Original Article

Essure Multicenter Off-Label Treatment for Hydrosalpinx Before In Vitro Fertilization

Donald I. Galen, MD*, Naveed Khan, MD, and Kevin S. Richter, PhD

From the Reproductive Science Center of the San Francisco Bay Area, San Ramon, California (Dr. Galen) and Shady Grove Fertility Reproductive Science Center, Rockville, Maryland (Drs. Khan and Richter).

ABSTRACT

Study Objective: To estimate the safety and efficacy of Essure placement for proximal tubal occlusion in women with hydrosalpinx before in vitro fertilization (IVF).

Design: Prospective 2-center clinical study of women with hydrosalpinx who were recruited for off-label unilateral or bilateral placement of Essure before IVF (Canadian Task Force classification II-2).

Setting: Tertiary office-based infertility and IVF practice settings.

Patients: Twenty women with bilateral or unilateral hydrosalpinx desiring IVF.

Interventions: Office-based Essure placement and subsequent hysterosalpingography confirmation of proximal tubal occlusion.

Measurements and Main Results: Placement success, and proximal tubal occlusion and birth rate after IVF. Eight women with unilateral hydrosalpinx received unilateral Essure placement, and 12 women with bilateral hydrosalpinx received bilateral placement. One unsuccessful placement occurred. Hysterosalpingography confirmed proximal tubal occlusion in 19 of 20 women (95%) and of 31 of 32 tubes (97%) with Essure placement. Subsequent IVF resulted in 12 live births, for a birth rate per transfer of 57% (12 of 21) and a birth rate per patient of 67% (12 of 20). Four obstetric complications were reported including placenta previa, hypertension, maternal diabetes with premature rupture of membranes, and preeclampsia. All infants are well.

Conclusion: Placement of Essure microinserts is an effective method of nonincisional proximal tubal occlusion of hydrosalpinx. Success rates achieved through subsequent IVF are typical of outcomes of good-prognosis in similarly aged patients without hydrosalpinx in our same programs, based on 2008 Society for Assisted Reproductive Technologies data. Journal of Minimally Invasive Gynecology (2011) 18, 338–342 /C211 2011 AAGL. All rights reserved.

Keywords: Essure; Hydrosalpinx; Hysteroscopic tubal occlusion; In vitro fertilization; Microinsert; Outpatient; Tubal factor

A hydrosalpinx is a distally blocked, dilated, fluid-filled fallopian tube often a consequence of previous pelvic infection, and may be unilateral or bilateral. Tubal factor accounts for 25% to 35% of female infertility [1], and hydrosalpinx is present in 10% to 30% of all patients undergoing in vitro fertilization (IVF) [2]. Both retrospective and prospective studies have demonstrated that women with hydrosalpinx have up to a 50% reduction in implantation and pregnancy rates after IVF compared with women with tubal factor infertility without hydrosalpinx [1–7].

Exactly what mechanisms negatively affect implantation rates in women with hydrosalpinx are not known; some possibilities include the effects of bacterial toxins in the hydrosalpingeal fluid on the gamete or embryo, reduced expression of cytokines and integrins, decreased endometrial blood flow, and possible mechanical flushing of the embryo from the endometrium [3,8–11]. Spontaneous abortion and ectopic pregnancy rates have been reported to be as much as 2- to 3-fold higher in patients with hydrosalpinx [3,4]. Also reported are spontaneous abortions in patients with unilateral hydrosalpinx when other causes of abortion have been excluded [12].

Essure (Conceptus Inc, San Carlos, CA) is a nonincisional procedure that involves hysteroscopic insertion of a small flexible device called a microinsert into each fallopian...
tubing to permanently occlude the proximal tube for permanent female sterilization. In addition to the “space-filling” aspect of the microinsert, the primary method of action is an inflammatory benign tissue ingrowth that occurs after placement. The Essure system comprises the microinsert and a disposable delivery system, and has undergone clinical investigation since 1996. Essure received US Food and Drug Administration approval in 2002 for use in permanent female sterilization. By occluding the proximal tube, the Essure microinsert also prevents hydrosalpinx fluid from entering the endometrial cavity. Consequently, the procedure has been proposed as a nonincisional treatment for hydrosalpinx before IVF. The effects of Essure on the success of IVF have been uncertain. If pregnancy is achieved, the risks of the microinsert to the patient, the fetus, and continuation of the pregnancy have been unclear. Thus, the need for off-label clinical studies to measure the safety and efficacy of Essure during IVF cycles was identified.

