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# Comparative Study between Laparoscopic Tubal Disconnection and Ultrasound Guided Tubal Aspiration in the Management of Hydrosalpinx Prior to ICSI

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## Abstract

**Objective:** To compare the efficacy of ultrasound-guided aspiration with laparoscopic proximal tubal occlusion in the management of hydrosalpinx prior to ICSI.

**Patients and Methods:** This clinical trial included 40 candidates for ICSI suffering from hydrosalpinx. Patients were randomly divided into one of two groups for hydrosalpinx management; Group LD (n=20) by laparoscopic proximal tubal disconnection and Group AS (n=20), by vaginal ultrasound guided aspiration on the setting of the oocyte retrieval for the ICSI cycle. The primary and secondary outcome measures were clinical and chemical pregnancy rates, respectively.

**Results:** The two groups were comparable regarding basic clinical characteristics and results of ovarian stimulation and oocyte retrieval. The proportions of clinical pregnancies and chemical pregnancies were comparable in the two groups ( $p = 0.342$  and  $0.525$ , respectively). Eleven pregnancies were diagnosed chemically in laparoscopic disconnection group compared to 8 in aspiration group. In laparoscopic disconnection group one pregnancy failed to continue clinically.

**Conclusion:** Aspiration of hydrosalpingeal fluid at the time of oocyte retrieval is as effective as laparoscopic disconnection of the fallopian tube in terms of clinical pregnancy rate after ICSI cycles.

## Introduction

Tubal pathology accounts for 14% of the causes of subfertility. The most severe manifestation of tubal disease is hydrosalpinx [1]. An increased risk for early pregnancy loss and increased risk for ectopic pregnancies were reported [2,3,4].

A paradox emerged after recognition that IVF in patients with tubal disease was associated with lower implantation rates and an increased risk of early pregnancy loss than after IVF in other subfertile patients [5][6]. This deleterious effect of tubal disease on IVF outcome may be related to the severity of tubal damage [7].

The mechanism of this deleterious effect on IVF outcome is not clear. The hydrosalpinx fluid seems to have a key role [8]. It may affect the transferred embryo; possibly by embryotoxic factors [9]. The bathing of the endometrial cavity in hydrosalpinx fluid may interfere with the endometrial interaction with the transferred embryo necessary for implantation [10,11]. The presence of a thin layer of fluid upon the endometrial surface [12] and changes in endometrial peristalsis by the fluid [13] may wash-out or hinder implantation of the transferred embryo.

Many management options were suggested as proximal tubal occlusion. Other options include hysteroscopic tubal occlusion, ultrasound guided aspiration of hydrosalpinx and medical treatment (antibiotics and/

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or corticosteroids). Several authors suggest that ultrasound guided aspiration of hydrosalpinx fluid is the best alternative because it is simple, safe, easy and inexpensive. Furthermore, there is evidence supporting its beneficial effect on the outcomes of IVF-ET from several prospective randomized controlled studies [14,15].

The aim of the current study was to compare the efficacy of ultrasound-guided aspiration with laparoscopic proximal tubal occlusion in the management of hydrosalpinx prior to ICSI to assess the impact of treatment on ICSI cycle outcome.

## **Patients and Methods:**

This clinical trial was conducted at the Obstetrics and Gynecology Department, Kasr El Aini Hospital, Cairo University. The study involved 40 patients with tubal factor of infertility having hydrosalpinx and candidates for ICSI cycles.

Inclusion criteria were age 20-30 years, primary or secondary infertility, tubal factor of infertility with uni- or bilateral hydrosalpinx and scheduled for ICSI cycle using long protocol for controlled ovarian stimulation. Patients with male factor of infertility, uterine factor of infertility, poor ovarian reserve, poor response, obesity (BMI > 30 kg/m<sup>2</sup>) or any medical disorder were excluded from the study.

All patients were subjected to careful history taking, general and local examination. A recent hysterosalpingography (HSG) done within the last 6 months was used to confirm the presence of unilateral or bilateral fallopian tube dilatation with loss of rugal folds without or with decreased contrast in the peritoneal cavity. If HSG was not available, it was done during clinical evaluation.

Transvaginal sonography (TVS) was performed using a 7.5 MHz vaginal probe of Sonoace X6 ultrasound machine before laparoscopic management and two weeks after the operation. The uterus was scanned for detection of any endometrial abnormality, visible hydrosalpinx in the form of elongated, dilated, tortuous tube containing fluid which is anechoic was recorded.

The participants were randomized into one of two treatment groups:

- Group LD (n=20): In this group hydrosalpinx was managed by laparoscopic proximal tubal disconnection prior to the ICSI cycle.
- Group AS (n=20): In this group hydrosalpinx was managed by vaginal ultrasound guided aspiration on the setting of the oocyte retrieval for the ICSI cycle.

