

Tips and Techniques for Laparoscopic Tubal Reanastomosis: A Case Report

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Tubal reanastomosis or tubal reversal, a surgical method used to reverse tubal sterilization, may be an option for women who for various reasons wish to reestablish their fertility. A 38-year-old Chinese woman, gravida 2, para 2 (both delivered through cesarean section) presented to our outpatient gynecology clinic requesting bilateral tubal recanalization. After other causes of infertility were excluded, laparoscopic tubal reanastomosis was performed. Here, we present our tips and techniques for laparoscopic tubal reanastomosis that rapidly resulted in an intrauterine pregnancy, which delivered at term. Laparoscopic tubal reanastomosis is a well-established procedure with good prognosis, as reported in the literature. For women who wish to become pregnant after tubal sterilization, it is necessary to present the option of surgery as well as in vitro fertilization.

Key words: tubal sterilization, reversal, reanastomosis, laparoscopy

INTRODUCTION

According to the World Health Organization (WHO), the estimated incidences of tubal sterilization are as follows (values of tubal sterilization as a percentage of married or in-union women of reproductive age): Japan, 1.0%; U.S., 18.7%; UK, 8.0%; France, 4.1%; China, 18.3%; and India, 36.0% [1].

Approximately 1%-3% of the women who undergo tubal sterilization request a reversal [2, 3]. Tubal reanastomosis or tubal reversal, a surgical method used to reverse tubal sterilization, may be an option for women who for various reasons wish to reestablish their fertility. The current surgical management options for tubal reanastomosis include microsurgical techniques by laparotomy, laparoscopy, and a robotic approach. Laparoscopic tubal reanastomosis has been introduced, with good prognoses.

Here, we present our experience with a laparoscopic tubal anastomosis that rapidly resulted in an intrauterine pregnancy, which delivered at term.

CASE REPORT

A 38-year-old Chinese woman, gravida 2, para 2 (both delivered through cesarean section) presented to our outpatient gynecology clinic requesting bilateral tubal recanalization. She had undergone a tubal sterilization during the last cesarean section at the age of 27. In China, the One-Child Policy was abolished in 2015, but the number of tubal sterilization surgeries is still high. There are two possible reasons for this. The first is that the age group who wants a second child is not accustomed to the lifestyle of having two or more children because they grew up with an only

child policy, and the second is that they have lived with a lifestyle plan based on high education costs, rent (or mortgage), and other necessary expenses and do not like the new burden.

There was no other notable medical history. The physical examination revealed no abnormalities. Transvaginal ultrasound demonstrated a normal uterus and ovaries. Laboratory findings were within normal limits. After other causes of infertility were excluded, laparoscopic tubal reanastomosis was proposed.

Surgical procedure

Set-up

Under general anesthesia, the patient was placed in the lithotomy position. A uterine manipulator was inserted for uterine manipulation and chromopertubation. A 12-mm trocar was placed in the umbilicus for the laparoscope. A 30° laparoscope was inserted, and the pelvic cavity was inspected. One 5-mm trocar was placed in the midclavicular line at an umbilicus level, and two were placed 2-3 cm medial to the bilateral anterior superior iliac spine (Fig. 1). The uterus was mobilized for an inspection of the pelvis and examination of the proximal and distal tube lengths and the condition of the fimbria. There was no adhesion in the pelvis. We first performed a chromopertubation to visualize the site of ligation. The bilateral fallopian tubes were occluded at the ampulla portion approx. 2 cm from the fimbria (Fig. 2A,B).

Development of the proximal and distal ends of the fallopian tubes

The obstruction sites were excised with laparoscopic scissors (Fig. 2C). Both cut edges of the fallopian tubes

