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Ovarian Performance after Laparoscopic Salpingectomy or Proximal Tubal Division for Hydrosalpinx

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Abstract

Objective: To compare the effect of laparoscopic salpingectomy and proximal fallopian tubes division on ovarian function after controlled ovarian hyperstimulation.

Methods: Seventy six patients undergoing their first IVF-ET cycle were divided into (group 1) 20 patients undergoing laparoscopic salpingectomy, (group 2) 19 patients undergoing proximal tubal division and (group 3) 37 tubal-factor patients without hydrosalpinx as control group.

Main outcome measure (s): Ovarian artery pulsatility index (PI), basal follicle-stimulating hormone (FSH) levels before and after surgery, operative time, total dose and duration of IVF stimulation, number of retrieved and fertilized oocyte, and number of embryo transferred.

Result (s): No significant differences in mean ovarian artery pulsatility indices among any of the groups before or after surgery. The mean FSH value was similar before and after laparoscopic proximal tubal division. The FSH value significantly increased after laparoscopic salpingectomy. The operative time in the PTD group was significantly shorter than in the salpingectomy group, total dose and duration of stimulation, number of retrived and fertilized oocyte, were not significantly different between group 1, group 2 or control group.

Conclusion (s): Laparoscopic salpingectomy or proximal tubal division gives similar responses to IVF-ET cycles. However, proximal tubal division preserved ovarian function.

Keywords: Laparoscopy; Hydrosalpinx; Salpingectomy; Proximal tubal division; *In vitro* fertilization

Introduction

Tubal disease, particularly hydrosalpinx, has a detrimental effect on *in vitro* fertilization (IVF) cycle outcome [1]. Although, prophylactic salpingectomy for large hydrosalpinges could improve pregnancy and live birth rate in women undergoing IVF [2], the effect of salpingectomy on ovarian function remains a matter of debate. Decreased ovarian response ipsilateral to the site of salpingectomy were shown in one study [3], in other study no significant differences in the response to ovarian stimulation before and after salpingectomy were noted when patients were used as their own controls [4]. Due to the close anatomical association of vascular and nervous supply of tubes and ovaries, partial disruption of ovarian blood supply is possible after unilateral or bilateral salpingectomy [5]. Standell et al. [4] recommended cautious use of electrocautery, with resection very close to the actual tube to avoid damage to the medial tubal artery, and to leave a portion of an adherent tube on the ovary rather than performing unnecessary radical salpingectomy. In cases where it would be difficult to perform the salpingectomy close to the fallopian tube, Lass recommended clamping the proximal part of the hydrosalpinx in combination with distal fenestration [6]. In recent years, laparoscopic proximal tubal occlusion procedure was performed more often. This study compare the effect of laparoscopic salpingectomy with proximal tubal division on ovarian function assessed as ovarian response to IVF treatment for infertility patient with hydrosalpinx.

Patients and Methods

This prospective non randomized controlled study was conducted in Royal Commission Hospital, Jubail Industrial City, KSA, between July 2009 and November 2011. BY this prospective non randomized controlled study was conducted in Royal Commission Hospital, Jubal industrial city, between July 2009 and November 2011. Inclusion criteria were nulliparous women under 39 years old during their first IVF-ET cycle, cycle day 3 serum FSH level <10 mIU/mL, estradiol (E2) level <80 pg/mL, and normal diagnostic hysteroscopy performed 6 months before the IVF-ET cycle. All patients underwet transvaginal ultrasound examination and hysterosalpingoraphy using an oil-based radiographic contrast agent.

The presence of hydrosalpinges was diagnosed before laparoscopic surgery, and the diagnosis of was confirmed at the time of laparoscopy.

Exclusion criteria were previous salpingectomy, history of unilateral or bilateral ovarian cystectomy, and patients with mixed tubal surgery (i.e., salpingectomy on one side and tubal division, adhesiolysis or salpingostomy on the other side). Patients with mixed infertility factors and those who had hydrosalpinges less than 3 cm were also excluded from the study.

Patients were divided into three groups (Group A) included 20 patients undergoing laparoscopic salpingectomy unilateral or bilateral, (Group B) 19 patients undergoing tubal division unilateral or bilateral and (Group C) 37 patients with bilateral tubal blockage (i.e., tubal infertility) at laparoscopy and/or hystero-salpingography without evidence of hydrosalpinges as a control group. The decision to perform either salpingectomy or tubal division was left to the surgeon.

Laparoscopic salpingectomy was performed using fine-point unipolar and bipolar cautery and CO_2 laser. Adhesiolysis was performed, if necessary. The mesosalpinx was transected just below

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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. Proximal tubal occlusion was performed using bipolar cautery applied at two sites separated by approximately 1 cm on the isthmic portion of the affected tube, and the hydrosalpinx was not drained.

