

Fluoroscopic Tubal Recanalization in Tubal Factor Related Infertility

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Infertility is defined as the inability to conceive after 1 year of unprotected intercourse, a definition that is based on a monthly fecundity rate of 15 to 25%. Approximately 10 to 20% of couples may experience problems conceiving, and infertility can result from a wide variety of etiologies. Female factors account for 40% of infertility.¹ When investigating infertility, evaluation of both the male and female partner is warranted, as the likelihood of both partners having impaired fertility is relatively high.¹ Dysfunction of the female reproductive process can occur at any of the following steps to cause infertility:

1. Ovarian factor: the ovaries need to produce a mature oocyte.
2. Cervical factor: the cervix needs to capture and transport sperm into the uterus and fallopian tubes.
3. Uterine factor: the uterus needs to allow the embryo to implant.
4. Tubal factor: the fallopian tubes need to capture the ovulated oocyte and transport sperm and embryo.

Tubal factor fertility accounts for the most common cause of female infertility (►Fig. 1). Tubal adhesive or occlusive disease and peritoneal adhesions are typically due to either prior pelvic inflammatory disease or endometriosis. Another less common cause of proximal tubal occlusion is salpingitis isthmica nodosa.^{1,2}

Imaging to Diagnose Tubal Factor Infertility

Hysterosalpingography (HSG) permits evaluation of fallopian tube patency. In addition, HSG can help uncover uterine abnormalities such as adhesions (Asherman syndrome), polyps, myomas, bicornuate or subseptate uterus, or anomalies due to diethylstilbestrol exposure *in utero*.¹ HSG has about a 75% correlation to laparoscopy or hysteroscopy for accuracy,

with a false-negative rate ranging between 8 and 24% and a false-positive rate between 6 and 25%.

HSG is performed under fluoroscopic guidance during the follicular phase of the menstrual cycle, after the cessation of menses. The major complication of the HSG is infection, which occurs in 1 to 3% of patients; antibiotic prophylaxis with doxycycline (beginning 1 day before the procedure for a total of 5 days) is indicated when there is a prior history of pelvic infection. Other complications include a hypersensitivity reaction to iodinated contrast, vascular intravasation of contrast, and pain. To reduce discomfort, a nonsteroidal anti-inflammatory agent can be administered 1 hour before the procedure.^{1,2}

Indications and Procedure

HSG findings suggesting proximal tubal obstruction require further evaluation to exclude artifacts resulting from transient tubal/myometrial contractions or relating to catheter position.² Fluoroscopic selective tubal cannulation will confirm or exclude proximal tubal occlusion suggested by HSG, and provides the means for possible treatment via recanalization using specialized catheter systems.²

Fallopian tube recanalization (FTR) is a therapeutic procedure performed to open an obstructed fallopian tube by passage of a guidewire and catheter through a proximal fallopian tube obstruction.³ The equipment and techniques used for FTR are extensions of catheter interventions used in angiography. At our institution, patients are typically referred via the infertility clinic after findings on initial HSG suggest a tubal obstruction. All patients are evaluated in our interventional radiology clinic before any intervention. The procedure is usually performed during the follicular phase of the menstrual cycle (between days 7 and 12). Patients are asked to be nil per os (NPO) for 6 hours, since moderate sedation is

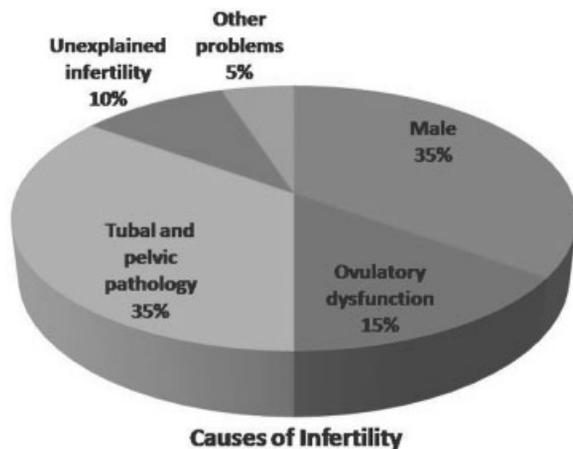


Figure 1 Causes of infertility.

usually given. To alleviate patient anxiety, antibiotic prophylaxis is also started typically 2 to 3 days before the procedure (doxycycline 100 mg orally twice a day for 5 days).

