



## Original Article

# Minor tubal defects - The unnoticed causes of unexplained infertility

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### Abstract

**Objective:** To review whether detailed videolaparoscopic evaluation of so called unexplained infertility can find out certain causes and laparoscopic corrective techniques can alleviate them. **Methods:** From 1998 to 2007, 1726 cases of unexplained infertility were investigated by laparoscopy at Repose Fertility Clinic, Kolkata. 846 minor tubal defects were detected. **Results:** According to our observation tubal defects were classified into six categories. Most of them belonged to combined aetiology. **Conclusion :** Different laparoscopic surgical techniques to restore structural and functional integrity of fallopian tubes may be useful in achieving pregnancy in many cases of so called unexplained infertility.

**Key Words:** Minor tubal defects, unexplained infertility, minimal endometriosis, tubo-ovarian relation.

### Introduction:

Tubal infertility was the most focused subject in the pre IVF era. Tubal microsurgery, tubal reconstruction etc., were the treatment of choice but the results were not encouraging. These were one-time procedures and last hope for the couple. With introduction and widespread practice of assisted conception technique notably In Vitro Fertilization and Embryo Transfer (IVF & ET) the role of tubal surgery has been de-emphasized in tubal infertility. Moreover IVF and ET being less invasive can be performed quite a number of times. With more

and more use of IVF the indications also expanded. One of the important indications of IVF now-a-days is unexplained infertility. Though IUI is first line of treatment choice in unexplained infertility, IVF remains to be only choice after IUI fails. The major problems of the ART procedures are their excessive psychological, physical and financial burden as well as low success rate. The clinical pregnancy rate per cycle as per 1998 statistics was about 30% only<sup>1</sup> which in 10yrs time came up to be about 44 – 45% only as per Dutch study<sup>2</sup>. This does not show any tremendous improvement in success rate. In our day to day practice it has been observed that patients who are advised IVF and ET are the main drop outs from the list of infertile couples attending the clinic. The main reason of this is not only excessive expenditure but also the excessive stress and frequent and prolonged treatment schedule in the form of frequent clinic attendance. The latter is supported by the studies about dropouts conducted in the countries where IVF is covered by insurance. In a study of 211 couples who were advised IVF, most common cited reason for dropouts

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were psychological burden and perception of poor prognosis<sup>3</sup>. This dictated us to reevaluate the treatment options of unexplained infertility in particular and to some extent tubal pathology as well.

### Patients and methods:

From 1998 to 2007, i.e., over a period of ten years, 1726 patients of initially declared unexplained infertility or infertility with ovulatory defect which got corrected with medication were investigated by laparoscopy. These patients were aged between 26 and 37 years with infertility between 5 – 7 years durations. Most of them had their tubal status evaluated previously by HSG or SSG. Some of them had initial diagnostic laparoscopy too where these minor tubal defects escaped detection. 846 of them showed minor tubal defects, which came out to be previously unnoticed cause of this group of infertility. During this period 81 cases of major tubal defects underwent Laparoscopic procedure to reevaluate the situation or achieve some correction. Apart from that 37 cases of unexplained infertility who had IVF failures were investigated by Laparoscopy. Routine pelvic assessment was performed primarily by pelvic examination followed by transvaginal ultrasonography performed by same observer. Main emphasis was given on possibility of presence of endometriosis as per clinical findings<sup>4</sup>. Routine preoperative investigations were also performed. Videolaparoscopy was a must. Usually triple puncture technique was used but some time four portals were also necessary. The minor tubal defects noted at laparoscopy and their incidence in our series were as follows -