Ovarian stimulation protocol

All women were treated according to a standardized long step-down ovarian stimulation protocol. Pituitary down regulation was achieved using GnRH agonist triptorelin (Decapeptyle, Ferring, Keil Germany) in all patients as a subcutaneous dose of (0.1 mg) daily starting in the midluteal phase of the preceding menstrual cycle. The initial dose of hMG (Fostimone, 75 IU Ibsa, Switzerland) 3 to 6 IM ampules of urinary FSH was individualized according to the patient's age and response. Baseline serum FSH, Serum E2 concentrations were measured on day 3 of ovarian stimulation and then repeated daily or every other day according to the individual's response to stimulation. Transvaginal ultrasound scan was arranged routinely on day 8 and day 10 of ovarian stimulation and every 2 days thereafter. When at least three follicles reached a mean diameter of ≥18 mm, hCG human chorionic gonadotropin 10,000 IU (Choriomon, Ibsa Switzerland) was administered.

Assessment of ovarian response and pregnancy outcome

Serum FSH and E2 concentrations were measured before surgery and 3 months after surgery but before commencing ovarian stimulation. Ovarian response to stimulation was calculated as the total dose and duration of hMG administration, the number of retrieved and fertilized oocytes, number of embryo transferred and serum E2 concentrations on the day of hCG administration. Bilateral Ovarian artery mean pulsatility index (PI) was assessed using pulsed wave directed color Doppler before and after surgery.

Statistical analysis

Data are presented as mean ± SD. Differences between groups were tested using one way ANOVA, $\chi 2$-test, and calculation of the Z-ratio as appropriate. The Statistical Package for Social Sciences (SPSS 15.0, Chicago) was used for statistical analysis. $P<0.05$ were considered statistically significant.

Results

The baseline clinical data and outcome of the first treatment cycle for group A, B and group C were shown in table 1, the three groups were comparable for age, ovarian artery pulsatilty index and basal FSH levels. Groups A and B were comparable for the percentage of unilateral and bilateral surgical procedures, and for ovarian artery pulsatility index after surgery. The operative time in (Group B) was significantly shorter than that of (Group A) (80.2 ± 11.5 min vs. 113.3 ± 25.0 min, P=0.07). Serum FSH levels were significantly higher in group A compared with group B after laparoscopic surgery, ($P<0.05$). The FSH levels were significantly higher after surgery than before surgery in group A (P=0.02) while, in the group B, the FSH level after laparoscopic surgery were comparable to those before surgery (P=0.479).

The responses to COH in the three studied groups were summarized in table 2. The required gonadotropin doses until oocyte retrieval, duration of stimulation, number of retrived and fertilized oocytes and estradiol level on hCG administration in were comparable between the three groups with no statistically significant difference in each parameter.

Discussion

Inflammatory cytokines present within hydrosalpnix fluid may play an inhibitory role on IVF-ET cycle outcome [7]. Women with hydrosalpinges expressed significantly less ά vb3 integrin, a presumptive marker of endometrial receptivity, than fertile controls [8]. Also, it has been demonstrated that HOXA10 expression, necessary for implantation, decreased in response to hydrosalpinx fluid and this was a potential molecular mechanism for diminished implantation rates. Salpingectomy restored endometrial HOXA10 expression [9]. Recently, the leukemia inhibitory factor (LIF) expression in the

	Salpingectomy group	PTD group	Control group	P-Value
Age (years)	34.4 ± 3.6	32.7 ± 6.3	31.7 ± 2.7	0.23
Unilateral surgery%	11/20	9/19	__	0.33
Bilateral surgery%	9/20	10/19	__	0.34
Basal FSH level before surgery	7.0 ± 3.8	8.1 ± 1.1	6.6 ± 2.3	0.42
Basal FSH level after surgery	15.3 ± 8.4[a]	9.0±4.3	6.7 ± 2.3	0.002[b]
Operative time (min)	113.3 ± 25.0	80.2 ± 11.5	__	0.07[c]
Ovarian artery PI (before surgery)	1.24 ± 0.76	1.47 ± 0.68	1.31 ± 0.58	0.13
Ovarian artery PI (after surgery)	1.06 ± 0.55	1.33 ± 0.61	1.28 ± 0.58	0.24

Data are expressed as Mean ± SD
a Significant differences between group A and B.
b P = 0.002 (group A: baseline pre-surgery vs. post surgery serum FSH levels).
c P = 0.07 (operative time In group A vs group B)

Table1: Baseline clinical and post surgery data for patients included in the study.

