<table>
<thead>
<tr>
<th>PRESENT DESIGNATION:</th>
<th>Director &amp; Senior Consultant Institute of OBG &amp; IVF SRM Institute for Medical Sciences Chennai</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESENT AFFILIATIONS:</td>
<td>Vice President of FERTILITY PRESERVATION SOCIETY OF INDIA MEMBER OF International Fertility Preservation Society CHAIRMAN-BOARD OF STUDIES (2016-2019) TN Dr MGR Medical University</td>
</tr>
<tr>
<td>MAJOR ACHIEVEMENTS:</td>
<td>FMMC FICS FICOG MBA (Health services management) Speciality Training in Fertility Preservations-Sheba Medical Centre, Israel Former Prof of O &amp; G Madras Medical College Past President OGSSI Organising secretary AICOG 2015 Chennai</td>
</tr>
</tbody>
</table>
Hydrosalpinx

Dr P M Gopinath
Chennai
Hydrosalpinx

• **Hydrosalpinx** - collection of watery fluid in the tube

• Heterogeneous entity with wide spectrum of pathology and distal tubal occlusion leading to potentially different outcomes.

  *Shahara FI et al, Hum Reprod 1996; 11: 526-30*

• Any distal tubal occlusion can lead to HS regardless of the cause

• Main cause – Pelvic inflammatory disease (50%)

• **C. Trachomatis** – the most common cause of PID and is associate with tubal damage, hydrosalpinges, ectopic pregnancy, infertility.

• In 10-30% of patients undergoing IVF-ET – unilateral or bilateral HS is present.
Hydrosalpinx

**Hydrosalpinx simplex** — excessive distension and thinning of the fallopian tube wall, tubal plicae are thin and widely separated.

**Hydrosalpinx follicularis** — tube without any central cystic cavity, the lumen being broken up into compartments, plicae are fused (it covers also cases without any fluid in tubes).

**Saktosalpinx** — dilation of the inflamed fallopian tube by retained secretions (saktos = stuffed).
Proposed Mechanisms for HF formation after C. trachomatis infection

- Destruction of tubal epithelium → Loss of membrane polarity ↓ expression of epithelial membrane transporters and ion channels (particularly CTFR) leading to abnormal fluid secretion and reabsorption.

- Release of inflammatory mediators increase fluid secretion in tube and stimulate myometrial and myosalpingeal contractions increase of luminal hydrostatic pressure due to distal tube occlusion increase serosa-to-mucosa fluid flow fluid accumulation.

- Effect of ovarian stimulation hormones on up-regulation of CTFR sudden increase in HF

Ajouma LC et al, Hum Reprod 2002; 8: 255-264
Bacteria (C. trachomatis) → Bacteria internalization via CTFR → Release of Inflammatory Mediators → Activation of CTFR/cl channels and inhibition of ENaC → Tissue Scarring/Occlusion → Increased Epithelial secretion/decreased fluid absorption → Fluid Accumulation → Hydrosalphinx

Ajouma LC et al, Hum Reprod 2002; 8: 255-264
Diagnosis of Hydrosalpinx

**Hysterosalpingography**
Sensitivity of 65% and specificity 83%
compared to Laproscopy

**Laproscopy with chromoperubation**
The gold standard

**Transvaginal u/s**
Better evaluation of the volume dilated tubes

**Sonohysterography**
Sensitivity of 90.4% and specificity of 70.3% compared to Laproscopy

De Witt W et al, Hum Reprod 1997; 12: 170
Kodaman PH et al, Cur Opin Obstet Gynecol 2004; 16: 221-9
Theories for the detrimental effect of Hydrosalpinx on IVF-ET outcome

1. Impairment of ovarian function, follicular development and oocyte quality
2. Endometrial damage
3. Purely dilutional effect of HSF on essential nutrients and substrates
4. Direct cytotoxic effect on gametes and embryos
5. Inflammatory response with production of proinflammatory cytokines
6. Mechanical washout of embryos
7. Effect on endometrial receptivity and inhibition of embryo implantation
Effect of Hydrosalpinx on fertility

- Data based on several retrospective studies.
- Two meta-analyses further strengthened the association between the presence of HS and adverse IVF outcome.
- Presence of HS is associated with significantly lower implantation and pregnancy rates after IVF.
- Spontaneous abortion rates and the risk for ectopic pregnancy were increased.
- Embryos appear to have reduced viability.

Zeyneloglu et al, Hum Reprod 1998; 70: 492-499
Camus et al, Hum Reprod 1999; 14: 1243-49
Strandel A et al, Hum Reprod 2001; 16: 2403-10
Does Hydrosalpinx Affect IVF-ET Outcome?

