Pregnancy rates following fimbriectomy reversal via neosalpingostomy: a 10-year retrospective analysis

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Objective: To establish parameters associated with successful fimbriectomy reversal and to estimate monthly fecundability and cumulative pregnancy rates through life-table analysis.

Design: Series report.

Setting: University-based infertility clinic.

Patient(s): Forty-one women undergoing surgery for tubal sterilization reversal.

Intervention(s): Surgical fimbriectomy reversal.

Main Outcome Measure(s): Time from sterilization to reversal, laparoscopy vs. laparotomy, uni- vs. bilateral fimbriectomy reversal, Bruhat vs. suture, tubal lengths, postsurgical hysterosalpingogram, ovulation induction, incidence of pregnancy and outcome, and life-table analysis to determine pregnancy rate.

Result(s): The mean time from sterilization to reversal was 11.5 years. Of the 41 women who underwent fimbriectomy reversal, 6 (14.6%) conceived. Sixteen reversals were performed by laparotomy resulting in 4 (25%) pregnancies, whereas 25 were performed laparoscopically resulting in 2 (8%) pregnancies. Eight had unilateral salpingostomies and 33 bilateral, of which 1 of 8 (12.5%) and 5 of 33 (15.2%) conceived, respectively. Using the Bruhat technique, 1 of 11 (9%) conceived vs. 5 of 30 (16.7%) that underwent reversal using sutures. The mean postoperative tubal length for the 6 women who conceived was 8 cm vs. 6.7 cm in the 35 women who did not conceive. Postoperatively, 26 women received ovulation induction and 1 (3.8%) conceived whereas 5 (33.3%) conceptions occurred in 15 women who did not require ovulation induction. Using life-table analysis with 619 postsurgical cycles, the monthly fecundability was .0097. The cumulative conception rate after 5 years was 31.2%.

Conclusion(s): Neosalpingostomy for the reversal of fimbriectomy sterilization represents a viable option for fertility restoration. The best candidates for this procedure are spontaneously ovulatory and have a tubal length of more than 7 cm. (Fertil Steril 2001;76:1041–4. ©2001 by American Society for Reproductive Medicine.)

Key Words: Fimbriectomy, neosalpingostomy, sterilization reversal, pregnancy rate

In the modern era of assisted reproductive technologies, the place for tubal microsurgical repair is becoming less evident. As a result, prudent patient selection including the patient’s age and wishes, number of offspring desired, financial considerations, and availability to microsurgical expertise all play an important role in the decision whether or not to proceed with surgery. Reconstructive surgery is not usually recommended for some causes of tubal infertility: severely damaged and dilated distal fallopian tubes, bilateral salpingectomy, and bipolar tubal obstruction. However, tubal sterilization reversal is associated with substantial success (1) and is recommended in most instances.

Various methods of tubal sterilization have been described in the gynecologic literature. Even though all are intended to be permanent, sterilization reversal is subsequently requested by a small percentage of patients (2). The success of sterilization reversal is partly dependent on the age of the patient and also on the postoperative length of the tube, which is a function of the method of sterilization employed (3). Of the various sterilization methods, Kroener’s fimbriectomy is thought to have one of the lowest failure rates (4). Kroener’s original de-
scription (4) includes 200 cases without a single failure. This type of sterilization has also been thought to have the lowest chance of successful reversal.

However, in his initial report, Novy performed neosalpingostomies on 9 women who had undergone Kroener fimbriectomy and reported a 44% pregnancy rate over a 4-year period with a mean interval from operation to conception of 6 months (range 4–9 months) (5). Subsequently, Novy reported a cumulative pregnancy rate of 40% over a 10-year period in 40 subjects who underwent fimbriectomy reversal and a cumulative pregnancy rate of 55% in 22 of the 40 women who had an ampullary width of 1 cm on preoperative hysterosalpingogram (HSG) (6).

The purpose of this study was to review the experience of fimbriectomy reversal at our institution in order to determine fecundability and cumulative pregnancy rates using life-table analysis and to identify factors leading to the success of fimbriectomy reversal.