The patient is positioned as comfortably as possible on the fluoroscopy table, including slight elevation of the pelvis using foam pads. Sterile prep and draping is performed, and a metal speculum is gently inserted into the vagina and used to visualize the cervix. We do not administer paracervical anesthesia or use tenaculums; in our experience, metal speculums tend to stabilize the cervix during a possibly lengthy procedure. During our initial experience, we typically used plastic speculums for patient comfort, but found that they collapsed frequently when FTR was performed.

We use the Radiographic Tubal Assessment Kit (Cook Medical, Bloomington, IN) to perform FTR. The kit consists of a 9F balloon catheter, a 5F curved tip catheter, and a 0.035-inch hydrophilic guidewire. After swabbing the cervix, the balloon catheter is inserted and inflated. This inflated balloon catheter provides a sterile system through which coaxial catheters and guidewires can be used and manipulated. Once the catheter is in place, a diagnostic HSG is then performed using 5 to 10 mL of Omnipaque (iohexol) (GE Healthcare, Port Washington, NY) contrast. A slow injection is used to avoid any spasm or cramping. If after opacification of the uterus the fallopian tubes do not fill or are not well visualized, a selective salpingogram is performed (► **Fig. 2**) At our institution, we perform selective salpingography with the Cook 5F curved polyethylene catheter and 0.035-inch hydrophilic guidewire that passes through the already positioned inflated HSG balloon. The guidewire is directed toward the cornual region with the catheter being gently wedged at the tubal ostium, and contrast is gently injected. If the selective salpingogram confirms a proximal tubal occlusion, then FTR is performed.

We typically attempt FTR by gently advancing the 0.035 guidewire through the guiding catheter positioned at the tubal ostium (► **Fig. 3**). Gentle probing is then performed of the tubal occlusions. If after several attempts the proximal obstruction is unable to be traversed, then a Progreat 2.7F microcatheter (Terumo, Phoenix, AZ) and a 45-degree angled

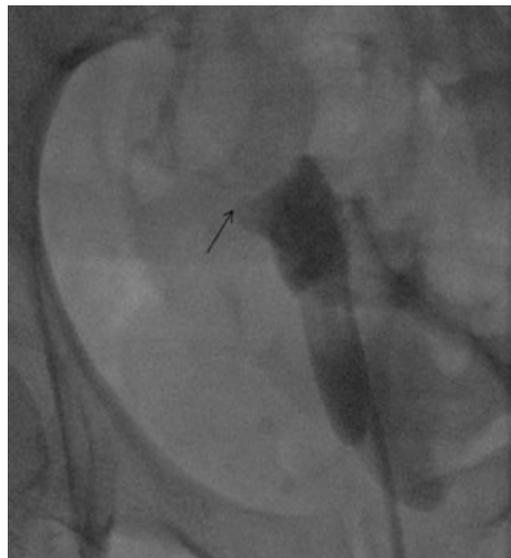


Figure 2 Hysterosalpingogram demonstrates a patent left fallopian tube with contrast spillage. There is a proximal right fallopian tube occlusion (arrow).

GT hydrophilic coated microwire system (Terumo) are used via our cornual catheter (► **Fig. 4**). We have found this microcatheter system to be 100% technically effective. Once the guidewire has crossed the obstruction, it is removed and an

