

ARText

Hydrosalpinx in Assisted Reproduction

2nd Edition

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President-IFS

It is my great privilege and pleasure to write this message for the 1st E-bulletin of IFS named ARTeXt. Knowledge sharing has forever been the Motto of Indian Fertility Society. We have always believed in spreading awareness about the common issues in ART and have made constant endeavors in doing so over past one decade. We intend to cover common day-to-day challenges in the field of clinical ART and thus bring out this E- bulletin named ARTeXt at regular intervals. The aim would be to simplify the complex issues in clinical ART and present before you in a concise manner.



I am sure that you would appreciate and learn from this academic initiative of Publication wing of IFS and will be able to apply the take home messages in your busy daily clinical practice. In this inaugural issue we would be covering a common enigma - Hydrosalpinx in detail and discuss the issues as we face them everyday while dealing with this disease.

This is the second edition and updated version of the previous ARTeXt, which came out in 2015, including the latest recommendations and guidelines.

Dr (Prof) Shweta Mittal Gupta

Secretary General-IFS

This is an honor for me to write best wishes message for this very special inaugural E-bulletin of IFS-ARTeXt 2nd edition on "Hydrosalpinx". A hydrosalpinx is a blocked fallopian tube occupied with serous or clear fluid. The blocked tube may become substantially distended giving the tube a sausage-like or retort-like shape. Hydrosalpinx is a common challenge in the ART practice and probably the scariest one for the patient as it entails salpingectomy or clipping.



In this bulletin we would learn about the nuances of the disease and the common methods of dealing with the issue, I am sure you would enjoy reading the bulletin.

Indian fertility Society feels proud and congratulates the editors on the launch of the 1st edition of ARTeXt E-Bulletin. I wish the editorial team best of luck in this endeavor.

Dr Shalu Gupta

Editor ARText

Hydrosalpinx is nightmare for both patient and Clinician. We have level 1 evidence for hydrosalpinx which is visibly on ultrasound.

The difficulties in managing hydrosalpinx is due to lack of evidence and secondly it is difficult for the patients to accept removal of fallopian tubes even if they are damaged.



In this edition we have tried to summarize all the literature available to enhance our understanding of the paradoxes associated with hydrosalpinx. Future research and RCTs are needed to enhance our knowledge in managing hydrosalpinx.

Thanks and regards

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HYDROSALPINX in ART

Definition

A **hydrosalpinx** is a distally blocked fallopian tube filled with serous or clear fluid. The blocked tube may become markedly distended giving the tube a characteristic sausage-like or retort-like shape. The condition is often bilateral and the affected tubes may reach several centimeters in diameter. Such blocked tubes can lead to infertility.

Hydrosalpinx is an amalgamation of the Greek words $\delta\omega\rho$ (hydōr - "water") and $\sigma\acute{\alpha}\lambda\pi\iota\gamma\epsilon$ (sálpinx - "trumpet").

A Fallopian tube when filled with blood is called as hematosalpinx, as commonly seen in cases Tubal pregnancy. Similarly a Fallopian tube filled with pus is called **pyosalpinx** as commonly seen in PID and tubo-ovarian abscess.

Normal Fallopian Tube Anatomy

The fallopian tubes extend laterally from the lateral margin of the uterus to the ipsilateral ovary. In an adult female adult the fallopian tubes are approximately 9–11 cm long and 1–4 mm wide in luminal diameter.

These are composed of four sections (from the medial aspect to the lateral aspect): the intramural part, isthmus, the ampulla, and the infundibulum.

The intramural portion lies within the myometrium and is around 1 cm long. The isthmus which forms the slender midsection of the fallopian tube, is 2–3 cm long. More laterally, the tube dilates to form the ampulla, which constitutes more than half the length of the fallopian tube.

At the ovarian end of the fallopian tube, the infundibulum opens into the peritoneal cavity. The infundibulum is composed of around 25 irregular fingerlike fimbriae, which overhang the ovary. During the course of its extrauterine course, the tube lies in a peritoneal fold along the superior margin of the broad ligament, the mesosalpinx.

The fallopian tube is composed of a mucosal lining, a muscular layer, and an outer serosa. The wall of the fallopian tube is complex, consisting of longitudinal folds and mucosal rugae, both of which increase in size and number from the medial aspect to the lateral aspect.