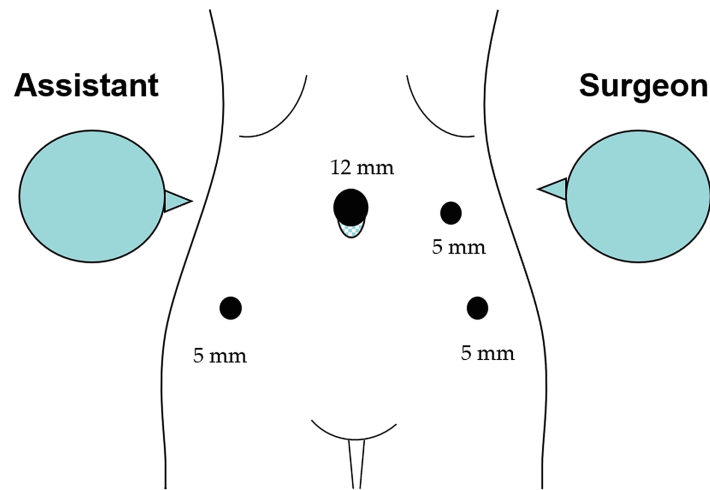


Fig. 1 Trocar placement; the four trocars were inserted as follows: A 12-mm trocar was placed in the umbilicus for the laparoscope. One 5-mm trocar was placed in the midclavicular line at an umbilicus level, and two were placed 2–3 cm medial to the bilateral anterior superior iliac spine.

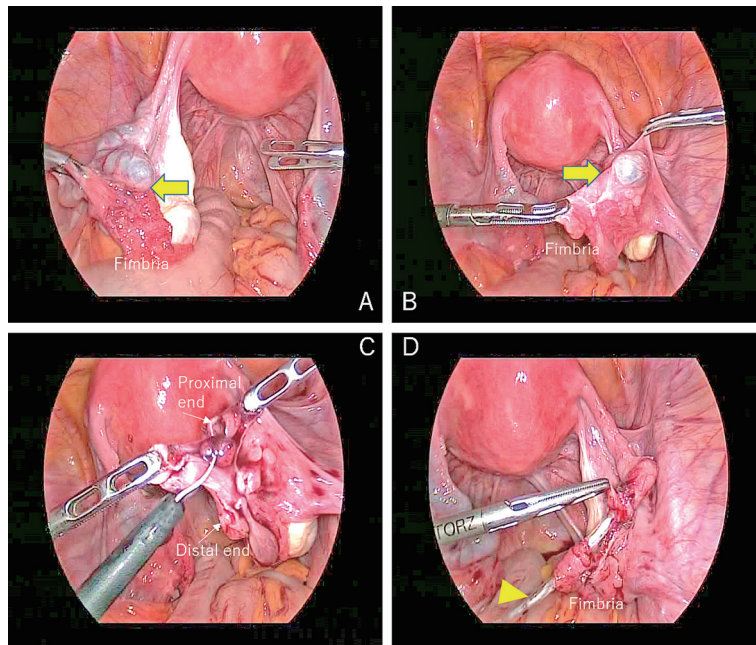


Fig. 2 Development of the proximal and distal ends of the fallopian tube.

A, B: Bilateral tubal ligation sites (yellow arrow) were identified by chromopertubation. Both occluded sites were at the ampulla portion approx. 2 cm from the fimbria.

C: The obstruction sites were excised with laparoscopic scissors.

D: A flexible catheter (yellow arrowhead) was inserted from the fimbriated end of the tube in order to line up the fallopian tubes.

were examined; they exhibited normal luminal tissue. Indigo carmine solution was flushed through the uterine manipulator to confirm the proximal tubal patency. The mucosa can be stained with indigo carmine to accentuate the visibility of the individual layers. A flexible catheter, 2 mm in diameter, was inserted from the fimbriated end of the tube in order to line up the fallopian tubes (Fig. 2D).

Sutures

Sutures were done sequentially in one layer including the mucosal, muscle, and serosal layers of the fallopian tubes with 5-0 absorbable monofilaments at the 6 o'clock, 3 o'clock, 9 o'clock, and 12 o'clock posi-

tions. The first suture of the inner musculoepithelial layer was placed at the mesosalpingeal border (6 o'clock position) to ensure proper alignment of the two segments of the tube (Fig. 3A). The suturing was done so that the knot was placed outside the mucosa (Fig. 3B). After the anastomosis was completed, the catheter in the lumen was removed and chromopertubation was performed to confirm tubal patency and a watertight anastomotic site (Fig. 3C). Finally, the defect in the mesosalpinx was approximated with 5-0 absorbable monofilaments. After careful pelvic irrigation, both fibrin glue and an adhesion barrier (a sodium hyaluronate-based bioresorbable membrane) were used to prevent adhesions (Fig. 3D).

