant of fertility is affected by genetic factors, reproductive age and operative procedures involving the ovary or its blood supply. Fallopian tubes are the female organs that transport the oocyte from the ovary to the uterus every ovarian cycle. In the presence of the sperm, the fallopian tubes transport the sperm towards the ovum, and transport the fertilized ovum towards the uterus for implantation. Anatomically, fallopian tubes are formed of 4 portions; interstitial part, isthmus, ampulla and infundibulum. Grossly, the whole tube is about 10 cm in length and 1 cm in diameter and situated within the broad ligament **(Casanova et al., 2018).**

Laparoscopic diagnosis and management of tubal disease is appreciable and invaluable. Laparoscopic tubal disconnection may be done for female sterilization or to manage pyosalpinx or hydrosalpinx, while laparoscopic salpingectomy is usually done to manage huge hydrosalpinx, tubal ectopic pregnancy or fallopian tube neoplasm. This is for example, not exclusively and doesn't rule out other rare conditions **(Rustamov et al., 2016).**

Due to the close anatomical association of vascular and nervous supply of the fallopian tube and the ovary, partial disruption of the ipsilateral ovarian blood supply is possible after unilateral or bilateral tubal surgery, then reducing the ovarian reserve. Recent studies recommend cautious use of electro cautery with resection very close to the actual tube to avoid damage to the medial tubal artery, and recommend leaving a portion of an adherent tube on the ovary rather than performing unnecessary radical salpingectomy **(Lumely et al., 2018).**

Ultrasonographic biomarkers (antral follicle count, ovarian volume and stromal blood flow) are good predictors of ovarian reserve. Trans-vaginal measurement of these markers is quick, accurate and cost effective. Basal antral follicle count (AFC) and mean ovarian volume (OVVOL) will be used in this study **(Domingues et al., 2010 and Oner et al., 2015).**

The aim of the present work was to study the effect of laparoscopic tubal disconnection or laparoscopic salpingectomy on ovarian reserve.

PATIENTS AND METHODS

This study was a prospective cohort study that was conducted at the Endoscopy Unit, Obstetrics and Gynecology Department, Al-Azhar University Hospitals, throughout the period from Oct. 2019 to Sep. 2020. It included 44 patients of the outpatient clinic with a diagnosis of tubal factor infertility or tubal ectopic pregnancy **(Omurtag et al., 2012 and Webster et al., 2019).**

Before enrolment, every patient was counselled about her case, management choices. Patients were informed about alternative approaches and chose what kind of surgical technique they wanted to receive. All patients had given written consents to share in the study.

Inclusion criteria:

Gynecologic cases:

- Female patient aging 20 – 30 years,
- BMI $\leq$ 30,
- Uterine tube disease, hydrosalpinx or pyosalpinx, confirmed by trans-vaginal sonography (TVS) and scanning by hysterosalpingography (HSG).

Obstetric cases:

- Female patient aging 20 – 30 years,
- BMI $\leq$ 30,
- Tubal ectopic pregnancy diagnosed by serum pregnancy test and TVS, and scoring for surgical management.

Exclusion criteria:

- Age under 20 or above 30 years.
- Obesity (BMI > 30).
- Prior tubal surgery.
- Prior ovarian surgery.
- Poly cystic ovary.
- Ovarian cyst / mass measuring more than 10 mm.
- Decreased ovarian reserve.
- Intraoperative diagnosis of concurrent conditions e.g. endometriosis.
- Any medical disorder (other than uterine tubal diseases) is excluded from the study e.g. diabetes.

All cases were counseled about their diagnoses, informed about alternative therapeutic approaches. For patients who agreed to laparoscopic surgery, bipolar diathermy was used cautiously to operate and to achieve hemostasis.

For patient with mild to moderate tubal insult, proximal tubal disconnection was performed, while in those with severe tubal insult or ectopic pregnancy; salpingectomy was done **(Dreyer et al., 2016, Hamza, 2017 and Webster et al., 2019).**

Patients were divided into 2 equal groups: Laparoscopic proximal tubal disconnection group, and laparoscopic salpingectomy group.