The structural complexity of the mucosa increases noticeably as the lumen enlarges from the uterine end to the ovarian end. The intramural portions comprise of about five or six plicae or folds. In the isthmus, the plicae, which are a dozen in number, increase in height to nearly fill the larger lumen of the tube. In the ampulla and infundibulum, the folds are delicate, and may have secondary and tertiary branches. The mucosal surface contains ciliated cells that direct the oocyte towards into the uterus with peristalsis.

In a healthy fallopian tube the cilia beat towards the uterus and the tubal fluid is by and large directed via the fimbriated end into the peritoneal cavity.

In the case of hydrosalpinx – due to Infection, inflammation and subsequent healing process in the fallopian the fimbria present at the fimbrial end of the tube are destroyed. The fimbria agglutinates which other closing the peritoneal end of the fallopian tube. When the fimbrial end of the tube gets obstructed the tubal fluid is not able to pass to the abdominal cavity and accumulates in the tube. Fluid now streams in reverse course to the uterus and drain into the endometrial cavity.

Hydrosalpinx Appearances

Hydrosalpinx simplex is characterized by excessive dis-tension and thinning of the wall of the uterine tube, the plicae being few and widely separated.

hydrosalpinx follicularis : A tube without any central cystic cavity, the lumen being broken up into compartments as the result of the fusion of the tubal plicae.

Sactosalpinx : Dilation of the inflamed uterine tube by retained secretions [saktos = stuffed).

Cause of Hydrosalpinx

Hydrosalpinx commonly results from a prolonged untreated infection of the fallopian tubes. Common causes are:

- Sexually transmitted diseases such as chlamydia or gonorrhea
- Unsafe Abortions
- Abdominal surgeries - Ruptured appendix
- Previous tubal surgeries
- Pelvic Endometriosis
- IUD's
- Tubal tuberculosis

Symptoms of Hydrosalpinx

Symptoms range from asymptomatic to painful menstruation. It is often diagnosed during infertility workup of the patient. Some patient may complain of constant pain in lower abdomen worsening during menstruation and in others may present as ectopic pregnancy. Constant vaginal discharge can also be associated with this condition.

Hydrosalpinx can be unilateral or bilateral and partial or complete. In most of the patients with unilateral hydrosalpinx, the opposite tube may also be associated with abnormalities.

The size of hydrosalpinx changes in different phases of menstrual cycle.

Hydrosalpinx and Infertility

Two meta-analyses have shown that women with hydrosalpinx have lower implantation, pregnancy and delivery rates, and a higher incidence of spontaneous abortion after IVF–embryo transfer compared with women with tubal infertility of other causes. This may be due to combination of chemical and mechanical effect disrupting endometrial environment. Furthermore, a prospective randomized clinical trial and a Cochrane review have demonstrated improved pregnancy and delivery rates with laparoscopic salpingectomy for hydrosalpinges prior to IVF. These findings suggest that, besides occluding the fallopian tubes, hydrosalpinx may also affect infertility through other mechanisms.

One theory to explain the deleterious effect of a hydrosalpinx on the outcome of IVF is the intermittent bathing of the intra-uterine environment with toxic fluid within the hydrosalpinx. The hydrosalpinx fluid may mechanically interfere with the opposition of the implanting embryo or may impede embryo development due to its deficiencies in essential factors. The presence of hydrosalpinx may also reduce the receptivity of the endometrium by decreasing the expression of specific factors. One such factor is $\alpha\beta 3$ integrin and LIF, the expression of which has been shown to be decreased in the endometrium of women with hydrosalpinx and to be increased following salpingectomy during the window of implantation

(Strandell et al., 2001; Johnson et al., 2002) (Meyer et al., 1997; Bildirici et al., 2001) (O chanelles 2011) (A F al kharoubi 2023)

Effect of Hydrosalpinx on Ovary

Hydrosalpinx was also found to be associated with ovulatory dysfunction and hence can effect natural conception. Patients with thin walled hydrosalpinx visible on ultrasound had significantly more ovulatory dysfunction compared to those patients who had hydrosalpinx invisible at the ultrasound.

Another author found that there were increased chances of both failures of rupture of the dominant follicle in a natural cycle and persistence of this unruptured follicle in the follicular phase of next menstrual cycle. They documented that in almost 52% of the patient's dominant follicle failed to rupture and persisted.

Effect of Hydrosalpinx on Reproductive Outcome

It is now well established that in presence of hydrosalpinx the pregnancy rate and implantation rate is reduced by 50% and the risk of spontaneous abortions is doubled. Retrospective studies have shown patients with hydrosalpinx have lower pregnancy rates when compared with patients with tubal infertility without hydrosalpinx .