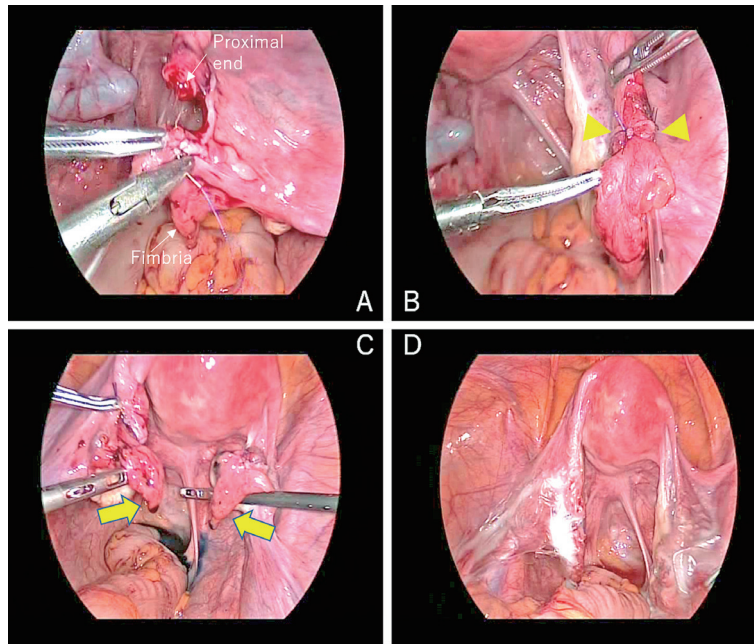


Fig. 3 Tubal reanastomosis.

A: The first suture was placed at the mesosalpingeal border (6 o'clock position).

B: Four interrupted sutures were done sequentially in one layer at the 6 o'clock, 3 o'clock, 9 o'clock and 12 o'clock positions (yellow arrowhead).

C: Chromopertubation demonstrated bilateral tubal patency and a watertight anastomotic site after laparoscopic reanastomosis (yellow arrow).

D: Fibrin glue and an adhesion barrier (a sodium hyaluronate-based bioresorbable membrane) were applied to prevent adhesions.

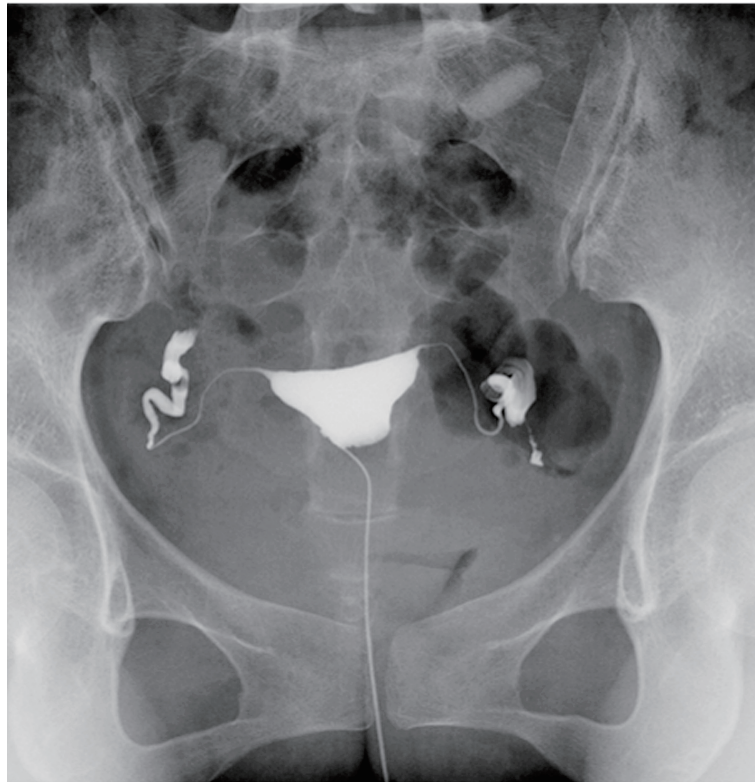


Fig. 4 Postoperative hysterosalpingography showed bilateral tubal patency.