1. Tubal kinks due to serosa to serosal adhesion (15%).

(Fig 2c). 2. Tubes pulled towards respective iliac fossa due to shortening of infundibulopelvic ligaments (17%) (Fig2b). 3. Fimbrial pathology like fimbrial eversion, fimbrial agglutination or combination of both (11%) (Fig1) 4. Peritubal adhesions causing problem in tubal mobility and adhesions in the POD causing hindrance to reservoir function and egg pickup (4%) (Fig4a, 4c). 5. Cornual or terminal tubal block developed in between previous HSG and present Laparoscopy (3%). 6. Pedunculated fimbrial cysts, which can block the fimbrial opening of respective fallopian tube like a ball valve causing temporary tubal block (6%). (Fig2a). Combination of above pathologies (44%) was most common. The tubal kinks which were formed by serosa to serosal adhesion and thereby shortening of the effective tubal length were corrected by a simple procedure called squeezing, manipulation and hydrotubation (SMH) technique. For this procedure special tubal forceps were introduced (own design) through a 5mm port. This forceps is a modification of tube holding forceps where serrations in the inner surface are absent. These plane holding surfaces of forceps blades help in milking the tubal walls without causing injury. The forceps' break the serosa to serosal adhesions thereby relieving the tubal kinks. Tubes were then milked from cornu to the fimbriae. As a result any sludge inside the tube was removed. The tubes got back their normal length. Hydrotubation with dye helped to wash out the remains and the tubes were opened when free spill occurred. Formation of C tube (Fig2b) due to shortening of infundibulopelvic ligament was another difficult problem. Attempt to lengthen the infundibulo pelvic ligament by stretching was not always successful. The pulled up tubes failed to pick the released egg from the POD. In this situation inducing multiple ovulations might be helpful as the egg might float on excess

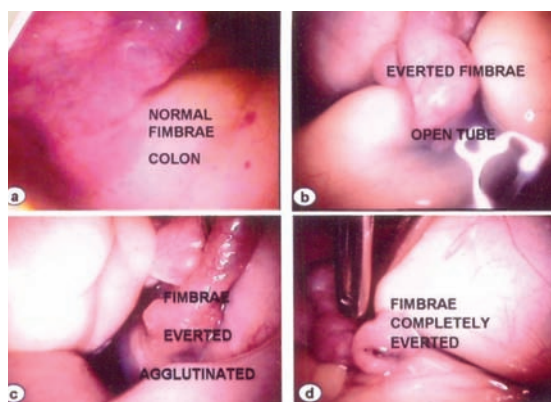


Fig 1 : Fimbrial Pathologies

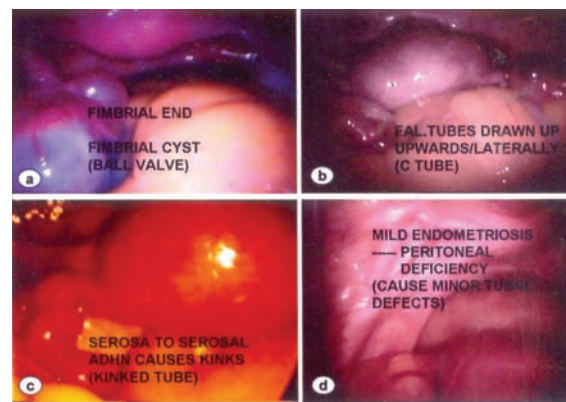
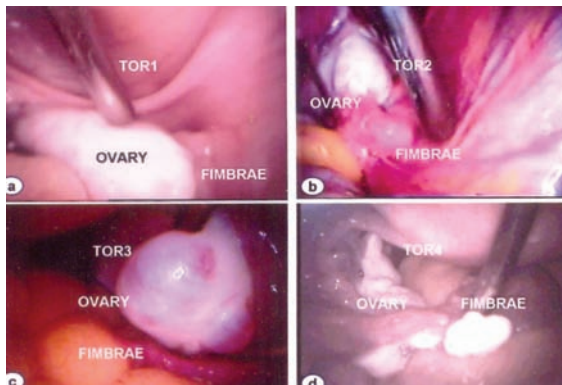
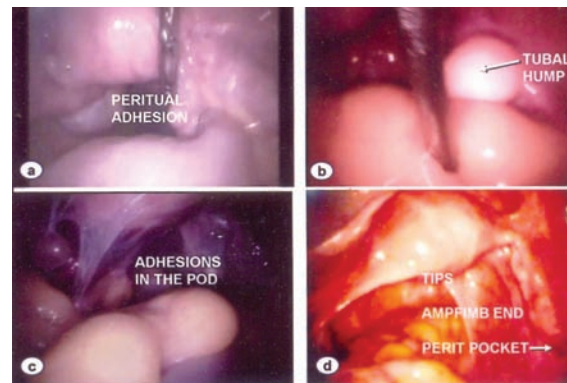