**MATERIALS AND METHODS**

During the time of this study, the infertility clinic of the Los Angeles County + University of Southern California Medical Center performed approximately 100 sterilization reversals per year. All patients underwent preoperative hysterosalpingography. After documentation of normal semen analysis and lack of ovarian failure, patients underwent diagnostic laparoscopy.

If a reanastomosis was feasible, it was performed under the same anesthetic. If the fimbriae were surgically absent, and the patient gave appropriate preoperative consent, a fimbriectomy reversal was performed. The details of the surgical method were selected by the surgeon, including the choice of laparoscopy vs. laparotomy, and whether a Bruhat technique (7) or sutures would be used to maintain tubal patency following neosalpingostomy. The choice of suture was also made by the surgeon, but in all cases consisted of a delayed-absorbable suture of a size between 4-0 and 6-0.

Between November 1989 and October 1999, 41 patients underwent fimbriectomy reversal with either unilateral or bilateral neosalpingostomies. All patients had at least 3 months of postoperative follow-up, for a total of 619 woman-months of follow-up. Clinical charts, radiological records, and patient interviews were used to determine the following end points: time elapsed from fimbriectomy sterilization to reversal; laparoscopy vs. laparotomy for fimbriectomy reversal; unilateral vs. bilateral neosalpingostomies; Bruhat vs. suture technique for neosalpingostomy; tubal length; postoperative HSG results, if performed; whether ovulation induction agents were used postoperatively; the period of postoperative follow-up; and pregnancy outcome.

Student’s **t**-test was used to compare tubal lengths, and life-table analysis was used to determine cumulative pregnancy rate. The remaining variables were analyzed with Fisher’s exact test. This retrospective analysis was approved by the Institutional Review Board of the Los Angeles County + University of Southern California Medical Center.

**RESULTS**

The mean age of the 41 women was 33.8 ± 3.6 years (mean ± SD) with a mean gravidity of 3.1 ± 0.9 and a mean parity of 3.0 ± 0.9. The mean time from fimbriectomy sterilization to reversal was 11.5 ± 4.7 years. Of the 41 women who underwent fimbriectomy reversal, 6 (14.6%) conceived at least once (all intrauterine). There was no significant difference in the age, gravidity, parity, or time from sterilization between the pregnant and nonpregnant groups (Table 1). One of the women conceived three times but was only counted as one conception for the purpose of pregnancy rate calculations.

Although there was a trend toward higher pregnancy success with laparotomy (4 of 16, 25%) as compared with laparoscopy (2 of 25, 8%), the difference did not reach statistical significance (**P**>0.05). There was also no statistically significant difference in success whether a unilateral (1 of 8, 12.5%) or bilateral (5 of 33, 15.2%, **P**>0.05) neosalpingostomy was performed or whether the neosalpingostomy

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<td>Mean tubal length (cm)</td>
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*Statistically significant.

**Table 1**

was performed using the Bruhat (1 of 11, 9%) or suture technique (5 of 30, 16.7%, \( P \geq 0.05 \)).

The mean postoperative tubal length for the 6 women who conceived was 8.0 ± 0.6 (mean ± SD) (range 7–9) cm vs. 6.7 ± 1.9 (range 2–11) cm in the 35 women that did not conceive (\( P < 0.05 \)) (Table 1). Tubal lengths included all tubes, but fimbritectomy reversal was only attempted when at least one tube had an ampullary segment. All of the women (6 of 6) who conceived had one tube with at least 7 cm length, compared with only 18 of 35 (51.4%) of those who failed to conceive (\( P < 0.05 \)). Postoperatively, 26 women received clomiphene citrate for ovulation induction and 1 (3.8%) conceived vs. 5 of 15 (33.3%) in those that did not conceive (\( P < 0.05 \)). The pregnancy rate for spontaneously ovulatory women with at least one tube >7 cm was 5 of 11 (45%).

Seventeen of the 41 women (41.5%) underwent a postoperative HSG 3–6 months after surgery. Three additional women, who conceived prior to HSG, were assumed to have tubal patency. Of the 4 women who underwent a unilateral salpingostomy and had a HSG, 2 (50%) demonstrated complete block of the tube. Of the 16 who underwent bilateral neoosalpingostomies and had a HSG, 7 (43.8%) demonstrated bilateral blockage (\( P > 0.05 \)).