All patients were subjected to history taking, clinical examination and investigations [Trans-vaginal sonography (TVS), hysterosalpigography **(**HSG) (HSG scanning is considered within 3 months before surgery), serum pregnancy test (Qualitative and quantitative serum pregnancy test is considered within 48 hours before surgery), and routine basic investigations: Blood group **(**ABO-Rh), complete blood count **(**CBC), prothrombin time and activity (PT and PA), random blood glucose **(**RBG), liver function tests (LFTs) and kidney function tests (KFTs)].

After surgery, same-day discharge to home if the surgical procedure was uncomplicated and the patient is doing well during the postoperative recovery. If a significant amount of blood loss occurred, observation overnight to follow vital signs and serial blood counts. Broad spectrum antibiotic and analgesic medications were prescribed **(Munro and Gomel, 2019).**

All patients were asked to return on day 3 of the third menstrual cycle after their surgery. A high resolution transvaginal examination was done using the ultrasound device equipped with a 7.5 MHz vaginal probe. Examination of both ovaries by 2D TVS was performed for assessment of the basal antral follicle count (AFC), and mean ovarian volume (OVVOL) regardless of the side of the operation **(Abuhamad et al., 2014, Stephenson, 2015 and Frates, 2017).**

Statistical analysis: Recorded data were analyzed using the statistical package for the social sciences software (SPSS, Inc., Chicago, Illinois, USA) version 20.0 /2011 for windows. Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage. Independent-samples t-test of significance was used when comparing between two means. Paired sample t-test of significance was used when comparing between related samples. The confidence interval was set to 95% and the margin of error accepted was set to 5%. P-value $\leq$ 0.05 was considered significant.

RESULTS

There was no statistically significant difference between the two groups according to the baseline characteristics (Table 1).

Table (1): Range and Mean±SD descriptive statistic of baseline characteristics in both groups.

Parameters \ Groups	Laparoscopic tubal disconnection *(n=22)*	Laparoscopic salpingectomy *(n=22)*	p-value
Age (years) Mean±SD Range	 23.36±2.22 20-a28	 22.91±2.45 20-a29	>0.05
Weight (kg) Mean±SD Range	 72.73±5.33 63-a81	 74.00±4.50 69-a86	>0.05
Height (m) Mean±SD Range	 1.58±0.05 1.49-a1.65	 1.62±0.05 1.55-a1.74	>0.05
BMI [wt/(ht)^2] Mean±SD Range	 28.60±1.09 26.43-a29.91	 28.37±1.46 23.94-a29.97	>0.05
Admission diagnosis 1ry infertility 2ry infertility Ectopic pregnancy for laparoscopy Total number of cases	 18 (81.8%) 4 (18.2%) 0 (0%) 22 (100%)	 10 (45.5%) 1 (4.5%) 11 (50%) 22 (100%)	

t-Independent Sample t-test

There was no statistically significant difference between the two groups according to the before basal AFC and the mean OVVOL. There was a statistically significant difference between the two groups according to the after mean OVVOL (Table 2).

Table (2): Range and Mean±SD descriptive statistic of the before and after basal AFC, and the mean OVVOL in both groups.

Time of measurement / Groups		Laparoscopic tubal disconnection group *(n=22)*	Laparoscopic salpingectomy group *(n=22)*	p-value
The before surgery TVS examination	**AFC** Mean±SD Range	17.18±2.41 14-21	17.32±2.42 14-22	> 0.05
	Ovarian volume Mean±SD Range	10.21±1.43 6.59-15.01	10.22±1.43 8.6-14.84	> 0.05
The before surgery TVS examination	**AFC** Mean±SD Range	17.16±2.40 14-20	17.26±2.42 14-21	> 0.05
	Ovarian volume Mean±SD Range	10.20±1.43 6.59-15.01	10.10±1.41 8.48-14.54	< 0.05

t-Independent Sample t-test.

There was no statistically significant effect of laparoscopic tubal disconnection on basal AFC and mean OVVOL (before surgery compared to after surgery). Also there was a statistically significant negative effect of laparoscopic salpingectomy on mean OVVOL (before surgery compared to after surgery) (Table 3).

Table (3): Comparison between before surgery and after surgery according to basal AFC and mean OVVOL in laparoscopic tubal disconnection group and salpingectomy group.