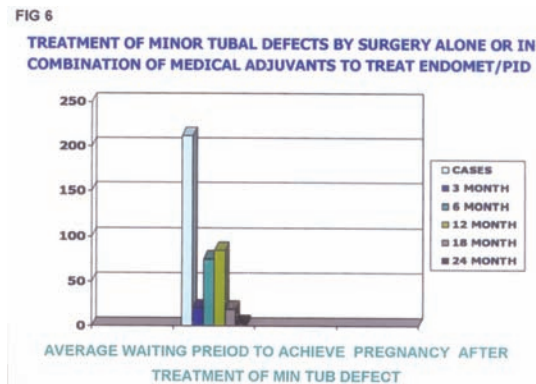
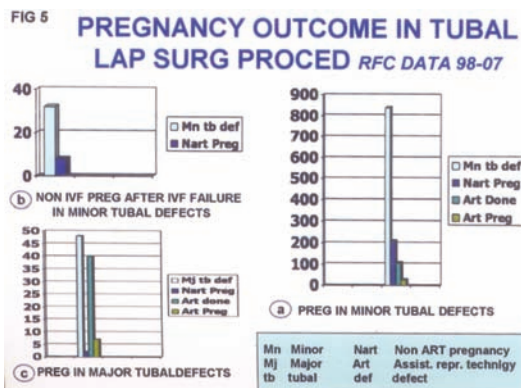
Fig 2 : Other Tubal Defects



**Fig 3 : Tubo Ovarian relations (TOR) Four Grades**



**Fig 4 : Minor tubal defects along with peritoneal pathologies**



amount of fluid released from multiple follicles in the pelvis and thereby might reach abdominal ostium of the tube passively. Fimbrial pathologies (Fig1) were corrected by fimbriolysis and fimbrial combing. Everted fimbriae (Fig1d) due to mild inflammatory relation were released by combing with palpating rod against the lateral pelvic wall. In other cases where thick membranous adhesions ran from fimbriae to ampulla they were cut with endoscopic scissors. In case of everted (Fig1b) and agglutinated (Fig1c) fimbriae which were mostly formed due to chemical irritation by endometriotic blood, fimbriolysis with squeezing and milking was found to be helpful.

In some irreversible eversions, cutting the circular band with scissors or diathermy hook became very useful. Sometimes ostial dilatation by endoscopic forceps (Merryland) was necessary.

Peritubal adhesions (Fig4a) needed use of multiple instruments to stretch the tube on one side and adherent structures on the other. The adhesion bands or mem-

branes were then separated either by blunt dissection with the palpating rod or by sharp dissection with endoscopic scissors. Any bleeding was coagulated by bipolar diathermy. Any peritubal adhesion with intestine was dealt with taking precaution not to injure intestine. If tubal serosa was adherent to the colon, intestines or lateral pelvic wall vessels, the surgical approach was more cautious and less heroic. Bleeding from that area might need a laparotomy. In these situations making the tissue wet with irrigating solution or a hydrodissection was found to be very rewarding. Adhesions in the pouch of Douglas (POD) observed carefully. Filmy adhesions (Fig4c) were either excised when they were avascular or divided with diathermy hook. Restoration of POD completely or at least partially raised the success rate. Any maneuver that might injure rectum was avoided. In case of cornual block, cornual massage with palpating rod or squeezing with special forceps might open the tubes on many occasions. A push and pull technique of hydrotubation along with squeezing and milking with tubal forceps and palpating rod might help in less organized block. In certain situations hystero-

