Microsurgical Reversal of Female Sterilization: The Role of Tubal Length

SHERMAN J. SILBER, M.D., AND ROBERT COHEN, M.D.

Reprinted from June 1980 Fertility and Sterility

PUBLISHED MONTHLY BY THE AMERICAN FERTILITY SOCIETY, BIRMINGHAM, ALABAMA

FERTILITY AND STERILITY
Vol. 33, No. 6, June 1980

Printed in U.S.A.

MICROSURGICAL REVERSAL OF FEMALE STERILIZATION: THE ROLE OF TUBAL LENGTH

SHERMAN J. SILBER, M.D.*
ROBERT COHEN, M.D.

St. Lukes West Hospital, St. Louis, Missouri 63112, and St. Johns Mercy Medical Center, St. Louis, Missouri 63141

A group of 25 women who had undergone tubal sterilization by a variety of techniques underwent microsurgical reanastomosis. The length of tube remaining and the segments of tube involved were carefully noted preoperatively, but were not used as a basis for selection of patients. The only criterion utilized for selecting patients was the presence of fimbriae on at least one side. In all patients, anatomical patency was achieved at surgery.

Normal intrauterine pregnancy was directly related to tubal length. Of seven patients who had less than 3 cm of tube, none achieved pregnancy. Of seven patients who had 3 to 4 cm of tube, three achieved a normal intrauterine pregnancy. Among 11 patients who had over 4 cm of tube, all 11 achieved a normal intrauterine pregnancy. No significant difference in pregnancy rate was noted in women who had short segments of ampulla so long as total tubal length was adequate.
Fertil Steril 33:598, 1980

Microsurgical techniques have resulted in pregnancy rates of approximately 70% for reversal of female sterilization.[1-3] In some series, patients with a tubal length of less than 4 or 5 cm were excluded from surgical consideration. In our series, no patients were rejected for surgery despite extensive tubal damage. We undertook to reconstruct the tubes of all candidates who strongly desired the surgery (and who had fimbriae) despite a questionable outlook for successful intrauterine pregnancy because of short tubes. By characterizing each case preoperatively, we hoped to determine what effect tubal length might have on the outlook for successful pregnancy, assuming that the surgery was technically accurate.

PATIENTS

Twenty-five patients were operated upon. Tubal length and the section of tube involved were carefully recorded. When tubal length was different on each side, the longest side was deemed the most important and the patient was so classified. Two patients had less than 2 cm of extrauterine tubal length, five had between 2 and 3 cm, seven had between 3 and 4 cm, four had between 4 and 5 cm, and seven had more than 5 cm of extrauterine tubal length. The cornual hump was not included in the measurement. Thus all of these measurements are 0.5 cm shorter than what many would routinely consider as extramural tubal length. Eleven of the twenty-five patients required ampullary-isthmic anastomosis, thirteen an ampullary-cornual anastomosis, and one an isthmic-cornual anastomosis. Follow-up extends over 1 year in all patients. Ancillary measures such as splints, steroids, dextran, and hydrotubation were not employed. Reliance was placed only upon the microsurgical accuracy of the anstomosis. For the first 14 consecutive patients, hysterosalpingograms were obtained 6 weeks to 6 months postoperatively, all of which revealed patent oviducts (Figs. 1 to 4). Thereafter it was assumed that our surgical technique was reliable enough to eliminate these x-rays. Those who failed to become pregnant with-

Received August 3, 1979; revised December 26, 1979, and February 26, 1980; accepted February 28, 1980.
*Reprint requests: Sherman J. Silber, M.D., 456 North New Ballas Road, St. Louis, Mo. 63141.

FIG. 1. Hysterosalpingogram after isthmic-cornual anastomosis in which a long length of extramural tube is visible. (Reproduced with permission from *Microsurgery*, edited by S. J. Silber. Copyright 1979, The Williams & Wilkins Co., Baltimore.)

in 1 year also underwent hysterosalpingography to ensure continued tubal patency. The microsurgical techniques used have been described previously.[4]

RESULTS

The results of the study are summarized in Tables 1 to 3. Of the 25 patients operated upon, 15 had achieved pregnancy, for a crude pregnancy rate of 60%. One of those pregnancies was ectopic; the others were normal intrauterine pregnancies.