Groups / Time of measurement		Before surgery (n=22)	After surgery (n=22)	Mean Diff.	p-value
Laparoscopic tubal Disconnection group	AFC	17.18±2.41	17.16±2.40	-0.02±0.07	> 0.05
	Ovarian volume	10.21±1.43	10.20±0.17	-0.01±0.02	> 0.05
Laparoscopic Salpingectomy group	AFC	17.32±2.42	17.26±2.42	-0.06±0.08	> 0.05
	Ovarian volume	10.22±0.23	10.10±0.15	-0.12±0.18	< 0.05

Paired Sample t-test

DISCUSSION

Ovarian reserve is affected by multiple determinants; genetic variants, environmental factors, biological or reproductive age, diseases and surgeries. Ovarian reserve cannot be measured directly, the evaluation of ovarian reserve is difficult to carry out. The serum level of follicle-stimulating hormone (FSH) is a predictor of functional ovarian reserve, but its usefulness is limited considering that the vast majority of patients undergo monolateral surgery and the contralateral intact gonad may completely substitute for reduced function of the operated ovary **(Sonya et al., 2012).**

Many studies reported that basal antral follicle number (AFC) and mean ovarian volume (OVVOL) could be used as indicators of ovarian reserve. Some studies stated that basal AFC is the most accurate biomarker to assess female fecundity. Others stated that mean OVVOL strongly correlates with the number of non-growing follicles and is a useful factor in the indirect estimation of human ovarian reserve **(Agrawal et al., 2014).**

Most studies on the topic of ovarian reserve after pelvic surgery are provided by infertility centers and are consequently lacking fertile patients and randomized selection of patients.

The present study included both infertile patients and fertile patients but also limited by selecting patients needing the procedure. According to this study, laparoscopic excision of uterine tube may affect the ovarian reserve, compared with laparoscopic proximal tubal disconnection.

Mostly, this was attributed to the damage to the ovarian vascular system during laparoscopic electrocoagulation or thermal damage of surroundings**.** Our study also has demonstrated that laparoscopic salpingectomy adversely affected ovarian reserve. This negative effect was significant in ovarian volume and insignificant in antral follicle count, when measured on the third menstrual cycle. The study has demonstrated that laparoscopic proximal tubal disconnection did not affect ovarian reserve. All study cases were examined by 7.5 MHz trans vaginal sonography. Basal AFC and mean OVVOL were measured on the 3rd day of the menstrual cycle before surgery and on the 3rd day of the third menstrual cycle after surgery.

As regard to transvaginal ultrasound examinations:

For the proximal tubal disconnection group, no difference was detected for the quantitative data between before and after surgery. On the 3rd menstrual cycle follow-up visit, the counts and the diameters taken were nearly the same as before surgery, and the calculated data were the same.

For the salpingectomy group, a difference was detected for the quantitative data between before and after surgery. On the 3rd menstrual cycle follow-up visit, the counts and the diameters taken were reduced than that before surgery; this negative effect was significant only in mean OVVOL and still insignificant in basal AFC.

On the 3rd menstrual cycle follow-up visit in salpingectomy group, the basal AFC showed negative effect, which was statistically insignificant, while the mean

OVVOL showed negative effect which was statistically significant if either compared to before surgery or compared to the tubal disconnection group.

In both groups, the basal AFC seems to be less affected than mean OVVOL (on the 3rd month follow up visit).

This analysis of collected data suggested that proximal tubal disconnection has no appreciable effect on/ did not affect ovarian reserve measured by basal AFC and mean OVVOL while salpingectomy has negative effect, measured by basal AFC and mean OVVOL and significant only in mean OVVOL. According to this study, laparoscopic proximal tubal disconnection can completely preserve ovarian reserve (OR).

