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Abstract

Aim: To evaluate the effect of total salpingectomy on ovarian reserve and function during abdominal hysterectomy.

Method: Twenty five patients undergoing total abdominal hysterectomy for dysfunctional uterine bleeding were randomly allocated into two groups; group (I) 13 patients undergoing total abdominal hysterectomy with bilateral excision of both tubes. Group (II) 12 patients undergoing classical method of total abdominal hysterectomy. Antral follicles count, ovarian volume, ovarian stromal blood flow and serum FSH,LH were evaluated preoperatively and 6,12 months postoperatively.

Results: A significant increase in ovarian stromal blood flow was observed 6 months post operatively in both groups with significant decrease in pulsatility and resistance indices (PI&RI), antral follicle count were significantly higher in group (I) compared to group (II) with no significant changes in FSH, LH levels in both groups. Twelve months postoperatively group I showed significantly higher antral follicles count, larger mean ovarian volume and increased ovarian stromal blood flow than group II.

Conclusion: Complete excision of tubes with caution not to damage the ovarian vascular structure during abdominal hysterectomy may preserve ovarian blood flow and function.

Introduction

Oophorectomy during abdominal hysterectomy in a premenopausal woman with sufficient ovarian reserve is still subject to debate, since this may cause sudden hormonal imbalance, aggravation of menopausal symptoms, and decrease of libido[1]. Hysterectomy alters intraovarian blood flow and may impair ovarian function [2]. However ,It is not clear whether tubal conservation at time of hysterectomy has any impact on ovarian blood flow, which has dual blood supply from terminal ascending branch of the uterine and corresponding ovarian artery [4, 5,]. Strandell A et al.

studied the effect of prophylactic salpingectomy on ovarian response in IVF treatment and found no impairment of ovarian response after prophylactic salpingectomy [6] moreover; Sezik M et al [7] suggested that complete removal of fallopian tube has no advantageous effect on ovarian blood supply during abdominal hysterectomy. Xiangying H et al found that the total blood supply to the ovary was reduced after hysterectomy due to loss of blood coming from uterine arteries and advised not to remove the uterus in patients for whom other conservative measures can be performed , otherwise new technique must be followed to keep an intact artery network as possible between oviduct and ovary for patients requiring hysterectomy (8). Furthermore , Repasy et al [9] found that 35% of post-hysterectomy patients without tubal excision developed hydro-salpinx or tubo-ovarian cysts causing symptoms that led to additional surgery. Although rarely encountered, the occurrence of post-hysterectomy carcinoma in the preserved fallopian tube has been reported (10, 11). We speculate that resection and near –complete excision of the tubes during hysterectomy with protection of ovarian vasculature could preserve the blood supply to the ovary and protect against further tubal complication later on. The aim of this study was to evaluate the effect of total salpingectomy on the ovarian blood flow and function during total abdominal hysterectomy.

Methods

This prospective randomized study was conducted one 25 attendant of outpatient clinic of Obstetrics and Gynecology departments, Zagazig University Hospital, from January 2009 to January 2010. All patients were scheduled to total abdominal hysterectomy without oophorectomy due to dysfunctional uterine bleeding. Patients were classified randomly into two groups. Group I consisted of odd numbers of patients (n = 13) and were subjected to total abdominal hysterectomy with bilateral complete excision of the tubes. Group II included an even numbers of patients (n =12) for whom the classical approach of hysterectomy was

performed. Informed written consent was taken from all participants, and the study was approved by the local hospital ethics committee of Zagazig University.

Inclusion criteria which were (i) age 40-43 years, (ii) absence of menopausal symptoms, (iii) baseline FSH value of 5 cm³. Patients were excluded if they had (i) hormonal treatment and or hormonal contraception for the last 6 months; (ii) history of previous pelvic surgery; (iii) any cystic or solid ovarian mass >10 mm.

Trans vaginal ultrasonographic examination by same observer with was carried out for all patients using (GE healthcare, voluson 370 pro V, Austria) medical system equipped with 7.5 M Hz vaginal probe. On the first half of the cycle, mean ovarian volume was calculated by taking the mean value of the two ovary measurements, using the ellipsoid formula (volume= width x length x depth x 0.5233) [12]. Antral follicle count (follicles measuring 2-8 mm was obtained in two dimensional planes[13]. Color directed pulsed Doppler mapping was used to visualize ovarian stromal blood flow. The high- pass filter was set at 50 to 100 Hz, blood flow waveform were obtained by positioning the Doppler cursor on colored spot, indicating ovarian arterial flow. Ovarian artery signals have low velocity and high impedance. At least five consecutive cardiac cycle were obtained and resistance index (RI) and pulsatility index (PI) were obtained.

Blood samples were extracted from all patients for hormonal assay (serum FSH, LH). LH, FSH were measured by ELISA kits (cat NO.KIF 40570 and 4023, respectively, Medix Biotech Inc: USA, with sensitivity < 0.5 m lu/ml.