Materials and Methods

This was a prospective, 2-center, off-label, sequential, nonrandomized Investigational Device Exemption– and institutional review board–approved observational study of Essure microinsert proximal tubal occlusion in women with hydrosalpinx and of their subsequent pregnancy rate after IVF using fresh embryo transfer or frozen embryo transfer cycles. Twenty-one women with either unilateral or bilateral hydrosalpinx were identified via laparoscopy or ultrasound (Fig. 1) from existing patients in the 2 study practices. Patients were offered off-label hysteroscopic placement of Essure rather than incisional surgery to achieve proximal tubal occlusion (Fig. 2). Enrollment began on April 14, 2009; enrollment is complete, and follow-up is ongoing. Primary inclusion criteria were age 21 through 38 years; normal ovarian reserve (day 3 serum follicle-stimulating hormone <10 mIU/mL and day 3 estradiol <80 mIU/mL, and combined antral follicle count ≥10 for both ovaries) or use of an eligible egg donor; attempt to achieve pregnancy for at least 1 year; and unilateral or bilateral hydrosalpinx as demonstrated at laparoscopy, hysterosalpingography (HSG), or ultrasound. Primary exclusion criteria were active or recent upper or lower pelvic infection, hypersensitivity to nickel or allergy to HSG contrast media, pregnancy or suspected pregnancy, delivery or termination of pregnancy less than 6 weeks before Essure placement, body mass index greater than 35, abnormal Papanicolaou smear (cervical intraepithelial neoplasia grade 2 or greater) within past year, and evidence of intrauterine abnormalities.

Typical insertion time for the Essure device, whether unilateral or bilateral, was 10 to 20 minutes. Patients were given an oral dose of doxycycline 100 mg 1 to 3 hours before the procedure and then brought to the office procedure room. The patient was placed with her legs in padded Allen stirrups, and cervical preparation was with povidone-iodine. Nine patients received paracervical block anesthesia using 15 to 30 mL of 1% lidocaine with epinephrine 1:200,000, and 11 patients received intravenous sedation using midazolam 2 mg, fentanyl 25 to 100 μg, and propofol 200 to 400 mg, titrated to patient needs. A tenaculum was placed on the cervix, and if necessary, cervical dilation proceeded sufficient to admit a 5-mm operative hysteroscope. With prewarmed normal saline solution, each proximal tubal ostia was noted hysteroscopically, and Essure microinserts were placed specifically with the goal of limiting the number of

![Fig. 1](http://example.com/fig1.png)

Transvaginal ultrasonogram shows a left-sided hydrosalpinx post Essure placement.

![Fig. 2](http://example.com/fig2.png)

Hysterosalpingogram shows proximal bilateral placement of Essure microinserts.
intrauterine coils to 2 to 4 after placement. Patients were then taken to the recovery room, and were discharged to home within 30 to 60 minutes. Each patient was followed up at HSG 3 months after Essure placement to confirm proximal tubal occlusion, and then proceeded with IVF or frozen embryo transfer cycles.

Results

One patient was excluded because of an extremely retroverted uterus not accessible at hysteroscopy; thus, 20 patients were included in the study. Eight patients underwent unilateral Essure placement, and 12 patients underwent bilateral Essure placement. Four intended to undergo subsequent IVF with donor eggs, and the remaining 16 intended to undergo IVF using their own eggs. To date, 18 women have undergone either a fresh cycle of IVF–embryo transfer (n = 16) or a frozen embryo transfer cycle (n = 2). Three women attempted a second transfer (frozen embryo) after an unsuccessful cycle of fresh IVF–embryo transfer, for a total of 21 embryo transfer procedures. One woman is currently waiting for an egg donor for her first IVF cycle, and another woman was lost to follow-up (could not be located).

The 16 patients using their own eggs ranged in age from 24 to 38 years (median, 34 years), and had day 3 follicle-stimulating hormone concentrations ranging from 4.1 to 9.8 IU/L (median, 6.6 IU/L) and antral follicle counts ranging from 10 to 38 (median, 15.5). The 4 patients using donor eggs ranged in age from 24 to 44 years (median, 38.5 years). One patient using donor eggs had previously undergone 2 attempts at IVF attempts. Two patients using their own eggs had, respectively, 1 and 2 previous unsuccessful attempts at IVF.