Our results were in agreement with the study of **Rustamov et al. (2016)** who studied the effect of salpingectomy, ovarian cystectomy and salpingo-oopherectomy on ovarian reserve. The analysis of retrospectively collected cross-sectional data suggests that neither salpingectomy nor ovarian cystectomy for cysts other than endometrioma has an appreciable effect on ovarian reserve determined by AMH, AFC and FSH. In contrast, salpingo-oopherectomy and ovarian cystectomy for endometrioma appear to have a significant detrimental impact on ovarian reserve. Our results were in agreement with this study regarding unaffected antral follicle count after salpingectomy, but our results were different regarding the following aspects: We restricted the population age between 20 and 30 years old instead of age range between 20 and 45 years old in the study of Rustamov et al. (2016). We have studied both tubal disconnection and salpingectomy groups, examined AFC and OVVOL, and then found that mean ovarian volume significantly reduced in salpingectomy group in the 3rd menstrual cycle follow up visit. We followed up our patients for a short equal period (only 3 months). We did not study the effect of ovarian cystectomy or salpingo-oopherectomy on ovarian reserve. We did not investigate FSH or AMH **(Rustamov et al., 2016).**

CONCLUSION

Laparoscopic tubal disconnection did not affect ovarian reserve, while salpingectomy has a significant negative effect on ovarian reserve, estimated by OVVOL three months after the surgical intervention.

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تأثير فصل قناة فالوب أو استئصال قناة فالوب بالمنظار البطني على مخزون المبيض

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خلفية البحث: تعد خصوبة المرأة أهم وظيفة في حياتها، و بالتالي فإن الحفاظ على عناصر هذه الخصوبة أمر بالغ الأهمية. و يعد العمر البيولوجي و مخزون المبيض من أكثر العناصر الحيوية و الهامة للمرأة، خاصة في أواخر الثلاثينيات و الأربعينيات من العمر. ولكن بسبب التقارب التشريحي بين قناتي الرحم و المبيضين فإن إعتلال قناة الرحم أو علاجها جراحيا قد يؤثر على وظيفة المبيض. و عادةً ما نحتاج إلى فصل قناة فالوب أو إستئصالها في مريضات ضعف الخصوبة بسبب مرض أنبوب الرحم أو يكون ذلك لعلاج الحمل الأنبوبي خارج الرحم جراحياً.

الهدف من البحث: دراسة تأثير فصل قناة فالوب أو إستئصال قناة فالوب بالمنظار البطني على مخزون المبيض.

المريضات وطرق البحث: جرت هذه الدراسة في وحدة المناظير بقسم التوليد و أمراض النساء بمستشفيات جامعة الأزهر في الفترة من أكتوبر 2019 إلى سبتمبر 2020 ، حيث تم دراسة 44 مريضًة تعانين من مرض قناة فالوب، و قد خضعت إثنتان وعشرون مريضة لفصل قناة فالوب بالمنظار البطني، بينما خضعت إثنتان وعشرون مريضة أخرى لإستئصال قناة فالوب بالمنظار البطني. و في كلتا المجموعتين تم قياس مجموع عدد الجريبات في كلا المبيضين (AFC)، و كذلك قياس متوسط حجم المبيضين (OVVOL) عن طريق الفحص المهبلي بالموجات فوق الصوتية (TVS) قبل الجراحة وبعدها بثلاثة أشهر.

نتائج البحث: لم يختلف متوسط مجموع عدد الجريبات ومتوسط حجم المبيضين قبل وبعد فصل البوق بالمنظار البطني مما يشير إلى عدم وجود أي تأثير له على مخزون المبيض، بينما كان متوسط مجموع عدد الجريبات ومتوسط حجم المبيضين قبل و بعد إستئصال الأنبوب الرحمي بالمنظار البطني مختلفين، وكلاهما إنخفض، لكن الفرق السلبي ذو دلالة إحصائية في متوسط حجم المبيضين فقط.

الاستنتاج: لا يؤثر فصل قناة فالوب على مخزون المبيض، في حين أن إستئصال قناة فالوب له تأثير سلبي على مخزون المبيض بحسب ما تم متابعته بقياس مجموع عدد الجريبات في كلا المبيضين و متوسط حجم المبيضين قبل الجراحة و بعد ثلاثة أشهر من التدخل الجراحي عن طريق المنظار البطني. وهذا التأثير السلبي لإستئصال قناة فالوب علي مخزون المبيض أعطي قيمة ذات دلالة

إحصائية عند قياس متوسط حجم المبيضين فقط، ولم يعطِ قيمة ذات دلالة إحصائية عند قياس مجموع عدد الجريبات في كلا المبيضين.

الكلمات الدالة: مخزون المبيض، عدد جريبات المبيض، حجم المبيض، فصل قناة فالوب، إستئصال قناة فالوب، المنظار البطني.