Both bilateral hydrosalpinx and large size hydrosalpinx visible on ultrasound are associated with significant reduction in pregnancy rate as compared to unilateral hydrosalpinx and hydrosalpinx not visible on ultrasound.

The risk of ectopic pregnancy and miscarriage rate are not affected by presence of hydrosalpinx. The negative effect of hydrosalpinx was also seen in patients who underwent frozen embryo transfer, suggesting that it is the failure of embryo implantation and not oocyte quality which decreases the reproductive outcome. The tubal fluid is believed to be the main culprit behind the negative effect of hydrosalpinx on pregnancy rate.

There are various theories explaining reduced pregnancy rates.

Retrograde leakage of tubal fluid into the uterine cavity:

The presence of inflammatory cytotoxins in fluid of hydrosalpinx are embryotoxic - preventing fertilization. This effect has been clearly documented in murine embryos but not on human embryos. The fluid of hydrosalpinx is found to effects sperm motility negatively.

There is the reduced expression of endometrial integrin $\alpha\beta3$ and HOXA 10 in patients with hydrosalpinx.

Mechanical problem

Disruption of contact between endometrial surface and embryo or flushing out the embryo through the cervical channel by tubal fluid leaking in endometrial cavity.

Leakage of hydrosalpinges fluid through the uterine cavity, resulting in embryo expulsion, has been suggested as a mechanism by several studies.

Hydrosalpinx fluid may cause an increase in endometrial peristalsis.

Heat-shock proteins

Heat-shock proteins elicit intense immune and inflammatory reactions and may be responsible for a local immune response, leading to inflammatory reactions, reduced implantation, and immune rejection after the embryo transfer procedure.

The incidence of Chlamydia trachomatis infection is more prevalent in patients with hydrosalpinx. Antibodies to chlamydial heat-shock proteins are more prevalent in patients with hydrosalpinx.

These can cause local immune and inflammatory reactions, impaired implantation and immune rejection of embryos

Endometrial Receptivity

The cross-talk between the embryo and the endometrium is obligatory for embryo implantation and is mediated by the expression of precise cytokines and related substances during the implantation period. This process may be disturbed due to the presence of hydrosalpinx fluid.

Cytokines like interleukin-1 (IL-1), leukemia inhibitory factor (LIF), colony stimulating factor-1 (CSF-1), and the integrin $\alpha\beta3$ are all factors that are of importance during implantation; they and few of their receptors are expressed and up-regulated by the embryo or the endometrium during the implantation window

Embryotoxic Properties of Hydrosalpinx Fluid

Hydrosalpinx fluid does not per se appear to contain toxic potent factors which are deleterious to embryo development.

Lack of certain essential substrates is more likely to be responsible for the impaired development of embryos in hydrosalpinx fluid.

(Daftary GS et al 2007), (Ajonuma LC et al 2002) (O chanelles 2011) (A F al kharoubi 2023)

FREQUENTLY ASKED QUESTIONS

Effect of IVF on Hydrosalpinx

In experimental conditions, distal occlusion of the fallopian tube results in a slow distension of tube almost >12 weeks before resulting in hydrosalpinx. The distention of tube was much almost within 2 weeks when both distal and proximal ends were blocked.

Sometimes hydrosalpinx enlarges during ovarian stimulation and become visible on USG. Factors causing enlargement of hydrosalpinx during stimulation are still unknown.

Should Aall the Hydrosalpinx be removed?

The largest randomized controlled trial (RCT) of 192 patients found a significant increase in both clinical pregnancy rates (46% versus 22%) and birth rates (40% versus 17%) in salpingectomies patients compared with patients without any surgical intervention.

They concluded the difference in outcome was significant only when patients with hydrosalpinges visible on ultrasound was considered excluding the subgroup of patients with hydrosalpinges not visible on ultrasound. This demonstrated that the benefit of salpingectomy is only evident if the hydrosalpinx has fluid in it.

A systematic review in the Cochrane library demonstrated a significant improvement in pregnancy rates [odds ratio (OR) 1.8; 95% confidence interval (CI) 1.1–2.9] and live births (OR 2.1; 95% CI 1.2–3.7) after IVF if salpingectomy was performed compared with no surgical intervention. The authors have suggests that all patients with hydrosalpinx, regardless of size or fluid accumulation, should undergo salpingectomy.

Effect of Salpingectomy on Ovarian Reserve?

During the past decades, there was concerns and debate regarding the potential detrimental effects of salphingectomy on ovarian reserve and its effect on ovarian stimulation. Recent studies are able to clarify some of these issues.

