

Hydrosalpinx Cutting or Fixing?

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Abstract: Hydrosalpinx is a fluid-filled distension of the fallopian tube with concurrent distal tubal occlusion. Hydrosalpinx-associated infertility is supposed to be treated only by IVF. Furthermore, salpingectomy plays a crucial role prior to IVF and scientific evidences have shown that it may improve pregnancy outcomes compared to functional surgery by removing the toxic effects of hydrosalpinx. However, functional surgery may be the excellent option in developing countries or in cases with specific characteristics. Functional surgery (i.e. fimbrioplasty, salpingostomy, microsurgical tubocornual anastomosis) may be amenable to performed in hydrosalpinges. Fimbrioplasty, salpingostomy, and microsurgical tubocornual anastomosis may increase pregnancy rate by 53%, 30%, and 80% respectively. Thin-walled hydrosalpinges with mucosal adhesions had a higher rate of tubal pregnancy, whereas thick-walled hydrosalpinges with fibrosis of the wall were not compatible with normal pregnancy. Functional surgery is, therefore, indicated in patients with thin-walled hydrosalpinges with minimal or no mucosal adhesions. Studies have shown that laparoscopic salpingectomy improves IVF outcomes. It should be performed only when hydrosalpinges are unable to be repaired or in cases of IVF failure. Functional tubal surgery should be preferred to salpingectomy in milder forms of tubal disease or in developing countries. Proper assessment of tubal mucosa of hydrosalpinges should be performed prior to surgical treatment as this will prevent mis-management of patients.

Keyword : Hydrosalpinx, Tubal Surgery, IVF

Introduction

Hydrosalpinx is defined as a fluid filled distension of the fallopian tube accompanied by distal tubal occlusion. It is one form of tubal diseases and may involve the proximal, distal or even entire portion of fallopian tube. Hydrosalpinx usually occurs secondary to infection and distends the fallopian tube with accumulation of serous fluid that is unable to pass into the peritoneal cavity(1). Occlusion frequently occurs secondary to pelvic inflammatory disease (PID)(90%), endometriosis, fimbrial-serosal obstruction following an adjacent appendicular inflammation and previous surgery (i.e. tubal, pelvic or abdominal). PID, the most common cause of the hydrosalpinx, may result in a severe inflammatory process that obstructs the distal end of the fallopian tube. This inflammatory process combined with natural transitional cell mucosa may produce a swollen non-functioning hydrosalpinx fluid(2).

Tubal disease is responsible for 25–30% of all female factors infertility and the prevalence of hydrosalpinx is as high as 30% in women with tubal pathology. Although *in-vitro* fertilization (IVF) was first developed to treat tubal infertility, it was then soon observed that patients with hydrosalpinx had a poor outcome after IVF treatment. The rationale behind surgical treatment of hydrosalpinx prior to IVF embryo transfer (ET) is to eliminate the detrimental effect of the hydrosalpingeal fluid, either by aspirating it (ultrasound-guided aspiration), by removing the fallopian tubes altogether (salpingectomy) or isolating them from the uterine cavity (laparoscopic proximal occlusion or hysteroscopic proximal occlusion) (3).

Diagnosis and Classification of Hydrosalpinx

Hydrosalpinx can be diagnosed using various imaging techniques. Most of these investigations can only assess the tubal patency with only few can assess the tubal function (functional status of tubal mucosa). Tubal patency test, such as HSG, hysterosalpingo-contrast ultrasonography (HyCoSy), TVUS and laparoscopy are not recommended in assessing tubal function.

Tubal function tests, such as falloscopy, salpingoscopy and fertiloscopy are the main tests that should be utilized to assess the functional status of the tubal mucosa. These tests are novel interventions that utilize tubal endoscopy. Hydrosalpinx can be

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classified according to severity of tubal damage into : Mild/grade I, moderate/grade II and severe/grade III(2).Salpingoscopy could also be used to classify hydrosalpinx into four types (Table 1)

Table I : Classification of hydrosalpinges based on salpingoscopy

Thin-walled hydrosalpinx with a healthy mucosa
Thin-walled hydrosalpinx with flattened mucosal folds without mucosal adhesions (hydrosalpinx simplex)
Thin-walled hydrosalpinx with mucosal adhesions (hydrosalpinx follicularis)
Thick-walled hydrosalpinx with absent mucosal folds

Thin-walled hydrosalpinx and healthy mucosa have favourable post-surgery outcomes. Meanwhile, Tubal function tests play an important role in choosing patient that is suitable for tubal surgery (functional tubal surgery or salpingectomy).