All Essure devices were intentionally placed with a reduced number of intravaginal coils visible (range, 1–5; median, 2). Follow-up HSG confirmed proximal tubal occlusion in 19 women (95%) (95% confidence interval [CI], 75%–100%). In 1 patient with bilateral Essure placement, only 1 of 2 tubes were occluded at follow-up HSG, and laparoscopic tubal occlusion of the remaining patent tube was required before IVF. Thus, after placement of 32 Essure devices, 31 tubes were successfully occluded (97%) (95% CI, 83%–100%).

In vitro fertilization was generally initiated approximately 4 months after confirmation of tubal occlusion. In each of these cycles, either 1 embryo (n = 6) or 2 embryos (n = 15) were transferred. As a result of the 21 embryo transfer procedures performed to date, there have been 12 live births, for a birth rate per transfer of 57% (95% CI, 36%–76%) and a birth rate per patient of 67% (95% CI, 44%–84%).

Birth outcomes were not noticeably changed by factors such as use of donor eggs, fresh vs cryopreserved embryo transfer, or unilateral vs bilateral Essure placement, although the small sample size greatly limited the ability to assess the potentially confounding effects of these variables. There was 1 birth after 3 embryo transfers in 3 donor egg recipients, and 11 births after 18 embryo transfers in 16 women using their own eggs (p = .55). Two of 5 transfers of cryopreserved embryos resulted in births, compared with 10 of 16 fresh embryo transfers (p = .61). Birth rates per transfer did not differ significantly between those study patients who had unilateral hydrosalpinx (n = 8) and those who had bilateral hydrosalpinx (n = 13): 63% (5 of 8) and 54% (7 of 13), respectively (p = .99).

The median (range) gestational age at birth was 37 (33–40) weeks, with 3 pairs of full-term twins, 1 preterm pair of twins at 33 weeks, 6 full-term singleton births, and 2 preterm singleton births at 33 and 35 weeks. All preterm infants are now home and doing well. One of the term singletons resulted from a twin pregnancy that spontaneously reduced during early pregnancy. In 1 additional pregnancy, nonviable twins were lost during the first trimester. Six deliveries were via caesarean section, which occurs more frequently in IVF pregnancies. Reported complications, which resulted in cesarean section deliveries, included placenta previa, hypertension, preeclampsia, and maternal diabetes with premature rupture of membranes (n = 1 each). Pregnancies and births were otherwise uncomplicated and healthy.

Discussion

The observed live birth rates per embryo transfer and per patient of 57% and 67%, respectively, are typical of IVF in patients with good prognosis without hydrosalpinx (https://www.sartcorsonline.com/rptCSR_PublicMultiYear.aspx?ClinicPKID=2351 and https://www.sartcorsonline.com/rptCSR_PublicMultiYear.aspx?ClinicPKID, Society for Reproductive Technology, Clinic Data Summary. Accessed January 20, 2011). The high rate (6 of 12; 50%) of cesarean deliveries reported in the present study was associated with twin births: 4 of the twin births were via cesarean section. Overall cesarean delivery rates in the United States (31.8%) [13] (more than the approximate 20% [14] in other developed countries that has been reported by the World Health Organization) have become notoriously commonplace regardless of patient history. In addition, obstetric complications such as preeclampsia, diabetes, preterm labor, preterm rupture of membranes, and placental abnormalities have been reported in women who conceive using donated oocytes compared with IVF patients using autologous eggs [15].

Conventional treatment options for hydrosalpinx include salpingectomy, salpingostomy, proximal tubal occlusion, and drainage of the hydrosalpingeal fluid at either laparoscopy, laparotomy, and transvaginal ultrasound needle aspiration. Incisional treatment of hydrosalpinx before IVF improves implantation and pregnancy rates [5,6,10,16–19]. Numerous studies have measured pregnancy outcome after proximal tubal occlusion as an alternative to salpingectomy [5,17,19–21]. There are not, however, so many large randomized controlled studies [8,20]. Laparoscopic proximal tubal occlusion may be achieved using monopolar or bipolar coagulation, applying rings or
clips, or by removing a section of the tube. Other studies reporting treatment by either proximal tubal occlusion or salpingectomy restored pregnancy rates to those expected for patient age and tubal factor infertility in women without hydrosalpinx. The American Society for Reproductive Medicine in collaboration with The Society of Reproductive Surgeons concluded that “For every six women with hydrosalpinges, one more ongoing pregnancy will be achieved if salpingectomy or tubal occlusion is performed before IVF” [22]. Although generally safe and effective, these incisional procedures carry increased risk of operative complications and are typically performed with the patient under general anesthesia. Moreover, women with diagnosed hydrosalpinx are more likely to have associated pelvic adhesions, which can make a laparoscopic or open surgical procedure more technically difficult, increase the risk of surgical complications, or not feasible.