Retrospective analysis

Hydrosalpinx with US evidence of dilated tubes

- 60 patients had 116 initiated cycles and 106 ET

Tubal Factor Controls

- 940 patients had 1428 initiated cycles and 1150 ET

Outcomes

- Implantation 16% vs. 21% (P = 0.013)
- Preclinical Loss 37% vs. 14% (P=0.001)
- Miscarriage 25% vs. 20% (P=0.28)
- Ectopic 8% vs. 3% (P=0.04)
Hydrosalpinges and IVF
Cochrane Meta-Analysis

14 different studies of IVF

5592 women
- 1004 unilateral or bilateral hydrosalpinges
- 4588 tubal blockage no hydrosalpinx
- 8703 IVF embryo transfers

Effect of Hydrosalpinges on IVF Outcomes

PR 19.7% vs. 31.2% (OR=0.64; 95% CI 0.56, 0.74).

IR 8.5% vs. 13.7%

SAB (miscarriage) 43.7% vs. 31.1% (OR 0.58; 95% CI, 0.49–0.69)

Delivery rate 13.4% vs. 23.4%

Effect of Hydrosalpinges on IVF Outcomes

2 Meta-analyses
– 6700 cycles in 11 studies & 4 abstracts

Pregnancy Rate
– Tubal infertility PR 31.2%
– Hydrosalpinges PR 16.4%
– PR 49% lower
– Fresh and FET

Miscarriage
– 2.3-fold (95% CI, 1.6–3.5)

Impact of Ultrasound Appearance of Hydrosalpinges

When Hydrosalpinx is Ultrasound-visible

- Implantation and Ongoing Implantation
  - OR=0.33-0.46, C.I. 0.21-0.96
- Cumulative chance ongoing pregnancy after 1+ cycles
  - Relative hazard 0.36, C.I. 0.22-0.59
- Hydrosalpinx not visible by ultrasound
  - IVF outcome not reduced


Effect of Unilateral Hydrosalpinges on IVF Pregnancy Rates

- Even patients with a unilateral hydrosalpinx have been shown to have lower pregnancy rates with IVF (1,2).
- Unilateral salpingectomy resulted in a significant improvement in IVF pregnancy rates in these patients (3).
- Salpingectomies for bilateral hydrosalpinges yielded higher IVF pregnancy rates than for unilateral hydrosalpinges (4).

Surgical Treatment of Hydrosalpinges and IVF

Hydrosalpinges
– Blocked tube at end secretes fluid faster than it is reabsorbed
– Becomes enlarged sac of secretions

Inflammatory/toxic fluid leaks back into uterus
– Direct mechanical flushing effect on embryo(s)
– Direct embryotoxic effect
– Effect on endometrial receptivity

Indications for Salpingectomy or Tubal Occlusion

• Indication
  – Fallopian tube is damaged beyond repair by infection, endometriosis, or ectopic pregnancy

• Poor prognosis
  – Extensive, dense peritubal adhesions
  – Massively dilated tubes
  – Thick fibrotic walls, and/or
  – Sparse or absent luminal mucosa

Technical Aspects of Salpingectomy

- Coagulate and divide tube close to cornua
- Serially coagulate and cut the Mesosalpinx
- Stay close to the tube to avoid thermal injury to the ovary
- Vascular injury of ovarian blood supply
- Ovarian injury possible but avoidable (1-3)

Does Treatment + IVF Work?

3 RCT
Pilot study of 90
  Hydro or SIN
  LS and treatment vs LS look only
  PR per cycle 23.7% tx vs 16.3% none

204 patients with hydrosalpinges tx vs no
  delivery rate 28.6% vs 16.3% (P=.045)
  If seen on U/S 40.0% vs 17.5% (P=.038)

Surgical Treatment for Tubal Disease in Women Due to Undergo IVF

5 RCT comparing surgical treatment vs. control group
- N=646
Salpingectomy vs. No Treatment, 4 trials
Salpingectomy vs. Tubal occlusion, 2 trials
Aspiration vs. No Treatment, 1 trial

Outcomes Laparoscopic Salpingectomy
Ongoing Pregnancy: Peto OR 2.14, 95% CI 1.23 to 3.73
Clinical pregnancy: Peto OR 2.31, 95% CI 1.48 to 3.62

Effect of Treating Hydrosalpinges Before IVF

Dechaud et al 1998 salpx
Strandell et al 1999 salpx
Kontoravdis et al 2006 salpx
Kontoravdis et al 2006 occl
Average: 1.8 (1.2, 2.7)

ASRM Practice Committee. Fertil Steril 2012;97:539-45
Surgical Treatment for Tubal Disease in Women Due to Undergo IVF

- **Laparoscopic occlusion vs. no intervention**
  - Ongoing Pregnancy: Peto OR 7.24, 95%CI 0.87 to 59.57
  - Clinical Pregnancy: Peto OR 4.66, 95%CI 2.47 to 10.01

- **Tubal occlusion to salpingectomy**
  - Ongoing Pregnancy: Peto OR: 1.65, 95%CI 0.74, 3.71
  - Clinical Pregnancy: Peto OR 1.28, 95%CI 0.76 to 2.14

- **US-guided aspiration (1 RCT)**
  - Clinical Pregnancy: Peto OR 1.97, 95%CI 0.62 to 6.29

- **No significant differences in adverse effects of surgical treatments**

Proximal Tubal Occlusion by Hysteroscopic Approach

• Essure coil inserts
  – Data on IVF success rates are limited to a few very small case series (1,2).
  – Trailing coils have potential to act as an IUD intrauterine
  – Complete tissue encapsulation coils 17% of patients within 1 year & 25% at 13–43 months (3).