A recent metaanalysis conducted on 1,482 patients to investigate the impact of salpingectomy in patients with IVF treatment on ovarian response concluded that salpingectomy does not have any negative effect on fertility treatment. But suggested further studies before this result can be considered definitive.

Another systemic review recently published reviewed 29 papers suggested that there was no variation in ovarian reserve markers after unilateral salpingectomy but the ovarian markers were affected in patients with bilateral salpingectomy.

In the case of tubal disease, unilateral salpingectomy may be considered safe. It does not affect ovarian reserve and ovarian response to gonadotrophin stimulation and also improves pregnancy rate. Data regarding bilateral salpingectomy and ovarian reserve are controversial. Further trials are needed to confirm the role of uni- or bilateral surgery in case of tubal blockage without hydrosalpinx and the safety of bilateral salpingectomy on ovarian reserve.

(Yoon SH et al 2016 , Noventa M, Gizzo S et al 2016)

MODALITIES OF DIAGNOSIS

USG

The fallopian tube becomes visible on USG only when it gets distended with fluid, blood, or pus. It appears like a cystic lesion with septa and is often confused with an ovarian cystic mass or fluid collections in the adnexa.

This may appear as -

Thin- or thick-walled (in chronic cases), elongated or folded, tubular, C-shaped, or S-shaped fluid-filled structure, distinct from the uterus and ovary.

Longitudinal folds that are present in a normal fallopian tube may become thickened in the presence of a hydrosalpinx. The folds may produce a characteristic "cogwheel" appearance when imaged in cross section. These folds are pathognomonic of a hydrosalpinx.

Incomplete septae may also give a "beads on a string" sign.

Sometimes the dilated fallopian tube may not show longitudinal folds. If the elongated nature of these folds is not noted, they may be mistaken for mural nodules of an ovarian cystic mass.

A significantly scarred hydrosalpinx may present as a multi-locular cystic mass with multiple septa (often incomplete) creating multiple compartments. These septa are generally incomplete, and the compartments can be connected. However, with more pronounced scarring, differentiation from an ovarian mass may not be possible.

The use of a 3D volume can connect cystic lesions lying in various planes and improve the diagnostic ability of USG. The 3D inverse mode can further help in visualizing the entire tube, in which all the fluid-filled portions become opaque, forming a cast of the cystic tube. This differentiates hydrosalpinx from an ovarian cystic mass.

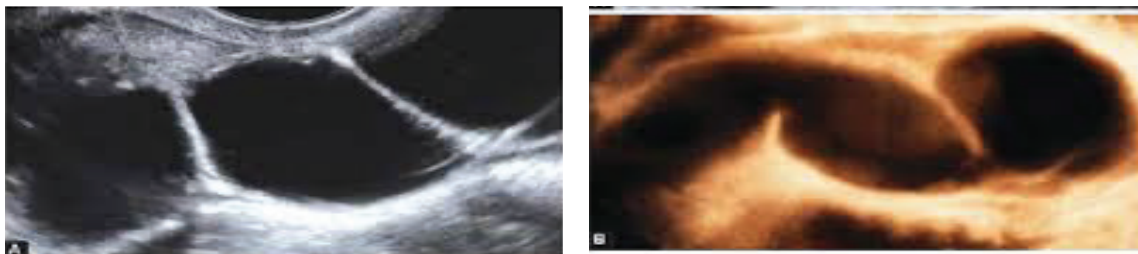
(Timor-Tritsch et 2010)

Sonographic features diagnostic for hydrosalpinx include a tubular or S-shaped cystic mass separate from the ovary, with:

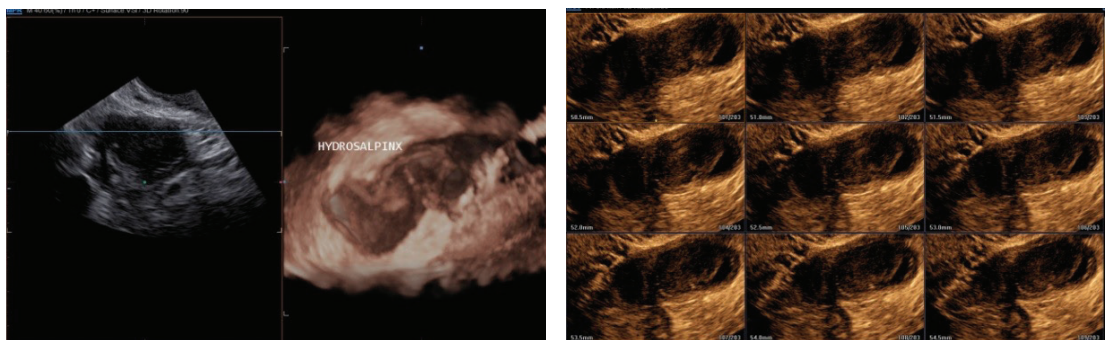
- "beads on a string" or "cogwheel" appearance (small round nodules less than 3 mm in size that represent endosalpingeal folds when viewed in cross section)
- "waist sign" (indentations on opposite sides)
- incomplete septations, which result from segments of distended tube folding over/adhering to other tubal segments