The monthly fecundability rate based on 619 woman-months of follow-up was 6 of 619, or .0097. Utilizing life-table analysis, the cumulative conception rate was 9.76%, 14.8%, 20.9%, 26.5%, and 31.2% after years 1 through 5, respectively (Figure 1). No conceptions occurred after the fifth postoperative year, although the number of patients in the cohort in this period was very small.

**DISCUSSION**

As suggested by early work on animal models, the tubal fimbriae perform an integral function in the process of ovum pick-up (8, 9). Using transvaginal hydrolaparoscopy, Gordts et al. (10) have recently confirmed the importance of this role by directly visualizing an actual human in vivo ovum pick-up. On the side of ovulation, fimbriae were noted to be congested and rigid demonstrating pulsatile movements, and to be in contact with the cumulus-oocyte mass located at the ovarian stigma. The cumulus-oocyte mass was then swept into ciliated folds of the fimbriae by sweeping movements. These fimbrial folds are contiguous with those of the ampullary segment of the fallopian tube (11). In this manner, the cumulus-oocyte mass is transported from the ovarian stigma to the ampullary segment of the fallopian tube where fertilization occurs.

It is therefore apparent from both animal and human data that the fimbriae are crucial to normal ovum pick-up. It is not surprising that surgical extirpation of the fimbria is associated with a very low rate of subsequent pregnancy, nevertheless it has been demonstrated in rabbits that a distal neofimbriae can retrieve and transport the cumulus-oocyte complex (12). Accordingly, after fimbritectomy reversal in this series, we observed pregnancies albeit at a low monthly fecundability rate of <1%.

Novy suggested that the ideal candidate for fimbritectomy reversal has residual tubal segments of 8 cm or longer and an ampullary width of 1 cm by HSG (6). This was also observed in our study where a tubal length of >7 cm was associated with the best prognosis for pregnancy. This tubal length corresponds to the mid-ampullary segment of the tube, the natural site for fertilization, and represents the widest diameter of the tube. Unlike fimbritectomy reversal, end-to-end anastomosis recreates a patent tube with structural normalcy and functional integrity including muscular coordination, ciliary apparatus and fimbrial-ovarian apposition. Fimbriectomy reversal fails to remedy one or more of these factors. Although more women conceived when the procedure entailed laparotomy and a suturing technique (compared to laparoscopy and Bruhat technique, respectively), the differences failed to reach statistical significance. However, the sample size of this study may be too small to detect these differences.

Several authors have reported pregnancy rates following fimbritectomy reversal (Table 2). In total, 7 studies representing pregnancies observed over 4- to 10-year periods, account for 91 fimbritectomy reversals with a total intrauterine pregnancy rate of 38 of 91 (42%) and an ectopic rate of 1/91. The cumulative pregnancy rate observed in this study, based on life-table analysis, reached 31.2% after 5 years of follow-up. However, the number of patients in the cohort beyond the third year was small and a single additional pregnancy would have altered the cumulative rate appreciably.
Since pregnancies may occur several years after the surgery, it may well be that 1% fecundability continues to be observed for a considerable time, and the patient’s age at the time of the reversal should therefore be considered an important parameter in choosing surgical fimbriectomy reversal. The monthly fecundability rate of approximately 1% observed in this study pales in comparison to in vitro fertilization (IVF) in which cycle fecundability rates approximate 35% (17). However, IVF also has disadvantages such as high cost, the need for frequent monitoring and invasive procedures and a far greater risk of multiple gestations. Thus, women who are spontaneously ovulatory and have at least one tube >7 cm may indeed consider fimbriectomy reversal as a potential alternative to IVF.

In conclusion, fimbriectomy reversal may be a viable option for selected patients. The best candidates are those who are ovulatory and have a tubal length >7 cm. Patients lacking these criteria should be advised of the low monthly fecundability and cumulative pregnancy rates associated with surgical reconstruction and encouraged to consider IVF as the most efficient means to conception.

References