For group I Fallopian tubes were bilaterally dissected and freed completely from the underlying mesosalpinx through avascular window in the broad ligament, beginning from infundibular portion of the tubes, this was accomplished by bites of Kocher clamps placed parallel to and as close as possible to fallopian tube, followed by incision with scissor, free-tie ligature of 0 delayed absorbable suture was placed, caution was given not to damage the underlying vascular structures. Fallopian tubes were resected with the uterus. The mesovary was cut and ligated with the mesosalpinx in such a way that the lateral portions of the mesovary where the infundibulopelvic fold and the ovarian vessels reach the organ remain intact and the medial part of it, along with ovarian ligament was cut.

For group II clamping the ovarian ligament together with the tube and infundibulopelvic ligament as near as to uterus, fallopian tubes were removed partially leaving behind the neighboring para-ovarian tissue.

The patients were followed up 6 and 12 months

postoperatively. Transvaginal ultrasound examinations were done at presumed follicular phase (when no follicles beyond the diameter of 10 mm were visualized to be sure that the patients were in early follicular phase) to detect the number of antral follicles and ovarian volume calculation. Doppler study to ovarian stromal blood flow was done. Blood extraction to evaluate the level of serum FSH and LH from all participants was done.

Statistical analysis

Statistical analysis was carried out using SPSS version 11.0 for Windows (SPSS Inc., Chicago, IL, USA). Changes in outcome measures between the groups following normal distribution were tested by Student's *t*-test, paired *t*-test and Friedman test for independent variables and those not following normal distribution by Mann-Whitney *U*-test, Changes within the groups in repeated measurements were analyzed by Wilcoxon's signed rank test. A value of $P \leq 0.05$ was considered significant.

Results

Twenty five patients participated in this study, all were scheduled for abdominal hysterectomy due to dysfunctional uterine bleeding. Table (1), showed no significant difference between the both groups regarding age, body mass index, parity, preoperative mean ovarian volume, early follicular antral follicles count, serum FSH, LH, and ovarian stromal Doppler indices.

Table 2, showed no significant increase in ovarian stromal blood flow at 6 and 12 months postoperatively in group I, and a significant increase in ovarian volume 12 months post operatively. While in group II, the ovarian stromal blood flow was significantly increased at sixth months postoperatively but was significantly reduced at 12 months post-operative as compared with preoperative value. The antral follicles count was significantly reduced both 6 & 12 months post-operative in group II. When comparing the two groups with each other, 6 months post-operatively group I showed significantly higher antral follicle count, 12 months postoperatively group I showed significantly higher antral follicles count, mean ovarian volume, and ovarian stromal blood flow.

Discussion

Abdominal hysterectomy is one of the most common gynecological procedures performed in clinical

practice. Resection of the ovaries during abdominal hysterectomy is the most challenging part of the operation; some studies demonstrated that ovarian preservation during hysterectomy may not occasionally avoid ovarian failure or menopausal symptoms [14, 15]. Whether salpingectomy affects ovarian function remains controversial issue.

In this study we found a significant increase in ovarian blood flow in both groups 6 months postoperatively reflected by decrease in RI and PI values. Our findings run in agreement with a previous study that regards the decrease in ovarian artery pulsatility index as a compensatory response because the total blood supply to the ovary was reduced due to loss of blood coming from uterine arteries (8). Furthermore, Nahas and coworker [2] studied the effect of total abdominal hysterectomy on ovarian blood supply in women of reproductive age and concluded that there was reduced PI values suggesting a decrease in the resistance of flow in the ovarian arteries. However 12 months postoperatively we found a significant decrease in ovarian stromal blood flow in group II with increase in RI & PI values. Ovarian volume, serum FSH & LH were not significantly changed 6 months postoperatively in both groups, Fanchin et al [16] and van Rooij et al [17] postulated that serum antimüllerian hormone (AMH) level would appear to better reflect the level of ovarian aging than other known markers of ovarian reserve, as basal serum FSH level, inhibin B level and antral follicle count. We use serum FSH, LH, antral follicle count for assessing the ovarian reserve pre- and post-operatively because of the ease and availability