Hydrosalpinx Effect On Pregnancy Outcomes

The accepted theory states that the hydrosalpinx fluid plays a causative role in the reduced pregnancy rate with ART. It is well-known that the success rate of ART for women with tubal disease with hydrosalpinx is reduced by half when compared with women without hydrosalpinx. Many retrospective studies have shown an impaired outcomes of IVF in the presence of hydrosalpinx. Meta-analyses have demonstrated that the probability of achieving a pregnancy in the presence of hydrosalpinx is reduced by half and even if pregnancy is achieved, the incidence of spontaneous abortion is doubled (4).

Constituents of hydrosalpinx fluid include(4) :

- a) Epidermal growth factor (EGF)
- b) Tumor necrosis factor- α (TNF- α)
- c) Cytokines
- d) Integrin β
- e) Growth factors

Hydrosalpinx was formerly assumed to reduce fertility by promote embryotoxicity which need further investigation. However, there were also many cause-effect postulations proposed by different authors. The hydrosalpinx fluid is believed to work on two different target systems: directly on the transfer redembryos, on the endometrium with its receptivity for implantation, or both. Despite many mechanisms proposed, there has been no single explanation over a period of decades that can truly describe the exact mechanism of hydrosalpinx-associated infertility. The evidence has clearly pointed to adverse effects in the presence of a hydrosalpinx and these are due to(4):

- a) Mechanical effects
- b) Embryo and gametotoxicity
- c) Alterations in endometrial receptivity markers, result ingin poor implantation
- d) Direct effect on the endometrium, leading tointrauterine fluid formation

Hydrosalpinx Tubal Surgery

Although IVF is still the main treatment for tubal factor infertility related to hydrosalpinx, surgical treatment may have a crucial role prior to IVF. Scientific evidences have shown improved pregnancy outcomes by removing the toxic effects of hydrosalpinx that can impair IVF outcomes. Surgical interventions, such as salpingectomy and functional or reconstruction surgery (fimbrioplasty, salpingostomy and microsurgical tubocornual anastomosis) prior to the IVF procedure in women ithhydrosalpinges have been shown to improve the likelihood of increased pregnancy rate (2). Dechaudet *al*and Strandellet *al*.have performed removal of thick-walled hydrosalpinges as well as the ones that are sonographically visible. Thick-walled hydrosalpinges with a mean diameter of one to two centimeters, a wall thickness of 2-10 mm, and a frequently obliterated lumen are not likely to be distended during ovarian stimulation and/or become visible on an ultrasound.

Vasquez *et al*,in a prospective study, concluded that mucosal adhesions were the most important factors in determining the fertility outcome. Their study with thin walled hydrosalpinges showed that in the presence of normal or flattened mucosa, with no mucosal adhesions, pregnancy rate was about 58% and a lower risk of tubal pregnancy. However, thin-walled hydrosalpinges with mucosal adhesions had a higher rate of tubal pregnancy, and thick-walled hydrosalpinges with fibrosis of the wall were incompatible for a normal pregnancy. Functional surgery is, therefore, indicated in patients with thin-walled hydrosalpinges with minimal or no mucosal adhesions (4).

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a. Salpingectomy

Evidences from randomized trials showed that laparoscopic salpingectomy in women with hydrosalpinges may improve outcomes of IVF treatment compared to conservative management (5). Laparoscopic salpingectomy prior to IVF is usually performed in women who have unilateral hydrosalpinx with normal contralateral tube as well as those with bilateral hydrosalpinges. This intervention had shown a significant improvement in pregnancy rate and implantation after surgery. Thin-walled hydrosalpinges with mucosal adhesion and thick-walled hydrosalpinges with absent mucosal fold diagnosed using salpingoscopy are indication for salpingectomy (2).

Several reports have described a detrimental effect of hydrosalpinx on implantation and pregnancy rates. Leakage of hydrosalpingeal fluid from the tube into the uterine cavity may impede implantation either by flushing the embryos out of the cavity or disrupting the endometrium at the implantation site. Furthermore, hydrosalpinx fluid contains microorganisms, debris, toxins, cytokines, and prostaglandins that may impair endometrial receptivity and possibly reduce the percentage of motile spermatozoa.

On a molecular level, one group demonstrated decreased endometrial HOXA10 expression in response to hydrosalpinx fluid, with restoration of HOXA10 expression after salpingectomy. Since HOXA10 is an important transcription factor for implantation of the embryo, impaired expression of this gene may be a mechanism responsible for the deleterious effect of hydrosalpinges on implantation during IVF (6). Dechaud *et al* who randomly assigned women with hydrosalpinges in to salpingectomy or nonsalpingectomy before IVF procedure reported implantation and pregnancy rates per transfer in the salpingectomy group were 10 and 34 percent, respectively, but were only 5 and 19 percent in those without salpingectomy. A meta-analysis by Johnson *et al.* that review five randomized trials confirmed an increase in the rate of ongoing pregnancy in women with hydrosalpinges who were treated with laparoscopic salpingectomy prior to IVF (odds ratio [OR] 2.14, 95% CI 1.23-3.73) compared with no treatment. Bildirici *et al*, in prospective study, reported that the relative increase in the pregnancy rate after salpingectomy was greatest in women with a large hydrosalpinx visible on ultrasound (hazard ratio 3.8, 95% CI 1.5-9.2) (7,8,9).