Advantage : Non invasive ,easily assessable, dynamic painless with better delimitation of anatomy Of uterus and adenxa .Contrast enhanced ultrasound gives site of obstruction as well.

Disadvantages : Normal tubes not well delineated without contrast



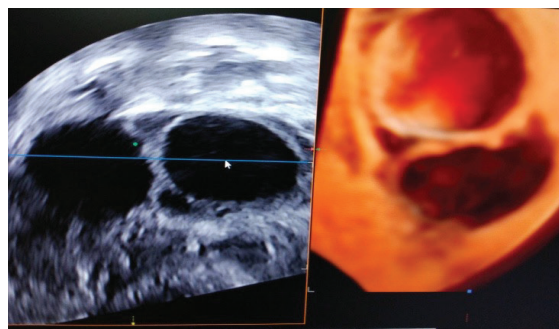
USG 1. DILATED TUBULAR CYSTIC STRUCTURE WITH INCOMPLETE SEPTAE :WAIST SIGN



USG 2. 3D multiplanar image and surface shaded image--dilated tubular sausage shaped structure with internal echoes s/o pyohydrosalpinx /hematosalpinx

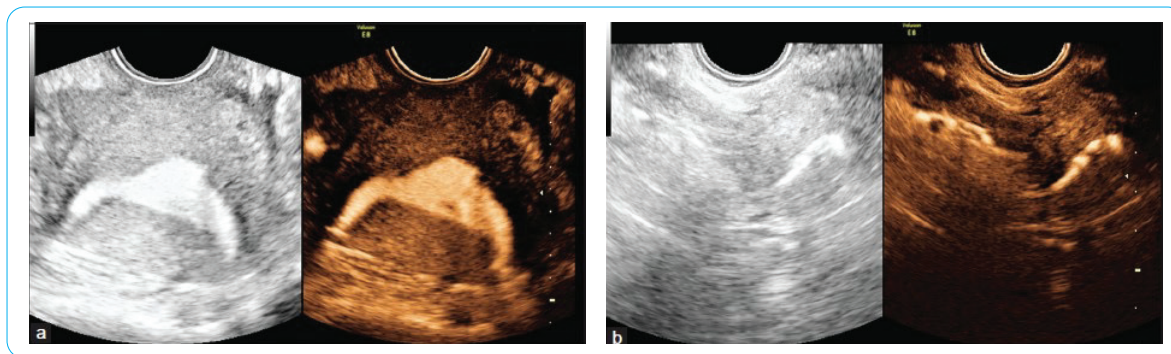


USG 3. Cog wheel appearance



USG 4. Nodule in sausage shaped structure

USG 5. 3D image displaying dilated tube separate from ovaries



USG 6. Contrast enhanced sonosalpingography showing cavity and bilateral tubes

CT

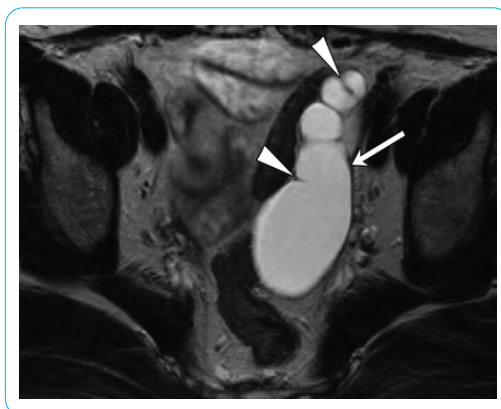
A hydrosalpinx may be seen incidentally at CT as a fluid-attenuation tubular adnexal structure, separate from the ovary. A simple hydrosalpinx is not accompanied by pelvic inflammation. The tubal wall may enhance following contrast