scopic division of adhesion relieved the block. Hysteroscopic tubal catheterization and use of balloon was not always rewarding. Minimal hydrosalpinx should not be considered hopeless. In certain situations opening the fimbriae saved the endosalpingeal damage. In case of healthy fimbriae with block, making a neoostium at close proximity to fimbriae sometimes yielded some results. In irreversible tubal damage where tubal blocks could not be relieved or there were major hydrosalpinges the outcome was hopeless. These are the cases, which should be listed for IVF and ET. Pedunculated fimbrial cysts were of special mention. It was difficult to diagnose them in usual tubal patency tests as tubes were always patent. The alternate contraction of circular & longitudinal muscles of tubal wall created a negative pressure inside the fallopian tube which sucked the oocyte along with follicular fluid towards abdominal ostium. The pedunculated fimbrial cyst that usually floated in follicular fluid might be drawn towards the abdominal ostium of fallopian tube and might block that tubal opening (Fig 2a) temporarily hindering egg pickup. Tubal cysts were easily excised using diathermy or scissors. In extremely small number of cases two conditions were noticed, one being tubal hump (Fig 4b) due to peri-ampullary fat deposition and other being TIPS (Tube in pocket state). In seven out of 846 cases, prominent fatty deposits over ampulla were noticed (Fig 4b). In two of them this fat collection extended up to the infundibulopelvic ligament. These were named to be tubal humps. This condition impaired tubal mobility probably due to weight. Simple diathermy at two to three positions over the humps cleared fat deposition as it was observed during subsequent caesarean sections. In a small number (only eight) of cases the ampullary fimbrial end of the tube either unilaterally or bilaterally might be placed in peritoneal pockets (Fig 4d) hindering their mobility & egg pickup. The pocket developed either by formation of raised peritubal folds over uterosacral ligament or ureter which divided POD into compartments.

Sometimes pockets were formed due to peritoneal deficiency & pseudomembrane formation. These result from mild to moderate endometriosis. This condition is called tube in a pocket state or (TIPS). The incidences of above two conditions were so small in this large series that they were not included in classification of minor tubal defects. Tubo Ovarian relation was very important for conception to occur. It was observed that tubo-ovarian (TO) relation might remain disturbed causing infertility. The fimbrial end of the Fallopian

tube should lie medial to the ipsilateral ovary and reach the POD. Depending on tubal relation to the ovary following grades could be thought of :

TOR I (Tubo ovarian relation 1) where ampullofimbrial end lying lateral to ovary (Fig 3a). TOR II where tubal fimbriae lying on superolateral end of the ovaries (Fig 3b). TOR III where fimbrial end lying on medial surface of the ovary (Fig 3c). TOR IV were fimbrial end reaching the floor of POD nicely and lying medial to the ovary (Fig 3d). TOR IV position was most favorable position for pregnancy to occur.

### Post surgical follow up

The follow up treatment consisted of postoperative hydrotubation once a month during follicular phase of menstrual cycle for 3 months. Hydrotubation was performed aseptically without any anesthesia using about 10ml normal saline mixed with anti-inflammatory agents like placental extract under oral antibiotic cover. In case of endometriosis, post operative treatment with Danazole or Progestins LHRH-a were essential to control the basic pathology. When the pathology appeared to be inflammatory, oral antibiotic selection was very important. Test for Chlamydia trachomatis was very costly in this country. So in suspected cases we used suitable multiple antibiotics against Chlamydia usually sequentially for 7 days – 3 weeks.

### Discussion

The fallopian tube has four functions in achieving pregnancy. It must be open with intact endosalpinx. It must have adequate length to reach the pelvic floor. It has to be mobile to reach the site of released egg and to create a negative pressure in itself. The fimbriae should be normal and free, to direct the egg towards the tubal ostium. The surgical approach should be directed to get all

the tubal functions back in a damaged or diseased tube. It has been observed from the present study that certain simple measures can alleviate tubal pathology to great extent and restore all the aforesaid functions. Above minor tubal defects may be the result of sub clinical or silent inflammation which may be introduced by Chlamydia trachomatis<sup>5</sup> or E. coli. Chlamydia trachomatis, for reasons unknown, may exist in non-replicating state for prolonged latent period without any symptoms<sup>6</sup>. On many occasions tubal kinks and thereby shortening of the effective tubal length, can