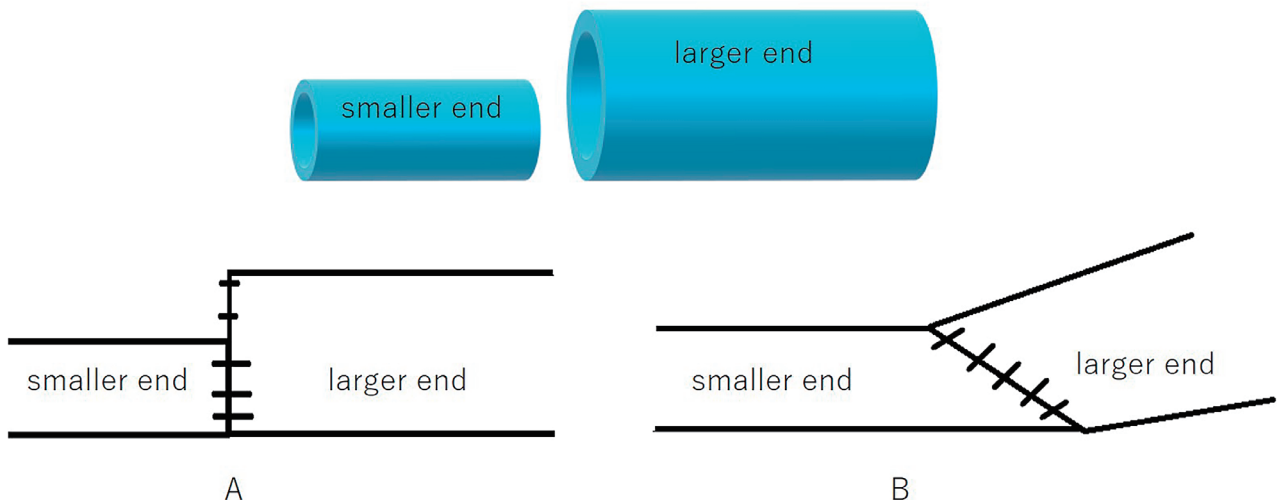


Fig. 5 Tubal reanastomosis in cases of different fallopian tube diameters.

A: Each end should be sutured so that the mucosa of each end is aligned, and then the remaining portion of the larger-diameter end should be sutured. The remaining portion of the thicker end should be sutured including the mucosa and muscular layer.

B: The smaller end should be resected obliquely and the inner diameters of both ends should be matched as much as possible.

Postoperative course

The surgery took 2 hr, and the bleeding was minimal. The patient had a good postoperative course and was discharged on the third postoperative day. On postoperative day 31, bilateral tubal patency was confirmed by hysterosalpingography (Fig. 4). She conceived spontaneously 5 months after the surgery and delivered at term.

DISCUSSION

Until 1989, laparotomy provided the only surgical route for tubal reanastomosis. The first case of laparoscopic sterilization reversal was reported in 1989, the procedure used biological glue and an intraluminal catheter without sutures [4]. The use of glue was later abandoned, replaced by simple sutures. The one-stitch technique (at 12 o'clock) [5], two-stitch technique (at 6 and 12 o'clock) [6], three-stitch technique [7], and four-stitch technique (at 3, 6, 9, and 12 o'clock) [8, 9] were later reported. Yoon *et al.* used two layers of four stitches followed by an intermittent serosal suture [8], and Ribeiro *et al.* used the one-layer four-stitch technique [9]. We adopted a single-layer surgical technique similar to Ribeiro *et al.*'s. In order to keep the mucosal surface of the tubal anastomosis firmly aligned and to maintain blood flow, the four-stitch technique was considered the most reasonable method. We felt that too many or too few sutures would not be good, and we therefore used the four-stitch technique in this case.

Here are two tips for suturing the fallopian tubes. First, if the inner diameters of the tubes are different, each end should be sutured so that the mucosa of each end is aligned, and then the remaining portion of the larger-diameter end should be sutured. The remaining portion of the thicker end should be sutured including the mucosa and muscular layer. Alternatively, the smaller end should be resected obliquely and the inner diameters of both ends should be matched as much as possible (Fig. 5).