MRI

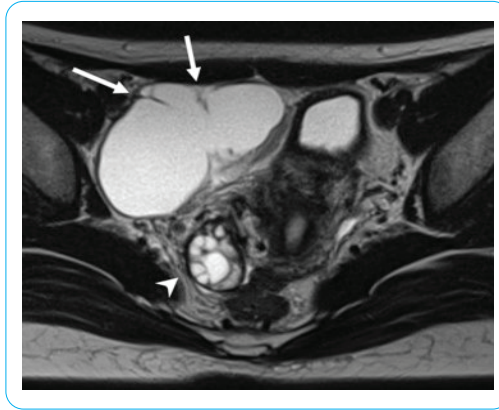
MR imaging is the modality of choice for the characterization and localization of adnexal masses that are inadequately evaluated with ultrasound. A dilated fallopian tube is interposed between the uterus and ovary and demonstrates fluid signal intensity. Incomplete septa or folds can be seen. The mucosal plicae are usually effaced, and the tube wall is uniformly smooth and thin.

MR imaging also may be useful for determining the cause of a hydrosalpinx or its associated adnexal process by characterizing the nature of the contents of the dilated tube. Tubal fluid with high signal intensity on T1-weighted images is suggestive of hematosalpinx associated with endometriosis and tubal pregnancy. A thickened wall of a dilated fallopian tube that displays variable or heterogeneous signal intensity may be indicative of pyosalpinx as a component of a tubo-ovarian abscess. Signal characteristics of the dilated tube(s) include:

- **T1:** typically hypointense although can be hyperintense if there is proteinaceous fluid
- **T2:** Hyper intense
- **T1 C+ (Gd):** The the mucosal plicae and the tube walls may show mild enhancement



MRI 1. MRI is not mainstay for diagnosis but the multiplanar capability of mr imaging can help determine whether a multilocular cystic structure is actually the dilated tube, which may be differentiated from an ovarian tumor or dilated bowel loops by its serpentine appearance



MRI 2. Dilated tubular structure with sub-mucosal plicae and incomplete septae.

Hysterosalpingography (HSG)

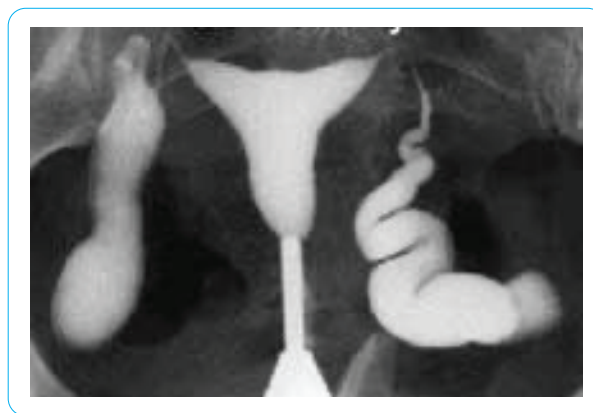
An X-ray procedure that uses a contrast agent to image the fallopian tubes, shows the retort-like shape of the distended tubes and the absence of spillage of the dye into the peritoneum.

If there is a tubal occlusion at the utero-tubal junction, a hydrosalpinx may go undetected.

When a hydrosalpinx is detected by an HSG it is prudent to administer antibiotics to reduce the risk of reactivation of an inflammatory process during the procedure.

Disadvantage – Increase risk of infection

Recommendation - Prophylactic antibiotic to be given



HSG 1: Bilateral dilated tubes upto distal end



HSG 2: Dilated right fallopian tube showing constriction waist sign with free spill on left side

Laparoscopy

Gold standard- therapeutic as well as diagnostic at same time

Disadvantage - Invasive procedure

MANAGEMENT

1. Salpingostomy

It involves a surgical incision in the fallopian tube. Only retrospective studies available. The method of choice when opting for tubal reconstructive surgery should be based on the presence of healthy tubal mucosa. It may help in spontaneous conception in the young patient. However the risk of ectopic pregnancy and recurrence is remains high.

2. Laparoscopic Salpingectomy

It is a prophylactic surgery in which there is complete removal of the tube. It should be performed with following precautions - cautious use of electrocautery, the mesosalpinx should be resection cautiously keeping very close to the tube to avoid damage to the medial tubal artery and if tube is badly stuck to ovary better to leave a portion of an adherent tube on the ovary rather than performing an unnecessarily radical salpingectomy. It is recommended not to resect the tube too close to the uterus to avoid the risk of dehiscence in the uterine wall and corneal fistulae.

Disadvantage

Effect of salpingectomy on ovarian reserve

During IVF there may be decreased oocyte recovery and increased gonadotrophin requirement. (Fan M 2016).