The prospect for a normal pregnancy was directly proportional to the length of remaining tube (Table 1). Roughly one-half of patients with 3 to 4 cm of tube on the longest side were able to achieve a normal intrauterine pregnancy. All 11 patients with more than 4 cm of tube achieved a normal intrauterine pregnancy. Of seven patients who had less than 3.0 cm of tube, none achieved pregnancy despite an accurate anastomosis.

Table 2 summarizes the results of pregnancy according to the length of ampulla remaining after the sterilization procedure on the side with the longest ampullary segment. Ampullary length had little or no significant effect on the chance for pregnancy, so long as there was at least 1 cm of ampulla remaining. However, once that minimal requirement was met, the incidence of pregnancy was not dramatically different in patients with long or short segments of ampulla. When there were more than 3 cm of ampulla, the chances for pregnancy were extremely high but were related to over-all tubal length rather than ampullary length.

The incidences of pregnancy after ampullary-isthmic anastomosis versus ampullary-cornual anastomosis were roughly equivalent (Table 3). The anatomical sites of the anastomosis did not have any significant effect upon fertility. The patients' ages ranged between 23 and 40 years. Age distributions were similar in both pregnant and nonpregnant women with the exception of one 39-year-old woman and one 40-year-old woman in the nonpregnant group. The average time to conception was 5 to 8 months.

Two of the successful pregnancies occurred in women whose husbands had also undergone microsurgical vasectomy reversal. One of the women who had a successful pregnancy had undergone a previously unsuccessful conventional tuboplasty.

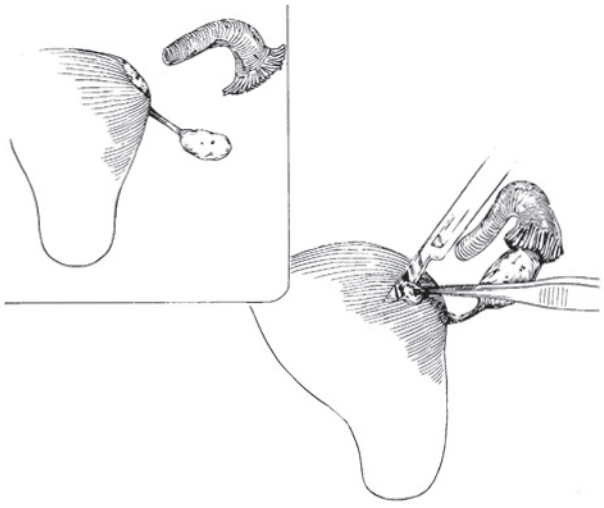

FIG. 2. Diagrammatic representation of preparation for ampullary-cornual anastomosis with resection of the scarred cornual stump. (Reproduced with permission from *Microsurgery*, Edited by S. J. Silber. Copyright 1979, The Williams & Wilkins Co., Baltimore).)

