
Ovarian doppler changes following tubal salpingectomy for hydrosalpinx

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Abstract

Background: Hydrosalpinx is a frequent tubal pathology encountered among infertile female. Hydrosalpinx impairs the expression of factors essential for differentiation of the endometrium impairing endometrial receptivity; reducing the in vitro fertilization success rate. Removal of a hydrosalpinx can increase the implantation rate of in vitro fertilization. However, salpingectomy could potentially affect the ovarian vascularity and may impose a potential change in ovarian Doppler indices. .

Objective: to assess the changes in ovarian vascularity following laparoscopic tubal salpingectomy in terms of change in ovarian Doppler indices.

Setting: Department of Obstetrics and Gynecology, Suez Canal University Hospitals, Ismailia, Egypt.

Patients and Methods: This prospective cohort study included 25 patients with unilateral communicating hydrosalpinx treated with laparoscopic tubal salpingectomy and ultrasound ovarian Doppler indices were assessed before and after surgery.

Main outcome measures: Tubal salpingectomy showed increased local ovarian vascular resistance with significant ovarian Doppler indices changes.

Results: Both pulsatility index and resistive index increased significantly 3 months after surgery denoting increased vascular resistance (p value 0.03 and 0.01 respectively).

Conclusion: laparoscopic tubal salpingectomy for treatment of hydrosalpinx can potentially affect ovarian Doppler indices with significant increase in ovarian local vascular resistance.

Keywords: Ovarian Doppler, Laparoscopic salpingectomy.

Introduction

Tubal disease is responsible for 25% to 35% of cases of female infertility (1). Hydrosalpinx is known to affect one third of women with tubal pathology. It is a pathologic tubal disorder in which distally obstructed fallopian tubes of various pathologies become filled with fluid, forming a saccular structure (2).

The expression of factors essential for differentiation of the endometrium is impaired by hydrosalpinx consequently deteriorating endometrial receptivity; reducing the IVF success rate, implantation rate,

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and pregnancy rate by 50% and doubles the rate of spontaneous abortion(3).

It is generally recognized that removal of a hydrosalpinx can increase the implantation rate of in vitro fertilization. However, whether salpingectomy affects ovarian reserve is uncertain, with some studies suggesting that salpingectomy decreases ovarian reserve (4), and other studies indicating that it has no effect on ovarian reserve (5).

The close anatomical association of the vascular and nervous supply to the fallopian tubes and ovaries constitutes the rationale for the risk of impaired ovarian function after surgery (6,7).

The purpose of this work was to document the changes in ovarian Doppler indices following laparoscopic tubal salpingectomy for hydrosalpinx.

Patients and methods

Patients

This is an observational prospective cohort study which was performed at the department of Obstetrics and Gynecology, Suez Canal University hospital. This study was approved by the faculty ethical committee; and all patients gave an informed consent before inclusion in the study. This prospective cohort study included 25 patients with unilateral communicating hydrosalpinx more than 3 cm long by ultrasound with the age between 20 and 40 years.

All patients had an initial assessment to diagnose hydrosalpinx. Hydrosalpinx was diagnosed when an elongated tubular mass with echogenic wall and linear echoes in the lumen was observed by ultrasound and confirmed by Hysterosalpingography; Hydrosalpinx appear enlarged and irregular, with absent rugae, and most often with failure of contrast medium spilling from the tubes into the pelvis.

Methods

After obtaining informed consent all the patients in the study were subjected to detailed history taking, General , and local examinations.

Ultrasound indices of ovarian function:

Assessment of ultrasound parameters of ovarian function were done by measurement of antral follicular count (AFC), ovarian volume and ovarian stromal blood flow.

AFC is defined as the number of all small follicles (between 2 and 9 mm) counted in the ovary. Ovarian volume calculated by multiplying the 3 dimensions of the ovary, then by 0.5. i.e. $0.5233 \times D1$ (length) $\times D2$ (width) $\times D3$ (breadth)(Cm^3).

Ovarian stromal blood flow indices included pulsatility index (PI) resistivity index (RI) and systolic diastolic ratio S/D ratio

All ultrasonographic examinations were done at the ipsilateral ovaries before and 3 months after laparoscopic surgery between day one and day 4 of their cycles using a Philips HD11 XE Transvaginal ultrasonography with a 7.5-mHz probe. All examinations were conducted by the same investigator to remove interobserver bias, and the parameters were measured at least three times and the mean value was recorded.

Surgical intervention:

Laparoscopic salpingectomy was performed using bipolar cautery and scissor. Adhesiolysis was performed if necessary. The mesosalpinx was transected just below the fallopian tube to minimize any compromise to the Collateral blood supply of the ipsilateral ovary. The fallopian tube was transected 1–1.5 cm from the cornual region.

Results

The demographic and clinical characteristics of the study population are presented in table (1).

There was statistically significant difference between the ovarian doppler indices before and after surgery ,with a statistically significant increase in resistive index (from 0.65 ± 0.19 to 0.76 ± 0.16 and p value =0.01) and a statistically significant increase in pulsatility index (from 1.2 ± 0.95 to 1.78 ± 0.9 and p value =0.03) table (2).

Discussion

This prospective cohort study was performed on infertile women below 40 years of age with unilateral communicating hydrosalpinx to detect the effect of laparoscopic tubal salpingectomy on ovarian Doppler indices. 25 females with unilateral communicating hydrosalpinx were recruited in the study. They were all subjected to treatment

with laparoscopic salpingectomy, and the ovarian Doppler indices were recorded before and three months after surgery.