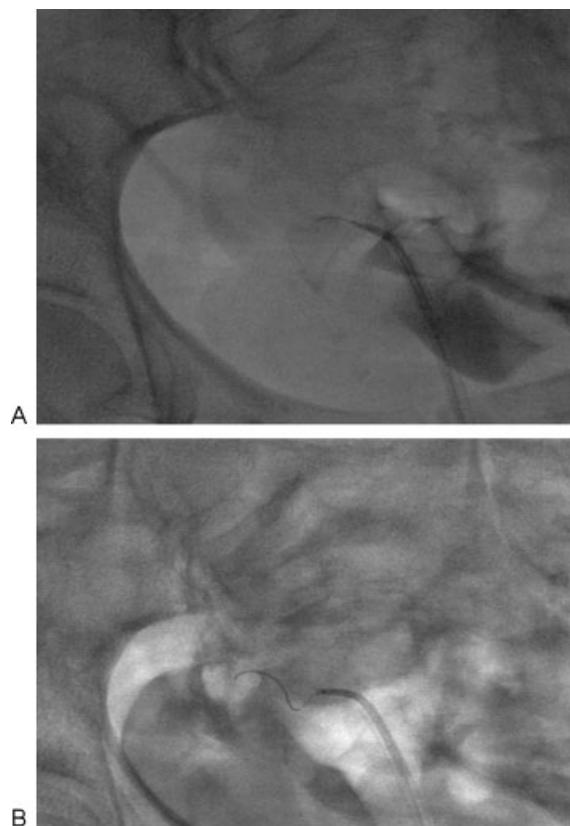


Figure 3 (A) Selective catheterization of the right fallopian tube is performed with a microcatheter system through the 5F cornual catheter. (B) Radiograph demonstrates recanalization of the right fallopian tube using a microwire.



Figure 4 The microcatheter system is advanced into the distal fallopian duct, recanalizing the proximal occlusion.

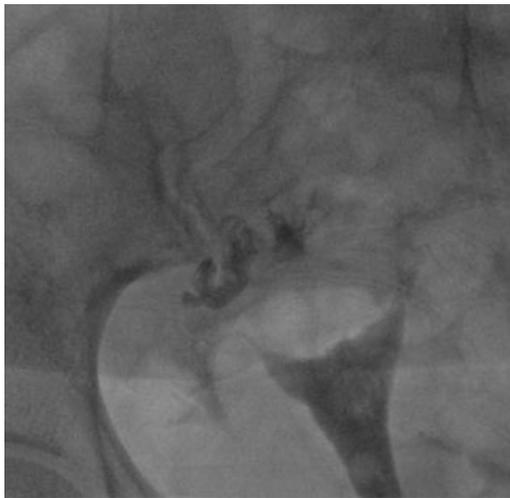


Figure 5 Postprocedure image demonstrates successful recanalization of the right fallopian tube with free contrast spillage.

intratubal salpingogram is performed by gently injecting contrast through the microcatheter. After successful recanalization, the catheter is removed and a repeat selective salpingogram is performed through the guiding catheter still wedged at the tubal ostium (► **Fig. 5**). If a proximal occlusion was also identified on the contralateral side during the initial hysterosalpingogram, the guiding catheter and guidewire wire is reintroduced and redirected toward the contralateral cornual ostium, and the above steps are then repeated. Postprocedural mild cramping and vaginal bleeding can

occur. However, most patients go home the same day as the procedure, and are counseled to try to conceive the same week.

Conclusion

Fallopian tube catheterization is a minimally invasive and well-established procedure in the treatment of infertility. It has a high technical success rate (71–92%) and should be considered as a treatment option for women diagnosed with proximal tubal occlusion as a cause of their infertility.⁴ Pregnancy rates following FTR have been variable (9–58%), but an average pregnancy rate of 30% has been reported.⁴ Tubal reocclusion is difficult to estimate because it is time variable; however, most patients who do not conceive within 6 months have a 50% chance of reocclusion. Repeat catheter recanalization for these patients should be attempted. To alleviate concerns in this younger patient population, it should be noted that the reported radiation exposure to the ovaries from FTR has been reported to be approximately 10 mGy (1 rad).⁴

It is essential to have a good working relationship with the infertility specialists. At our institution, those patients who have both proximal and distal tubal disease, or endotubal disease diagnosed during FTR, are better suited for in vitro fertilization (IVF), which has an overall live birth rate of 29%.⁵ On the contrary, patients with unilateral or bilateral proximal tubal disease who are not willing to undertake the expense and emotional stress of IVF, who do not wish to receive hormonal stimulation, or who are not good candidates for IVF (advanced maternal age older than 45 years), typically undergo FTR as a first-line attempt to help them conceive.

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