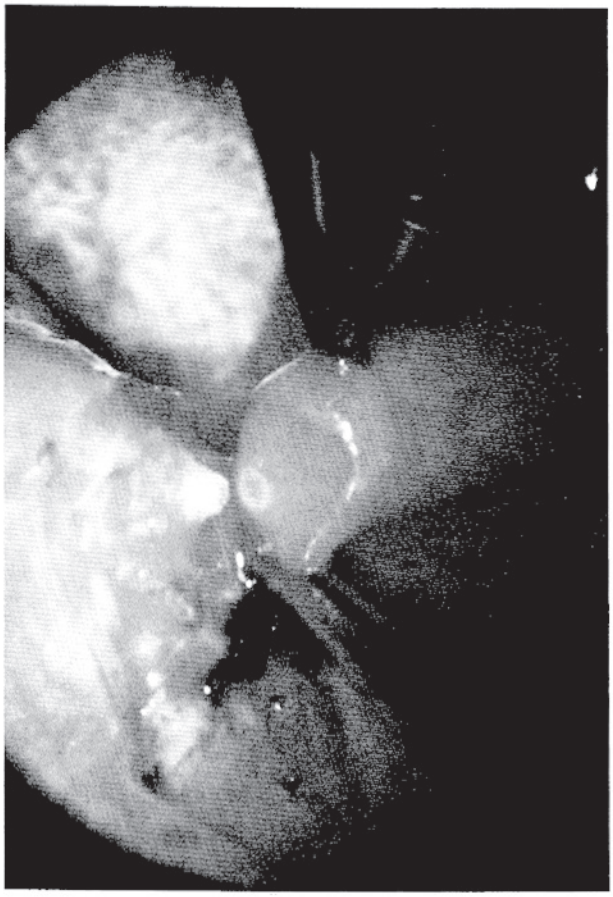

FIG. 3. The isthmic portion of the tube adjacent to the cornual portion in preparation for an isthmic-cornual anastomosis. (Reproduced with permission from *Microsurgery*, Edited by S. J. Silber. Copyright 1979, The Williams & Wilkins Co., Baltimore.)

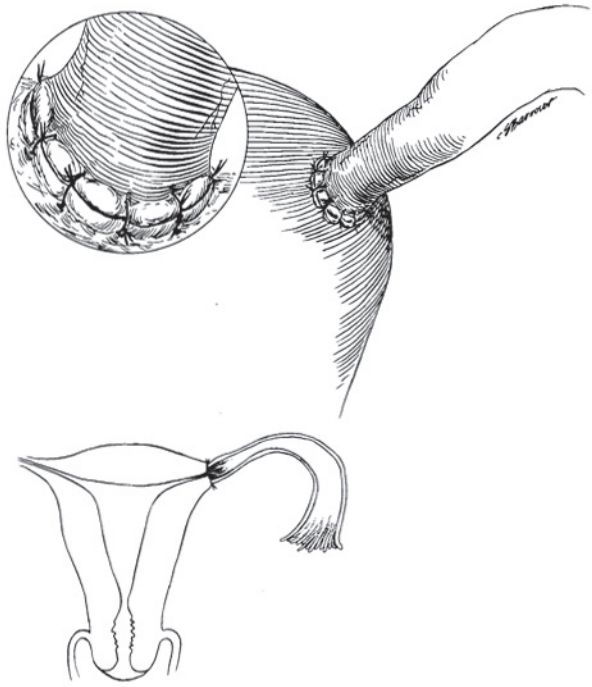

FIG. 4. The final appearance of an ampullary-cornual anastomosis. (Reproduced with permission from *Microsurgery*, Edited by S. J. Silber. Copyright 1979, The Williams & Wilkins Co., Baltimore.)

Most patients had undergone laparoscopic cauterization. Two had undergone Falope-Ring placement, and the remainder had had Pomeroy or Irving type tubal ligations. Seven of the fourteen normal pregnancies occurred in women who had undergone laparoscopic cauterization. Interestingly, some of the Pomeroy tubal ligations removed very large segments of oviduct. The only type of sterilization that reliably left a long segment of tube with which to work was the Falope-Ring, but the number of cases is too small to permit any large-scale conclusions about recommending one form of sterilization over another. However, it is obviously desirable to preserve as much tubal length as possible.

DISCUSSION

So long as there are healthy fimbriae, an accurate microsurgical anastomosis can restore patency of the tube in all cases. We wished to determine what length of tube is required for normal fertility and to discern whether one tubal section might be more important than another.

In rabbits it has been shown by Eddy et al.[5, 6] and Winston et al.[7] that resection of only 1 cm of tube involving the ampullary-isthmic junction with accurate reanastomosis results in no decrease in fertility as compared with unoperated controls.