In our patients the follow-up evaluation has been done 3 months after surgery. Nevertheless, a lot of studies demonstrate that choosing the third postoperative month to test the effect of surgery on ovarian functions is enough to assess the extent of recovery after acute ovarian damage (14).

Moreover, ovarian transplantation studies have clarified that the formation of small preantral and antral follicles from quiescent primordial follicles requires at least 3 months (19), a specific time point that we choose as follow-up in our study.

The results of the present study showed higher values of pulsatility (PI) index, resistivity index (RI) and S/D ratio in the post-operative follow up compared to the preoperative values. There was a statistically significant increase in resistive index from 0.65 ± 0.19 to 0.76 ± 0.16 and p value = 0.01, and statistically significant increase in pulsatility index from 1.2 ± 0.95 to 1.78 ± 0.9 and p value = 0.03.

Salpingectomy has been postulated to decrease ovarian reserve through several mechanisms. One common argument is that ovarian blood flow may be compromised during salpingectomy. Because the tubal branch of the uterine artery originates at the same point as the ovarian branch of the uterine artery, damage to ovarian branch as it traverses the mesosalpinx, by surgical disruption or thermal spread may decrease blood flow to the ovary. (15)

Strandell et al in 2001 examined 26 women who underwent salpingectomy because of hydrosalpinx and acted as their own controls before and after surgery. The study did not describe any signs of compromised ovarian function after surgery. Two other similar studies reached the same conclusion (17, 18). Also, hemodynamic studies using Doppler ultrasonography in patients with hydrosalpinx have revealed that the blood flow to the endometrium and ovary may be impaired at baseline. Thus, a decrease in blood flow to ovary may occur after salpingectomy for hydrosalpinx compared to tubal ectopic pregnancies. (8,9)

Some surgeons have also argued that disruption of blood flow may occur only with poor surgical technique. The use of either a 5-mm Harmonic® scalpel or LigaSure device in cauterization of the

mesosalpinx as close as possible to the fallopian tube can markedly minimize damage to ovarian blood supply, as these instruments minimize lateral thermal spread compared to monopolar or conventional bipolar electrocautery, thereby reducing unintended tissue damage.

However, whether these postsalpingectomy ovarian vascular changes affect the ovarian reserve or not, it is still in debate. In a systematic review to investigate the impact of salpingectomy on ovarian reserve, the overall analysis as well as subgroup analysis based on laterality, age and AMH (anti-müllerian hormone) kits revealed no short-term changes in serum AMH concentrations after salpingectomy (10). These results are surprising given the expected post-salpingectomy damage of ovarian reserve as a result of impairment of ovarian blood supply as shown in several previous studies (11,12,13)

Possible explanation for these results is that the postulated post-salpingectomy decline of ovarian reserve may be a chronic process that could take a long time to occur. In other words, the possible post-salpingectomy impairment of blood supply may lead to chronic ovarian ischemia that could take a relatively long time to cause reduction in the number of the small antral follicles with subsequent fall in circulating AMH, which is exclusively secreted from these follicles. This hypothesis, however, requires validation through further long-term follow-up studies on the changes of circulating AMH after salpingectomy. (16)

In contrast to their result, our measures were ovarian stromal blood flow in the ovarian stroma at a maximum distance from the ovarian capsule not the ovarian artery which may explain the difference.

The limitations of this study are its small sample size and lack of long-term follow up. We do not know whether the differences in ovarian volume and AFC would begin to appear as the participants get further out from surgery.

Conclusion

The results of the present study showed higher values of pulsatility (PI) index, resistivity index (RI) and S/D ratio in the post-operative follow up compared to the preoperative values. Which postulates that laparoscopic salpingectomy in-

creases local ovarian vascular resistance which could affect ovarian reserves over longer duration. The revert to other surgical modalities rather than salpingectomy in the management of hydrosalpinx in infertile females with already embarrassed ovarian reserve seems to be a wiser option.

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Appendix**Table (1):** Demographic and clinical characteristics of the study group.

Age (years)	Mean \pm SD Range	26.4 \pm 4.5 20-39
Smoking	Smoker Non-smoker	0 25(100%)
BMI	Mean \pm SD Range	24.6 \pm 3.93 20-34
Infertility	Primary Secondary	6(24%) 19(76%)
Years of infertility	3.4 \pm 1.2	
Parity	0 1 2	6(24%) 13(52%) 6(24%)
Abortion	0 1 2	6(24%) 16(64%) 3(12%)
Ectopic	0 1 2	16(64%) 8(32%) 1(4%)
Pelvic surgery	Yes No	17(68%) 8(32%)

Table (2) : Ovarian doppler indices before and 3 months following salpingectomy

Parameter	Pre-salpingectomy	Post-salpingectomy	t-test	p-value
Ovarian volume(cm3)	5.2 \pm 1.55	4.85 \pm 2.2	1.4	0.18(NS)
Antral follicular count	8.3 \pm 2.4	9.6 \pm 1.4	1.39	0.14(NS)
Pulsatility index	1.2 \pm 0.95	1.78 \pm 0.9	2.08	0.03*
Resistivity index	0.65 \pm 0.19	0.76 \pm 0.16	2.45	0.01*
S/D ratio	3.6 \pm 2.88	4.95 \pm 4.3	1.21	0.23(NS)

(NS) Statistically non-significant difference between both groups (P value > 0.05)

* Statistically significant difference between both groups (P value \leq 0.05)