happen due to chemical inflammation arising from endometriotic blood in the pelvis in which tubes float following menstruation. Even in minimal or mild endometriosis this pro-inflammatory state can cause adhesive disease leading to sub fertility<sup>7</sup>. These tubal kinks look like bellows of piano-accordion and cause shortening of the effective length of the fallopian tubes. As a result tubal fimbriae fail to reach the pelvic floor and thereby fail to achieve egg pick up. Sometimes tubal defects are results of post abortal or puerperal infections as it happens in secondary infertility. Substantial number of tubal blocks are of mild form and simple SMH may open the tubes easily. Postoperative hydrotubation further maintains the patency of the tubes. Peritubal adhesiolysis should be performed with great caution as multiple organs including major blood vessels may be involved. Fimbrial pathology is another condition worth mentioning in group of tubal defects which can arise from mild or minimal endometriosis or some other mild form pelvic infection. The minimal tubal defects are mostly associated with endometriosis. This is our observation that adherent fimbriae on many occasions cause infertility due to poor egg pick up even in cases of anatomically patent tubes. If the fimbriae are not inspected properly in video monitor under magnified view the defects pass unnoticed. These cases are regarded as unexplained infertility. Lyses are also very important to get back mobility of fallopian tubes. Peritubal adhesion needs freeing of tubes for proper mobility and function. It is observed that when a tubal block is due to fibrosis the endosalpingeal damage is substantial. Tubal patency depends on endosalpingeal integrity. Major endosalpingeal damage results in irreversible tubal block or hydrosalpinx. Minor endosalpingeal damage is self-repaired for which usually 6 months is necessary. Hence it takes about 6 months to one year in achieving a pregnancy in majority of patients following tubolysis. After adhesiolysis bleeding from tubal serosa should be dealt with caution. In most of the cases bleeding stops on pressure or on its own. If diathermy is necessary, bipolar is a better choice, as there is minimal scattering of coagulated current. Any blood clot or carbon particle produced as a result should be washed out carefully to prevent readhesion. In fact, minor tubal defects are usually being stamped as unexplained infertility.

Tubo-ovarian relation is to be evaluated with great care and corrective measures should be undertaken. TOR I position is mostly associated with C tubes. TOR IV position is most favorable position for pregnancy to occur.

### **Result Analysis**

During last 10yrs, 846 cases of primarily unexplained infertility along with some cases of anovulatory infertility not conceiving even after ovulation induction were subjected to laparoscopic evaluation. After corrective measures, 209 (about 25%) cases conceived either normally or by IUI, otherwise called non ART way. Out of remaining cases, IVF and ET were performed in 112 cases which subsequently yielded pregnancy in 30 cases (about 26.7%). This is a 3cycles cumulative data for IVF and six to twelve cycle attempts for non ART pregnancies (Fig5a). Forty nine cases who had failure of one to three IVF attempts previously were subjected to laparoscopy as they were unwilling to go for further IVF procedure. Thirty seven of them had minor tubal defects and after correction nine of them conceived in non ART way yielding a success rate of 24.9% (Fig5b). Forty eight cases of major tubal defects were subjected to laparoscopic corrective procedures yielding a non ART pregnancy in 3 cases only (6.5%). Forty cases amongst them had IVF treatment and 9 cases conceived (22.5%) (Fig5c). It has been observed that following laparoscopic corrective surgery for minor tubal defects, most of the pregnancies occur between 6months to one year after attempts at pregnancy are undertaken. The pregnancy rate drops down significantly after one year of attempts and becomes negligible after one and half years following corrective laparoscopy (Fig6). This is comparable to results obtained after laparoscopic ovarian cystectomy in infertile women in same centre<sup>8</sup>. Incidentally the ectopic pregnancy rate is similar to that of non-tubal infertility group in minor tubal defects indicating the amount of endosalpingeal damage in this group.

### **Conclusion:**

It appears from the present study that half of the cases of so called unexplained infertility are due to minor tubal defects which pass unnoticed if not observed with great care during laparoscopy. Such tubal defects may be due to sub clinical PID or mild grade endometriosis. There may be altered tubo ovarian relation due to some etiology and so also disturbed function of POD. The main object of the corrective procedures are to get a freely mobile Fallopian tube, having proper length and fimbrial function alongwith satisfactory tubo ovarian relation. Recovery of POD is also another important aim such that proper egg pickup can take place. The pregnancy outcome following the corrective procedures

in cases of minor tubal defects are also comparable to that of IVF success rates.

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