Microsurgical Reversal of Female Sterilization: The Role of Tubal Length

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MICROSURGICAL REVERSAL OF FEMALE STERILIZATION: 
THE ROLE OF TUBAL LENGTH

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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 fimbrae 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.

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Microsurgical techniques have resulted in pregnancy rates of approximately 70% for reversal of
female sterilization.1,2 In some series, patients
with a tubal length of less than 4 or 5 cm were exclud
ed from surgical consideration. In our series,
no patients were rejected for surgery despite ex
tensive tubal damage. We undertook to recon
struct the tubes of all candidates who strongly de
sired the surgery (and who had fimbrae) despite a
questionable outlook for successful intrauterine
pregnancy because of short tubes. By characteriz
ing each case preoperatively, we hoped to de
termine 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 care
fully 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 extraterine 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 extraterine
tubal length. The cornual hump was not included
in the measurement. Thus all of these measure
ments are 0.5 cm shorter than what many would
routinely consider as extramural tubal length.
Eleven of the twenty-five patients required ampul
lary-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, ste
roids, dextran, and hydrotubation were not em
ployed. Reliance was placed only upon the micro
surgical accuracy of the anastomosis. For the first
14 consecutive patients, hysterosalpingograms
were obtained 6 weeks to 6 months postoperative
ly, 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-
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.

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

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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.)

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.)
Most patients had undergone laparoscopic cauterization. Two had undergone Fallope-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 Fallope-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**

<table>
<thead>
<tr>
<th>Tubal length</th>
<th>0-2 cm</th>
<th>2-3 cm</th>
<th>3-4 cm</th>
<th>4-5 cm</th>
<th>&gt;5 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no. of patients</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Pregnant</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Not pregnant</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Normal intrauterine pregnancy rate</td>
<td>0%</td>
<td>0%</td>
<td>43%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
McComb and Gomel 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 one 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 anastomoses may create one long tube in preference to two short ones.

### REFERENCES


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

<table>
<thead>
<tr>
<th>Length of ampulla</th>
<th>0-1 cm</th>
<th>1-2 cm</th>
<th>2-3 cm</th>
<th>3-4 cm</th>
<th>&gt;4 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no. of patients</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pregnant</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Not pregnant</td>
<td>8</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Pregnancies occurred only when isthmic length was sufficient to bring total tubal length to >3.0 cm in all of these patients.

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**TABLE 3. Anatomical Site of Anastomosis**

| Ampullary-isthmic | Ampullary-isthmus | Isthmic-isthmic |
|-------------------|-------------------|-----------------
| Pregnant          | 7                 | 7               |
| Not pregnant      | 4                 | 6               |