Second, reanastomosis should be started at the 6 o'clock position. There are two reasons for suturing in the 6 o'clock direction first: first, it is the most likely to

be blind among the four directions, and it is the most difficult part to manipulate; second, because it is the mesenteric attachment site, the suture points of both cut ends can be reliably identified.

According to a systematic review of 15 studies, pregnancy rates after laparoscopic reversal ranged from 25% to 83%, with a pooled pregnancy rate of 65% (95%CI: 61%–74%). The mean pooled ectopic pregnancy rate was 5.6% (95%CI: 3%–9%). There was no significant difference in pregnancy rates between laparotomy, laparoscopy, and robotic surgery [10]. The important prognostic factors are the patient's age, the postoperative tubal length, the previously used sterilization technique, the time from sterilization until reversal, and the site of ligation [10].

Most of the prior investigations have indicated that the most critical prognostic factor affecting the chance of conceiving after tubal reanastomosis is the patient's age [10]. There is an at least 50% chance to deliver within the next 5 years if the tubal reversal done before the patient age of 40 years; after that age, the rate falls to half that [11]. On the other hand, in 1990 Trimbo reported a pregnancy rate (PR) of 45% in women between 40 and 45 years old [12], and in 2007 Petrucco *et al.* reported a 40% live birth rate for patients over 40 years old after tubal reanastomosis [13]. According to a 2019 study by Pierre *et al.*, pregnancy rates and delivery rates for women between 40 and 42 years old were 68.4% and 52.6% and those for women >42 years old were 36.4% and 27.3%, respectively. Pierre *et al.* described the good prognosis of women with advanced age compared to those who had undergone in vitro fertilization with no other infertility factor besides prior tubal sterilization [14].

Women with a tubal length >5 cm have been reported to achieve a high rate of conceiving, and the rate decreases if the tube length is shorter [15]. Why do shorter fallopian tubes make it harder to get pregnant? The total length of the fallopian tube is 11–12 cm, and 2/3 of the total length is the ampulla of the fallopian tube [16]. A fallopian tube length of less than five centimeters is less than half the normal length, which

means that most of the ampulla of the fallopian tube, the site of fertilization, is lost. This may make it difficult to fertilize in the fallopian tube. Even if fertilized, the normal development of the fertilized egg may be hindered, or it may be expelled into the uterus during development.

The method of previous sterilization is also important, with clips or rings being associated with better results after tubal reversal compared to coagulation/section techniques. Berger *et al.* reported a 76% pregnancy rate after clips and rings versus 68% and 67% after sterilization by resection or coagulation, respectively [17].

Hanafi reported a pregnancy rate of 91% at 1-5 years after sterilization versus 72% at 11-15 years after sterilization [18]. In our patient's case, the interval between sterilization and conception was >10 years. According to a systematic review, the site of ligation was not associated with the pregnancy rate [10].

Our patient was 38 years old; the postoperative tubal length was approx. 9 cm, the method of sterilization was unclear, and the types of anastomosis were ampullary-ampullary anastomoses. Although her age was slightly advanced, the lengths of her fallopian tubes were sufficient and there was no adhesion around the tubes, which may have led to the early spontaneous pregnancy in her case.

In conclusion, we would like to show some important points in increasing the postoperative pregnancy rate after tubal reanastomosis. The first point is to check the fallopian tube passage at the proximal and distal ends before suturing the fallopian tubes, and also to check the fallopian tube passage after suturing. Secondly, when suturing the fallopian tubes, the mucosal surface should be aligned properly. Finally, in order to preserve fallopian tube function and prevent postoperative adhesions, the fallopian tubes should be handled as gently as possible, with adequate intra-abdominal lavage and the use of anti-adhesion agents on the fallopian tubes.

Laparoscopic tubal reanastomosis is a well-established procedure with good prognosis, as reported in the literature. For women who wish to become pregnant after tubal sterilization, it is necessary to present the option of surgery as well as in vitro fertilization.

CONFLICT OF INTEREST

There were no conflicts of interest.

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