• Adiana: no data
  – Radiofrequency energy to stimulate interstitial scarring followed by insertion of a small silicone elastomer matrix

Tubal occlusion

polymer matrix Adiana® system

- 1995 animal studies
- 1998 hysterectomy studies
- 2002 November pivotal trial
- 2009 July FDA authorized for sale

micro-insert Essure® system

- 1995 animal studies
- 1998 hysterectomy studies
- 2000 pivotal trial
- 2002 November FDA authorized for sale

Hologic has resolved litigation with Conceptus concerning patent infringement claims.
Hologic has decided to discontinue the manufacturing, sales and marketing of its Adiana system from May 18th, 2012.
Tubal occlusion

1. Advance catheter’s black positioning marker to tubal ostium

2. Retract the insertion catheter (external catheter)

3. Gold band slightly outside the ostium

4. Release the implant (3 to 8 coils indicates the ideal position)

FDA May 2010 post-Approval Study

**Bilateral placement 96.9%**

**Average time 9 minutes**

**Effectiveness 99.80%**
## Tubal occlusion: the best alternatives?

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<td><strong>41(44.5%)</strong></td>
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Tubal occlusion

Essure® for management of hydrosalpinx prior to in vitro fertilisation—a systematic review and pooled analysis

P Arora, a RS Arora, b D Cahill c

a Department of Reproductive Medicine, St Mary’s Hospital, Manchester, UK
b Department of Medical Oncology, Max Super Speciality Hospital, New Delhi, India
c Academic Unit of Obstetrics and Gynaecology, St Michael’s Hospital, Bristol, UK

Correspondence: P Arora, 19 Wet Earth Green, Swinton, Manchester M37 8AL, UK. Email parora@doctors.org.uk

Accepted 30 August 2013. Published Online 3 January 2014.

Author’s conclusions: Essure® appears to be an effective option for management of hydrosalpinx in women before IVF although evidence from a randomised controlled clinical trial is lacking.
DESH (Dutch Essure® versus Salpingectomy for Hydrosalpinx) Trial

prospective randomized trial to evaluate and to compare the impact of hysteroscopic Essure® intratubal device placement and laparoscopic salpingectomy on IVF-ET outcomes of patients with hydrosalpinx

primary objective
is to evaluate and compare the IVF-ET outcomes

secondary objective
is to evaluate ovarian reserve through measurements of early follicular phase serum FSH & AMH levels and antral follicle counts presurgery and 3 months postsurgery in both study groups
Aspiration and Neosalpingostomy Before IVF

- Ultrasound-guided aspiration of hydrosalpinges at the time of oocyte retrieval yielded conflicting results in two small retrospective studies (1,2).
- A randomized study comparing ultrasound-guided aspiration with a nontreated control reported significantly higher clinical pregnancy rates with aspiration (3).
- Intuitively, it makes sense that laparoscopic neosalpingostomy before IVF should improve the pregnancy rate, but there are still no confirmatory studies.

Effect of Unilateral Hydrosalpinges on IVF Pregnancy Rates

• Even patients with a unilateral hydrosalpinx have been shown to have lower pregnancy rates with IVF (1,2)
• Unilateral salpingectomy resulted in a significant improvement in IVF pregnancy rates in these patients (3)
• Salpingectomies for bilateral hydrosalpinges yielded higher IVF pregnancy rates than for unilateral hydrosalpinges (4)

Chances for Pregnancy After Unilateral Salpingectomy

- 25 women with one hydrosalpinx
- 18 salpingectomy or 7 tubal ligation
- pregnancy rates naturally without IVF
- 88% women achieved pregnancy
- Salpingectomy quicker
- Mean time to pregnancy 5.6 months

Conclusions

• Surgical treatment should be considered for all women with hydrosalpinges prior to IVF treatment.
• Laparoscopic tubal occlusion is an alternative to laparoscopic salpingectomy in improving IVF PR.
• Further research is required to assess the value of aspiration of hydrosalpinges prior to or during IVF procedures and also the value of tubal restorative surgery as an alternative (or as a preliminary) to IVF.

Conclusions

The live birth rate achieved with IVF among women with hydrosalpinges is approximately one half that observed in women without hydrosalpinges.

In women with hydrosalpinges, preliminary laparoscopic salpingectomy or proximal tubal occlusion improves subsequent pregnancy and live birth rates achieved with IVF.

For every six women with hydrosalpinges, one more ongoing pregnancy will be achieved if salpingectomy or tubal occlusion is performed before IVF.

Data are insufficient to permit recommendations regarding the effectiveness of alternative treatments such as laparoscopic neosalpingostomy, transvaginal aspiration of hydrosalpingeal fluid, hysteroscopic tubal occlusion, or antibiotic treatment.

SRS and ASRM Practice Committees. Fertil Steril
Thank you

Questions