	Salpingectomy group	PTD group	Control group	P value
Total dose of hMG (ampoules)	23.3 ± 2.7	22.2 ± 3.4	24.1 ± 3.9	0.013
Duration of hMG stimulation (days)	9.5 ± 0.2	9.3 ± 0.4	10.1 ± 0.3	0.22
E2 on day of hCG (pmol/L)	2,556 ± 219	2,366 ± 282	2,921 ± 257	0.26
No. of oocytes retrieved	16.2 ± 1.2	17.5 ± 1.8	14.4 ± 1.3	0.11
No. of oocytes fertilized	12.87 ± 4.5	13.21 ± 4.7	11.8 ± 5.4	0.26
Number of embryo transferred	3.1 ± 0.5	3.3 ± 0.8	2.7 ± 1.0	0.17

Note: Data are expressed as Mean ± SD unless otherwise indicated

Table2: Response to controlled ovarian hyper stimulation in the studied groups.

endometrium was found to be significantly lower in infertile women with hydrosalpinges compared with fertile controls, and these levels were increased following salpingectomy [10]. Thus it is not the presence of hydrosalpinges, but the influx of hydrosalpinx fluid into the uterine cavity that could had a negative impact on endometrial receptivity of the embryo.

The risk of chronic infection, torsion and decrease in access to the ovary at oocyte aspiration may be also increased if a hydrosalpinx was left in situ .Thus prophylactic salpingectomy had been performed in hydrosalpinx patients before IVF-ET in an effort to eliminate the retrograde flow of potentially embryotoxic substances, with the majority of studies, demonstrating benefit of salpingectomy in enhancing IVF-ET cycle implantation and pregnancy rates over historic controls [1,2]. On the other hand this procedure is clearly invasive and may become technically difficult in the face of extensive pelvic adhesions, with an increased potential for injury to surrounding structures. In addition, transection of the tube too close to the cornua may also increase the risk of an interstitial pregnancy after embryo transfer, a devastating complication [11,12].

Several recent reports have indicated that patients who underwent salpingectomy showed no impairment of ovarian stimulation for ART treatment [2,13,14]. On the other hand, Lass et al. reported that a significant reduction in the number of developed follicles and retrieved oocytes were noted from the ovary ipsilateral to which a unilateral salpingectomy had been performed [3]. A theoretical decrease in ovarian blood perfusion may result after the saplingectomy, once some of the blood supply to the ovary is received through the branches of the uterine artery and the mesosaplingeal vascular arcade. Thus, bilateral salpingectomy could diminish ovarian function. In the rat model, a reduction in ovarian blood supply may have had a direct effect on ovulatory function [15] whereas in the rabbit model, fimbriectomy resulted in a reduced number of corpus luteum [16].

Proximal tubal occlusion represents a significantly less invasive approach that requires less surgical dissection and operative time while still eliminating retrograde flow of hydrosalpingeal fluid into the endometrial cavity. In one study the clinical impact of proximal tubal occlusion and salpingectomy was evaluated before IVF in patients with hydrosalpinges [17]. The implantation, clinical-pregnancy, and ongoing-pregnancy rates were comparable to in those who underwent salpingectomy or proximal tubal occlusion. Moreover, the approach and method of laparoscopic proximal division of fallopian tubes was easier and safer than laparoscopic salpingectomy.

In this study, we found that management of hydrosalpinges by laparoscopic salpingectomy or proximal tubal division gives similar response to controlled ovarian hyperstimulation but when comparing baseline presurgery with postsurgery serum FSH levels, the latter were significantly raised in the salpingectomy group. Thus salpingectomy may have a negative effect on ovarian reserve, compared with tubal division or no surgery.

Our results runs in agreement with a recent study which found that laparoscopic proximal tubal division preserved ovarian function and were an optimal operative method for infertility patients with hydrosalpinges. As the basal FSH values after laparoscopic proximal tubal division were comparable to those before surgery [18]. Also, the operative time in the PTD group was significantly shorter than that of the salpingectomy group, because the severe adhesion and large hydrosalpinges lengthened the operative time.

In a study done by Gelbaya et al. [5] the baseline FSH levels were significantly raised post surgery compared to pre-surgery, and post surgery FSH concentrations were significantly higher in the salpingectomy group when compared to the division of fallopian tubes group in agreement with our result. However, in their study the number of retrieved oocytes in the salpingectomy group was significantly lower when compared to the division of fallopian tubes group. Our result showed that IVF cycle outcomes were unaffected by salpingectomy as a great care was taken to transect the mesosalpinx just below the fallopian tube in an effort to minimize compromise to collateral ovarian blood supply. A more extensive transaction of the mesosalpinx could have a deleterious effect.

Also, in their study patients with mixed infertility factors were included and this could affect the response to stimulation.

Conclusion

Surgical management of hydrosalpinges by either laparoscopic salpingectomy or proximal tubal division gives statistically similar responses to controlled ovarian hyper stimulation. However, salpingectomy in women with hydrosalpinx may not be without reproductive risks. So, laparoscopic proximal division of fallopian tubes should be recommended for the treatment of hydrosalpinges rather than laparoscopic salpingectomy, especially for ovarian reserve and safety.

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