Laparoscopic assessment of the peritoneal cavity:

Under General anesthesia, CO<sub>2</sub> pneumoperitoneum and introduction of at least two ports was used to detect:

- Presence or absence of endometriosis.
- Peritoneal spill after cervical cannulation with methylene blue.
- Tubal disconnection using bipolar diathermy or salpingectomy

Technique of ovarian hyperstimulation and embryo transfer:

1. The induction protocol was the long luteal phase agonist protocol. Participants received (GnRHa) long protocol, Decapeptyl 0.1 µg SC injection daily starting on day 21. After pituitary down regulation had been confirmed, by serum E<sub>2</sub> < 50 pg/ml, 225-300 IU of hMG per day was started on day 3 of the cycle, then the dose was adjusted according to the response, being monitored by ultrasound on day 8 or 9 to establish the number of ovarian follicles.
2. Triggering of ovulation was done by 10000 units of hCG IM when two or more follicles reach 18 mm in mean diameter.
3. Ovum retrieval using transvaginal ultrasound was scheduled 34-36 hours after hCG injection
4. All grade embryos were transferred on day 3-5 after ovum retrieval.
5. Serum B-hCG test was done to confirm pregnancy two weeks after embryo transfer (chemical pregnancy).
6. Transvaginal ultrasound examination was done after 5 weeks from embryo transfer to confirm positive fetal pulsations (clinical pregnancy).

The following parameters were monitored: a) number of oocytes collected in ICSI cycle, b) degree of oocyte maturity, c) endometrial thickness on day of triggering in ICSI cycle and d) number and quality of embryos transferred.

### **Technique of Laparoscopic tubal disconnection**

Under general anesthesia, using 25 mm ports for entry at the right and left lower quadrants, the affected fallopian tube(s) was identified. The tube was grasped and the bipolar diathermy was applied 2-3 cm from the cornu followed by cutting of the diathermized point using scissors

Ultrasound Guided Aspiration was done under general anesthesia after ovum pickup during the ICSI cycle.

Through TVS the aspiration needle is washed from the inside using saline and the same needle was used to aspirate the hydrosalpinx either unilateral or bilateral.

The primary outcome measure was clinical pregnancy rate of the ICSI cycles. The secondary outcome measure was the chemical pregnancy rate.

### **Statistical methods**

Data was analyzed using IBM SPSS Advanced Statistics version 22.0 (SPSS Inc., Chicago, IL). Numerical data were expressed as mean and standard deviation or median and range as appropriate. Qualitative data were expressed as frequency and percentage. Chi-square test was used to examine the relation between qualitative variables. For quantitative data, comparison between the 3 groups was done using student t-test or Mann-Whitney as appropriate. All tests were two-tailed. A  $p$ -value  $< 0.05$  was considered significant.

### **Results**

The two groups were comparable regarding age, body mass index (BMI), antral follicle count (AFC), and pretreatment hormonal profile as shown in table 1.

The outcome of ICSI cycles is shown in table 2. During oocyte retrieval, the total number of oocytes ranged from 9 to 16 with no significant difference between the two groups ( $p = 0.091$ ). These ova were mainly in the mature metaphase I and II with no significant difference between the two groups in the number of MI oocytes ( $p = 0.195$ ) or MII oocytes ( $p = 0.789$ ). There was no significant difference between the two groups in the total number of embryos ( $p = 0.575$ ) or grade A embryos ( $p = 0.317$ ). The proportions of clinical pregnancies and chemical pregnancies were comparable in the two groups ( $p = 0.342$  and  $0.525$ , respectively). Eleven pregnancies were diagnosed chemically in laparoscopic disconnection group compared to 8 in aspiration group. In laparoscopic disconnection group one pregnancy failed to continue clinically.

### **Discussion**

This study demonstrates that laparoscopic disconnection of the fallopian tube and ultrasound-guided aspiration of hydrosalpinx resulted in comparable pregnancy rates after ICSI cycles.

Salpingectomy remains the most frequently undertaken procedure. However, it can possibly affect ovarian function due to compromising blood supply. Laparoscopic proximal tubal division was suggested

to preserve ovarian function. This was the type of laparoscopic salpingectomy adopted in the current study. Laparoscopic proximal tubal division has been previously suggested as an optimal operation method for infertility patients with hydrosalpinges [16]. Other investigators reported similar findings with no effect on ovarian reserve [17,18,19].

Similar to the current study, [20] investigated the effectiveness of proximal tubal cauterization for the treatment of hydrosalpinges before in vitro fertilization. They concluded that proximal tubal cauterization is effective in reversing the adverse effects of hydrosalpinges. Compared to salpingectomy, aspiration, salpingostomy and tubal occlusion are thought to have the advantage of being less invasive, safer and easier to perform in the case of dense adhesions, with shorter hospital stays [19,21].

Aspiration of the hydrosalpinx fluid (HSF) was another choice we used in the current study. It is a rather simple procedure that can overcome some obstacles encountered when planning for open or laparoscopic salpingectomy. In the current study, aspiration of HSF was statistically comparable to laparoscopic salpingectomy. However, it was associated with lower ongoing pregnancy rate (40%).