b. Functional or Reconstructive Tubal Surgery

This surgery should be considered as first-line treatment when achievable and good results are expected. It should be preferred to salpingectomy in milder forms of hydrosalpinges, especially those with preserved tubal mucosa without adhesions (diagnosed using salpingoscopy) as these hydrosalpinges are amenable to surgical repair and may have better prognosis (2).

1. Fimbrioplasty

Fimbrioplasty is the incision of any fibrosis or scar tissue covering the terminal end of the tube, thus freeing the agglutinated fimbriae and lysis of peritubal adhesions. Fimbrioplasty is, thus indicated in patients with fimbrial occlusion usually with concurrent periadnexal adhesions (2). Fimbrioplasty is performed for treatment of fimbrial phimosis, which is characterized by partial obstruction of the distal end of the fallopian tube. In this condition, the tube is patent but there are adhesive bands that surround the terminal end. The longitudinal folds of the tube are usually preserved. Fimbrioplasty is performed by dividing the peritoneal adhesive bands that surround the fimbria. Gentle introduction of an alligator laparoscopic forceps into the tubal ostium followed by opening and withdrawal of the forceps helps to stretch the tube and release minor degrees of fimbrial agglutination. In a series including 434 patients with distal tubal occlusion who underwent laparoscopic fimbrioplasty (enlargement of the ostium) or neosalpingostomy (creation of a new ostium) by a single surgeon, five-year actual delivery rates decreased as the severity of tubal occlusion increased: 53, 43, 24, and 23 percent, respectively; the ectopic rate was constant at about 15 percent. These results are inferior to those of IVF (29 percent of IVF cycles result in a live birth and 0.7 percent result in ectopic pregnancy). The authors, Audebert *et al* concluded that fimbrioplasty/neosalpingostomy was an appropriate alternative to IVF for women with less severe tubal occlusion (stage 1 or 2), but IVF was the better option for women with more severe disease (stage 3 or 4). Time is also taken into consideration: half of the pregnancies occurred in the first 11 months after surgery and 75 percent occurred in the first 21 months (6,10).

2. Salpingostomy or Neosalpingostomy

Salpingostomy is the procedure whereby a stoma is created in the distal fallopian tube using scissor, electrosurgery or laser. The procedure can be performed using laparoscopy or laparotomy microsurgical technique. When the procedure is performed for mild hydrosalpinges, it is associated with better pregnancy rates (2). Chu *et al* reported that the efficacy for improving fertility rate is generally poor. However it also depends upon tubal wall thickness, ampullary dilation, presence of mucosal folds, percentage of ciliated cells in the fimbrial end, and peritubal adhesions. The average pregnancy rate following salpingostomy is nearly 30 percent, with an ectopic pregnancy rate of 10 percent (11).

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3. Microsurgical Tubocornual Anastomosis

Microsurgical tubo-cornual anastomosis is a procedure where the patent portion of the distal tube is joined to the uterine cavity under magnification. This procedure has been regarded as the standard treatment for proximal tubal occlusion. This type of surgery is more effective for women with mild hydrosalpinges and should be considered especially in centres where appropriate expertise is available (2). Indications for tubal anastomosis include reversal of sterilization, midtubal block secondary to other pathologies, tubal occlusion from ectopic pregnancy, and salpingitis isthmica nodosa. The goal is to remove abnormal tissue and reapproximate the healthy tubal segments with as little adhesion formation as possible. The technique involves micro suturing using 6-0 to 10-0 sutures. Cha SH *et al*, reported that pregnancy rates after laparoscopic tubal anastomosis and conventional microsurgical anastomosis are equivalent, 80 and 81 percent within 12 months after surgery. Ectopic pregnancy rates are also similar at 2.5 and 2.8 percent (12).

Conclusion

Hydrosalpinx is a common cause of female infertility. Several studies have shown that laparoscopic salpingectomy improves IVF outcomes. However, this procedure is not ideal for every woman with hydrosalpinx. It should be performed only when hydrosalpinges are beyond repair or in cases of IVF failure. Reconstructive tubal surgery should be preferred to salpingectomy in mild forms of tubal disease. Proper assessment of hydrosalpinges tubal mucosa utilizing tubal endoscopy tests should be routine prior to decision about the choice of surgical treatment as this will prevent mis-management of patients.

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