Psychological aspect of tube removal

Risk of interstitial pregnancy – can be avoided by placing corneal suture

Laparoscopic salpingectomy before IVF is the only treatment option that has been evaluated properly in a large randomized controlled trial (RCT) of 192 patients providing level I evidence to formulate recommendations. The salpingectomy group demonstrated a significant improvement in pregnancy and birth rates in patients with hydrosalpinges that were large enough to be visible on ultrasound.

(Hsu CC et al 2005, Strandell A et al 1999)

3. Proximal tubal occlusion (PTO) by laparoscopy

Recommended when pelvic adhesions are too thick with the risk of injury to adjacent organs with salpingectomy. In this laparoscopically the medial end of the tube can be either cauterised and divided or occluded with a clip

Advantage

less invasive, easier to perform and less perioperative time
 Preservation of the ovarian blood supply.

Disadvantage

Risks of adnexal torsion
 Pelvic pain due to the distended remnant of the diseased tube.
 Repeat surgery

A Randomized controlled trial comparing 38 women undergoing laparoscopic salpingectomy with 37 women undergoing PTO. The clinical pregnancy [(18.4 % vs 24.3%) (p=0.25)], ongoing pregnancy [(18.4% vs 21.6%) (p=0.50)] and miscarriage (0% vs 2.7%;p=0.52) rate were comparable between both groups. The live birth rates were also comparable between both groups. They concluded that both salpingectomy and PTO have the comparable reproductive outcome. The decision to remove or occlude hydrosalpinx prior to IVF may be based on patient profile and surgical expertise.

(Malhotra N et al. 2015)

4. Tubal occlusion through Hysteroscopy using micro insert device- ESSURE

Indication – laparoscopy contraindicated eg obesity, frozen pelvis

Advantage

Done as day care procedure with help of hysteroscope under saline distention

Disadvantage

Off-label use for Hydrosalpinx
 Training is required to learn proper insertion
 May fail in uterine anomalies or when tubal spasm occurs
 Not effective immediately. Take 12 weeks for fibrosis and tubal occlusion.
 HSG did post 12 weeks to ensure complete occlusion

A recently published case series of 29 patients who underwent treatment with Essure, 21 began a cycle of in vitro fertilization (IVF), and 13 finished in embryo transfer that resulted in seven clinical pregnancies. The clinical pregnancy rate per patient with an IVF cycle started was 33.3%, the live-birth rate per patient was 14.3%, the miscarriage rate was 57.1%, and the implantation rate was 16.3%.

Essure placement is an alternative method for occlusion of hydrosalpinges before IVF. Monitoring the live-birth rate confirms that this option may be considered when laparoscopy is impossible or contraindicated.

(Juan Lorente Gonza et al 2015)

In 2017, systematic review of more than 3000 patients showed that management of hydrosalpinx by hysteroscopic placement of Essure® devices before IVF had lower clinical pregnancy and live birth rates when compared with laparoscopic salpingectomy and laparoscopic proximal tubal occlusion. Following the review Essure® is no longer recommended as a form of treatment for hydrosalpinges. (Xu B 2017

5. Transvaginal Aspiration of Hydrosalpinx

The modest way to treat hydrosalpinx is transvaginal aspiration of tubal fluid. one study did evaluate trans-vaginal aspiration of hydrosalpinx to no aspiration in ART cycle . Unfortunately, the study was stopped due to recruitment difficulties. The study was inadequately powered (66 patients) and the difference in clinical pregnancy rate was not statistical significance.

There is a quick reoccurrence of fluid at the time of Embryo transfer , which counteract any advantageous effect of hydrosalpinx drainage . Aboulghar et al , evaluated TVS guided aspiration before ovarian stimulation and demonstrated that there was no improvement in pregnancy rates .

Advantage

Less invasive, safer, easier to perform in cases of dense adhesions and requires shorter hospitalization.

Contraindication or nonacceptance for surgery

Disadvantages

High recurrence rate of hydrosalpinx

The risk of pelvic infection.

The data available about the efficacy of this procedure are conflicting.

An RCT (2008) did not show a significant increase in the odds of clinical pregnancy (OR: 1.97, 95% CI: 0.62–6.29) whereas another RCT demonstrated a significantly increased clinical pregnancy rate (OR: 3.02, 95% CI: 1.13–8.05), and ongoing pregnancy rate (OR: 3.69, 95% CI: 1.23–11.05) in patients who underwent ultrasound-guided aspiration of hydrosalpinx before embryo transfer compared with patients with no aspiration of hydrosalpinx before embryo transfer.