The number of the antral follicles was significantly high in group I who had total excision of the tube 6 & 12 months postoperatively. Ovarian volume was significantly higher in group I who underwent total excision of the tube 12 months postoperatively. We suggested that disruption of arterial blood supply of the ovary through clamping the mesovary with infundibulopelvic ligament in group II could affect ovarian function. The ovarian blood flow is the first parameter to be affected, the antral follicle count is also affected early by disrupted blood supply to the ovaries while ovarian volume and hormonal changes are late. This is consistent with the results of Chan C et al [3,] who studied the effect of salpingectomy on ovarian reserve in terms of ovarian volume, antral follicle count, and stromal blood flow in women undergoing laparoscopic or laparotmic salpingectomy for tubal ectopic pregnancy, and they stated that "ovarian ultrasound parameters were similar after salpingectomy on the normal and on the operated side,

however decreased ovarian blood flow after laparoscopic but not on laparotomic salpingectomy. These findings might emphasize the implication of the surgical technique and method for protection of future ovarian reserve." They explained these results as a "higher degree of tissue trauma resulting from tubal surgery was associated with impaired ovarian function, as it is possible that during open surgery it was easy to place the surgical clamp very close to mesenteric border of the affected tube and hence limit damage to blood vessels in the mesosalpinx. In contrast during laparoscopic salpingectomy, bipolar diathermy was the method employed in cauterizing the mesosalpinx; the heat damage could be more as the depth of damage was not limited to excision site".

Our results can be explained as theoretically ovarian artery forms an arcade-like anastomosis system with the tubal branch of the uterine artery at the junction of the mesosalpinx and the mesovary, close to the hilum of the ovary. Careless surgery in this area can undoubtedly jeopardize the ovarian arterial blood supply [9]. In turn it can disrupt follicular development and normal steroidal production. So in our study affection of ovarian function which was manifested more 12 months postoperatively in group II mostly due to stretching of the infundibulopelvic vessels with a consequent thrombosis and scarring leading to decreased blood flow to the ovary. These results were in accordance to that found by Chan C et al [3] who stated that there was impaired ovarian blood flow & reduced antral follicle count on operated site shortly after laparoscopic salpingectomy. However Sezik M et al [7] studied the effect of total salpingectomy on ovarian reserve during abdominal hysterectomy and they concluded that complete removal of fallopian tube has no advantageous effect on ovarian blood supply.

In conclusion complete excision of tubes during abdominal hysterectomy with care to preserve the ovarian vascularity may preserve the ovarian function; a second advantage is protection against development of tubal adenocarcinoma or tuboovarian cysts in the lifted tubes. Larger study group is needed to confirm these results.

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Illustrations

Illustration 1

Table 1: Preoperative baseline data in the study groups.

Studied parameters	Group I with total salpingectomy (n = 13) Mean ± SD	Group II without salpingectomy (n = 12) Mean ± SD
Mean Age	41.4 ± 1.5	41.9 ± 1.7
Body mass index	23.5 ± 3.4	25.6 ± 4.8
Parity	3.4± 1.6	4.2 ± 0.9
Number of Antral follicles	6.5 ±1.6	5.7±1.5
Mean ovarian volume (cm ³)	7.3 ± 1.7	7.5 ± 1.5
Early follicular FSH (IU/L)	6.3 ± 1.4	6.5 ± 1.6
Early follicular LH (IU/L)	4.8 ± 1.3	5.8 ± 1.8
Early follicular estradiol (pg/ml)	95.2±13.8	93.6± 14.6
PI ovarian stromal vasculature	1.24 ± 0.76	1.47± 0.68
RI ovarian stromal vasculature	0.63 ±0.18	0.73 ± 0.13

Illustration 2

Table 2: Comparison of pre- and post-operative ovarian reserve parameters.

	Preoperative	6 months Postoperative	12 months postoperative
Number of antral follicles Group I(n=13) Group II (n=12)	6.5±1.6 5.7±1.5	6.3±1.7 ^b 4.6±1.6 ^a	5.3±2 ^b 3.7±1.2 ^a
Mean ovarian volume(CM3) Group I (n=13) Group II (n=12)	7.3 ± 1.7 5.7±1.5	6.5 ± 1.6 7.1± 0.98	8.8 ± 2.3 ^{ab} 6.3 ± 1.5
Early follicular FSH (IU/L) Group I (n=13) Group II (n=12)	6.3 ± 1.4 6.5 ± 1.6	6.4 ± 1.5 6.7 ± 1.5	6.7 ± 1.7 7.1 ± 1.2
Early follicular LH (IU/L) Group I (n=13) Group II (n=12)	4.8 ± 1.3 5.8 ± 1.8	4.5 ± 1.4 5.9 ± 1.4	5.2 ± 0.92 6.2 ± 1.3
PI of ovarian stromal vasculature Group I (n=13) Group II(n=12)	1.24±0.76 1.47 ± 0.68	0.97 ± 0.4 ^a 0.95 ± 0.34 ^a	0.84± 0.3 ^{ab} 1.71 ± 0.46 ^a
RI of ovarian stromal vasculature Group I (n=13) Group II (n=12)	0.63 ± 0.18 0.73 ± 0.13	0.52 ± 0.19 ^a 0.67 ± 0.4 ^a	0.54 ± 0.1 ^{ab} 1.52 ± 0.3 ^a

^a Significant difference in same group pre and postoperatively

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