Office-based hysteroscopic Essure placement has recently been described as part of a pain and satisfaction study in a cohort of 209 women with an average (SD) age of 35.1 (5.2) years who received paracervical block anesthesia [23]. Pain was assessed at the time of the procedure using a visual analog scale (grade 0–10) as 2.6 (2.1). A hysteroscopic approach to tubal occlusion is also less invasive and may be a safer option than traditional incisional surgical treatments for hydrosalpinx in women who plan to undergo IVF [11,20]. The first reported case using Essure to treat hydrosalpinx was by Rosenfield et al [24], who treated 1 woman with unilateral hydrosalpinx by performing hysteroscopic placement of Essure before proceeding with IVF. The patient’s history included morbid obesity, infertility, pelvic adhesive disease, and previous intraoperative complications related to general anesthesia. In vitro fertilization was successful, resulting in a twin gestation. Those authors concluded that proximal tubal occlusion with the Essure device may be an alternative to a laparoscopic procedure to occlude hydrosalpinx in women who are not good surgical candidates.

In 2007, Galen and McWatters [16] reported results of an off-label pilot study using Essure for proximal tubal occlusion in women with hydrosalpinx before IVF. Eight women aged 32 to 44 years with unilateral or bilateral hydrosalpinx were evaluated. Bilateral Essure placement was performed in 6 women with bilateral hydrosalpinx; unilateral Essure placement was performed in 1 woman with unilateral hydrosalpinx; and 1 Essure placement attempt was unsuccessful. The devices were intentionally placed with only 2 to 4 intrauterine coils visible after the procedure. Follow-up confirmatory HSG was performed in 6 patients, and all demonstrated bilateral proximal tubal occlusion related to the device. One woman elected not to undergo HSG. In vitro fertilization was initiated in 5 women at 3 to 4 months after confirmation of tubal occlusion. Four women became pregnant in their first IVF cycle, and delivered at term. One woman did not achieve pregnancy. All women used their own eggs for the IVF cycles. Results of this pilot study demonstrated an 80% term delivery rate per embryo transfer. Although none of these patients underwent second-look hysteroscopy to assess the status of the trailing ends of the Essure microinserts before IVF, Kerin et al [25] and Mijatovic et al [21] demonstrated almost complete tissue encapsulation of the intrauterine portion of the coils by performing second-look hysteroscopy before IVF.

Mijatovic et al [21] reported a series of 10 patients who received the Essure device for treatment of hydrosalpinx before IVF; all of whom had contraindications for laparoscopy. The live birth and ongoing pregnancy rates reported for these 10 patients were 20% and 40%, respectively [21].

Hitkari et al [17] described a series of 5 patients with hydrosalpinx who underwent the Essure procedure. Four of these women underwent hysteroscopic placement of the Essure device, and 1 underwent fluoroscopic-guided placement of the Essure device. Successful bilateral Essure placement occurred in only 2 of 5 patients, and no pregnancies after IVF were reported.

Conclusion

Based on our research of published literature (PubMed/ Medline and Cochrane databases; search terms, Essure, Essure hydrosalpinx, Essure in vitro fertilization, Microinsert hydrosalpinx, Tubal occlusion, and Essure IVF), the present study is the largest case series reported to date on the use of Essure for proximal tubal occlusion of hydrosalpinx before IVF. This prospective clinical trial adds support to earlier reports of cases and smaller series, including our previous pilot study, that suggested that placement of Essure microinserts is an effective method of inducing proximal tubal occlusion in infertile patients with hydrosalpinx. Observed outcomes of subsequent IVF were typical of those in patients with good prognosis without hydrosalpinx. Essure may offer an equally effective, yet easier, office-based and less costly alternative to traditional incisional methods of hydrosalpinx treatment before IVF. Ideally, these potential benefits should be confirmed in a large randomized clinical trial comparing Essure with incisional methods of proximal tubal occlusion.

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References