TABLE 1. *Relationship of Total Tubal Length to Pregnancy*

	Tubal length				
	0–2 cm	2–3 cm	3–4 cm	4–5 cm	>5 cm
Total no. of patients	2	5	7	4	7
Pregnant	0	0	4	4	7
Not pregnant	2	5	3	0	0
Normal intrauterine pregnancy rate	0%	0%	43%	100%	100%

TABLE 2. *Relationship of Length of Ampulla to Pregnancy*

	Length of ampulla				
	0–1 cm	1–2 cm	2–3 cm	3–4 cm	>4 cm
Total no. of patients	2	5	8	5	5
Pregnant	1	2	3	4	5
Not pregnant	1	3	5	1	0
	Pregnancies occurred only when isthmic length was sufficient to bring total tubal length to >3.0 cm			Total tubal length >3.0 cm in all of these patients	

McComb and Gomel[8] have very recently shown that decreased tubal length leads to a lower incidence of pregnancy in rabbits.

Our results in humans support the concept that tubal *length* is critical, but suggest that the length of ampulla is not as important as previously thought. Our findings suggest that total tubal length is the only critical factor so long as there is at least 1 cm of ampulla. In fact, when more than 5 cm of tube were present on either side, normal pregnancy occurred in every case. When 3 to 4 cm of tube remained, only 50% achieved pregnancy, and when there were less than 3 cm of tube, no patients have thus far achieved pregnancy.

The circumstances of the one ectopic pregnancy are worth elaborating. This patient had undergone laparoscopic tubal sterilization with complete destruction of the tube on open side and complete destruction of the ampulla on the other side. Her operation consisted of creating an artificial opening within the fimbriae and anastomosing it directly to the isthmus. The total tubal length in this patient was 4 cm, but it was all isthmus. When her ectopic pregnancy was discovered she underwent a total salpingectomy, and pathologic examination revealed that the embryo had migrated beyond the suture line and implanted near the uterine cornu. The length of the tube was sufficient to allow ovum pickup and pregnancy to occur, but early development of the egg occurred in the isthmus rather than the ampulla.

Whenever a new tuboplasty series is published using one technique or another, with loupes or with microscope, with splint or without splint, no comparison of pregnancy rates can be made between these various techniques unless accurate information is available on the length and quality of the tubes. If our series had included only patients with more than 5 cm of remaining tube, we would have reported 100% pregnancy. If we had operated upon only patients with less than 3 cm of tube, we would have had no pregnancies. Comparing the crude pregnancy rate of one series with that of another is invalid unless the preoperative condition of the tubes is carefully characterized.

If the surgeon performing the sterilization wishes to make the procedure as reversible as possible he needs to ensure the least amount of tissue damage. If he destroys more than one-half of the tube on both sides, the possibility of subsequent reversibility is diminished considerably; if he leaves less than 3 cm of tube on both sides, the chances for subsequent pregnancy with reversal surgery are very poor. For such women who have extensive tubal destruction, possibly an autotransplant to the opposite side using microvascular anstomoses may create one long tube in preference to two short ones.

TABLE 3. *Anatomical Site of Anastomosis*

	Ampullary-isthmic	Ampullary-cornual	Isthmic-cornual
Pregnant	7	7	1
Not pregnant	4	6	0

REFERENCES

1. Gomel V: Tubal reanastomosis by microsurgery. Fertil Steril 28:59, 1977
2. Winston RML: Microsurgical tubo-cornual anastomosis for reversal of sterilization. Lancet 1:284, 1977
3. Diamond E: Microsurgical reconstruction of the uterine tubes in sterilized patients. Fertil Steril 28:1203, 1977
4. Silber SJ, Cohen R: Microsurgical reversal of female sterilization. In Microsurgery, Edited by SJ Silber. Baltimore, Williams & Wilkins Co, 1979
5. Eddy CA, Hoffman JJ, Pauerstein CJ: Pregnancy following segmental-isthmic reversal of the rabbit oviduct. Experientia 9:1194, 1976
6. Eddy CA, Antonini R Jr, Pauerstein CJ: Fertility following microsurgical removal of the ampullary-isthmic junction in rabbits. Fertil Steril 28:1090, 1977
7. Winston RML, Frantzen C, Oberti C: Oviduct Function following resection of the ampullary-isthmic junction. Fertil Steril 28:284, 1977
8. McComb P, Gomel V: The influence of fallopian tube length on fertility in the rabbit. Fertil Rteril 31:673, 1979