[22] reported that the aspiration of pelvic inflammatory cystic masses resulted in increased ovarian response and a significant increase in the number of embryos per transfer in IVF-ET cycles. [23] reported a patient with bilateral hydrosalpinges who failed to conceive in the first IVF-ET cycle. The patient conceived after ultrasound-guided aspiration of hydrosalpinges which was performed 1 month before the second IVF-ET cycle. [24] reported seven women undergoing 11 IVF-ET cycles had their hydrosalpinges aspirated at the time of oocyte retrieval without any noted morbidity, resulting in two ongoing pregnancies and three pregnancy losses.

A comparative, controlled retrospective analysis was performed for women with infective tubal damage who were going to have surgical drainage of the hydrosalpinx at the time of oocyte collection for in-vitro fertilization. A total of 237 embryo transfer cycles in women with hydrosalpinges were compared with 705 embryo transfer cycles in women with tubal disease but no hydrosalpinx. Success rates were higher in the first cycle, but did not significantly influence overall differences. The study showed marked reduction in embryo implantation in the presence of tubal damage with distal occlusion, even in the absence of obvious fluid distension. The authors recommended surgical drainage of distended hydrosalpinges in these cases [25].

Another study compared clinical pregnancy rate in women with hydrosalpinges with and without aspiration of HSF at the time of oocyte retrieval. It was found that aspiration of hydrosalpinges was associated with a higher clinical pregnancy rate, a higher ongoing pregnancy rate, and a higher implantation rate. This study confirms the association between the presence of hydrosalpinges and poor IVF outcomes [26].

A randomized controlled trial was done on the effects of ultrasound-guided HSF aspiration of ultrasonically diagnosed hydrosalpinx during oocyte collection on IVF outcome including 66 women. Aspiration resulted in a greater biochemical pregnancy rate [15].

More recently, 110 women with ultrasound-visible hydrosalpinges were enrolled in a study to test the effect of ultrasound-guided aspiration of HSF at the time of oocyte retrieval on the outcomes of IVF-ET. The authors reported that patients who underwent aspiration of hydrosalpinges demonstrated a significantly increased implantation and clinical pregnancy rates. In the aspiration group, re-accumulation of HSF within 2 weeks was associated with lower – but not statistically significant - implantation and pregnancy rates, compared to those with no reaccumulation [14].

A recent case report of a 36-year old nullipara with

unilateral hydrosalpinx was published. The patient declined salpingectomy prior to IVF treatment and had two failed IVF cycles. Following transvaginal ultrasound scan guided aspiration of the hydrosalpinx fluid at the time of oocyte retrieval, she became pregnant with the third IVF attempt [27].

There are concerns about the possible occurrence of infection after puncture of hydrosalpinx during aspiration of hydrosalpingeal fluid and that rapid re-accumulation of HSF may preclude any beneficial effect of aspiration. In the current study, we did not record any case of flaring of pelvic infection, peritonitis or fluid re-accumulation. These results are in accordance with previous studies reporting no infectious morbidity in patients after aspiration of hydrosalpinges [15,25,26].

A limiting factor in our study is the small number of cases.

In conclusion, the aspiration of hydrosalpingeal fluid at the time of oocyte retrieval is simple, easy, safe and effective procedure for patients with ultrasound-visible hydrosalpinges. It is as effective as laparoscopic disconnection of the fallopian tube in terms of clinical pregnancy rate after ICSI cycles. Further multicentric prospective randomized studies are needed to confirm these findings.

**Table 1:** Demographic and clinical characteristics of the two studied group.

	Group LD n=20	Group AS n=20	p value
Age (years)	25.4±2.9	24.8±2.8	0.509
Body mass index (kg/m <sup>2</sup> )	22.4±2.6	21.8±2.1	0.463
FSH (IU/mL)	4.7±1.2	4.3±1.2	0.327
LH (IU/mL)	3.8±1.0	3.4±0.9	0.242
Prolactin (ng/mL)	16.3±4.5	15.9±4.1	0.807
Estradiol (pg/mL)	38.4±15.2	39.2±12.7	0.849
AMH (ng/mL)	4.6±1.5	4.5±1.6	0.735
Antral follicle count (AFC)	14 (8-17)	12 (7-17)	0.091

Data presented as mean±SD or median (range)

ase I, MII: metaphase II

Data presented as median (range)

**Table 2:** The outcome of ICSI cycle after treatment in the two studied groups.

	Group LD n=20	Group AS n=20	p value
Total No Ova Retrieved	13 (9-16)	13 (10-16)	0.091
No. of Atretic ova	0 (0-2)	0 (0-2)	0.414
No. of GV oocytes	0 (0-4)	1 (0-3)	0.262
No. of MI oocytes	4 (3-7)	5 (3-7)	0.195
No. of MII oocytes	6 (5-10)	7 (4-11)	0.789
Total No of embryos	7 (4-10)	8 (5-11)	0.575
Grade A	6 (3-9)	6 (4-8)	0.317
Grade B	1 (0-3)	1 (0-3)	0.061
Grade C	1 (0-3)	1 (0-3)	0.733
Clinical Pregnancy	10 (50.0%)	8 (40.0%)	0.342
Chemical Pregnancy	11 (55.0%)	8 (40.0%)	0.525

GV: germinal vesicle phase, MI: metaphase I

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