Recommendation

Change the needle when doing bilateral aspiration

Prophylactic antibiotic during aspiration

(Juan Lorente Gonza et al 2015 Fouda UM, Sayed AM et al. 2011)

6. ANTIBIOTIC TREATMENT

The role of extended antibiotic is controversial.

7. SCLEROTHERAPY

Has pregnancy rate and fertility outcome comparable with salpingectomy. (Cohen A etal 2019)

It may be superior to no treatment but further studies are warranted.

CONCLUSION

Hydrosalpinx is a Greek word meaning a Fallopian tube filled with water or fluid. It is now recognized that the live birth rate of patients with hydrosalpinges undergoing IVF is only one-half that of women who do not have hydrosalpinges.

Moreover, in a prospective, randomized multicentre trial in Scandinavia, it was shown that in women who had hydrosalpinges and were randomized to have no intervention prior to IVF, the pregnancy rate was 23.9%, miscarriage rate was 26.3% and live birth rate was only 16.3%; however, in women who were randomized to have salpingectomy prior to IVF, the corresponding results were 36.6%, 16.2%, and 28.6%, respectively. The live birth rate was significantly ($P < 0.05$) higher than the no-treatment group. In a subgroup of women in whom the hydrosalpinges were visible by ultrasonography, the difference in results appeared more significant. There is, therefore, good evidence that salpingectomy prior to IVF in women with hydrosalpinges improves outcome.

The adverse impact of hydrosalpinges on implantation may be attributed to a direct embryotoxic effect, a mechanical effect whereby the accumulated fluid may flush the embryo out of the uterus, as well as a negative effect on endometrial receptivity.

A study by Seli et al. (2005) showed that the expression of leukemia inhibitory factor, a cytokine essential for successful implantation, was reduced in the presence of hydrosalpinges, but the expression was restored to normal after salpingectomy. A further study showed that removal of hydrosalpinges may improve endometrial receptivity by restoring normal $\alpha v \beta 3$ integrin expression.

RCTs have given evidence that Pre-IVF laparoscopic salpingectomy is effective in improving pregnancy rates and delivery rates. It should be recommended if the hydrosalpinx is visible on ultrasound examination. Whether to offer it to all patients is still a dilemma.

Proximal tubal ligation is a suitable alternative if salpingectomy is contraindicated. Other treatments need to be evaluated in randomized trials before recommending.

GUIDELINES

Further studies required to give recommendations on-

- Management of the wide spectrum of tubal pathologies of varying severity such as slight tubal dilatation (uni or bilateral), previous tubal abortion and negative tubal patency test without hydrosalpinx.
- The surgical management of varying degrees of hydrosalpinx
- Unilateral hydrosalpinx with the non-patent contralateral tube.

ASRM 2021

- HSG - first-line test to assess tubal patency but has false-positive diagnoses of proximal tubal blockage.
- Tubal cannulation for proximal tubal obstruction in young women with no other significant infertility factors.
- Laparoscopic fimbrioplasty or neosalpingostomy is for mild hydrosalpinges in young women with no other significant infertility factors.
- Laparoscopic salpingectomy for both proximal tubal occlusion and distal occlusions in cases of surgically irreparable hydrosalpinges to improve IVF pregnancy rates.
- Good prognosis patient are those with limited filmy adnexal adhesions, mildly dilated tubes (<3 cm) with thin and pliable walls, preserved mucosal folds and a lush endosalpinx

AUSTRALIAN RECOMMENDATIONS - Oswald Marino Petrucco 2024

- Women with fallopian tubes that have been proven to have minor and not severe endothelial damage can be considered for day surgery endoscopic salpingostomy. In preoperative counselling, higher incidence of ectopic pregnancy than associated with IVF should be discussed
- Salpingoscopy and microsalingoscopy should be used to assess tubal endothelial damage and persistence of inflammation prior to salpingostomy
- The presence of loss of cilia, cellular inflammation, and intraluminal or severe peritubal adhesions are contraindications to salpingostomy.
- Salpingostomy for bilateral hydrosalpinx should be considered for young women at diagnostic laparoscopy because of time-dependant deterioration in tubal function if left untreated
- The benefits of surgical resolution of hydrosalpinx-related infertility before proceeding to IVF/ART. include emotional and psychological improvement associated with the knowledge that spontaneous pregnancy may be possible and more likely partner acceptance.
- Day surgery salpingostomy can be financial savings when compared to long-term IVF treatment

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