

# Reversal of Female Sterilization an Evaluation of 49 Cases at Maharaj Nakorn Chiang Mai Hospital

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**Abstract :** Forty-nine patients underwent reversal of tubal sterilization between December 1981 and October 1991. The average age was  $32.3 \pm 3.6$  years, mean parity was  $2.2 \pm 0.6$  and mean duration from sterilization to reversal was  $76.9 \pm 42.3$  months. Reasons for requesting reversal were a change in marital status, desire for more children and loss of a child. The most common site of anastomosis was isthmic-ampulla, followed by ampulla-ampulla.

The mean duration of follow-up was  $21.1 \pm 20.2$  months. During this period 37 pregnancies occurred in 30 patients giving a crude pregnancy rate of 61.2%. Ectopic pregnancy occurred in 13.5% and abortion in 24.4%. Twenty patients delivered at least one living child giving a take-home pregnancy rate of 40.8%. To account for incomplete and variable follow-up, life-table analysis was performed yielding cumulative pregnancy rates of 30.6%, 45.9% and 80.8% respectively at 12, 24 and 36 months after operation. Prognostic factors that may affect the pregnancy rate were studied in stepwise survival analysis with covariates (Cox Model). Only operative time, dextran use, location of anastomosis and age of the patients were found to significantly predict success after reversal. (Thai J Obstet Gynaecol 1994;6:23-32)

**Key words :** tubal sterilization, reversal, pregnancy, dextran

In the United States, it is estimated that about 10% of women who have undergone sterilization subsequently regret the procedure and about 3% will express interest in reversal. However, only 1% will be suitable for and undergo actual surgical rean-

tomosis, resulting in approximately 6500 surgical procedures per year<sup>(1)</sup>. Similar data for Thai women does not exist but our experience indicate that the demand for reversal of tubal sterilization is on the increase. Although microsurgical technique was

introduced into our clinic more than ten years ago, we do not, as yet, have data on its outcome. In this report, we present our experience regarding demographic characteristics of patients, reasons for requesting reversal, pregnancy rate and prognostic factors that affect the success of reversal procedures. Such information will be useful in patient counselling, in selecting proper patients for reversal and in optimizing the outcome of these procedures in the future.

## Materials and Methods

In our clinic, couples requesting reversal of tubal sterilization will have detailed history recorded at their first visit. Female partners will be undergoing complete physical and pelvic examination. Preoperative evaluation includes semen analysis for male partners, complete blood count, routine urinalysis, chest film, serology for syphilis (VDRL) and diagnostic laparoscopy for females. In some cases, hysterosalpingogram is also performed to evaluate status of proximal tubes. Couples are counselled regarding the cost, the prognosis and possible immediate and late complications of the procedures including anesthetic risks, wound infection and risk of ectopic pregnancy. They are also strongly advised not to have surgery (but not rejected) if the male partners have oligoasthenospermia. Patients are not accepted for surgery if they have a remaining tubal length <4cm.

Ampicillin is given parenterally as prophylactic antibiotic in all patients. Surgery is performed with the aid of loupes 2.5x to 5x magnification, employing gentle tissue handling, fine bipolar coagulation for accurate hemostasis and constant irrigation with heparinized Lactated Ringer's solution (5000 units of heparin per 500 ml  $\pm$  5 mg dexamethasone). Under magnification, the occluded end of the proximal segment is identified and cut across using sharp scissors until clean and viable lumen is reached. The occluded end of the distal segment is then identified and a small opening that matches that of the proximal end is created by using fine forceps to hold a small segment of the tube and cut across with sharp scissors. After proper preparation of both the proximal and distal segments, tubal ends are brought together by placement of a 6-0 polyglactin (Vicryl) suture in the mesosalpinx right below the tubal serosa. Tubal reanastomosis is performed in 2 layers, using polyglactin (Vicryl) 8-0 suture. During closure of the first layer, the suture is placed in the muscularis at 6,3,9 and 12 o'clock respectively, avoiding the mucosa if possible. The serosal (second) layer is then approximated with interrupted sutures of 6-0 or 8-0 polyglactin. The patency is tested by injecting methylene blue (or indigocarmine) through the uterine fundus while occluding the lower uterine segment with Buxton clamp. At the completion of surgery, the pelvis is again washed with heparin-

ized lactated Ringer's solution and 6% dextran 70 in dextrose 250-500 ml instilled intraperitoneally. Since the value of dextran 70 in the prevention of postoperative adhesion is still controversial, its use is optional based on its availability in the hospital pharmacy and on the affordability of the patients.

In this study, infertile records, operative notes, in-and out-patient records of all 49 consecutive cases who underwent surgical reversal of tubal sterilization from December 22, 1981 to October 16, 1991 were reviewed. Additional information was obtained by sending a questionnaire to patients and by direct contact with surgeons who performed the operation. If the patients could not be reached by mail or if they did not respond to their second questionnaire, home visits were done to gather information from their neighbors, relatives and leaders of the villages. All data were keyed into dBase IV program and analyzed using BMDP programs on an IBM PC.

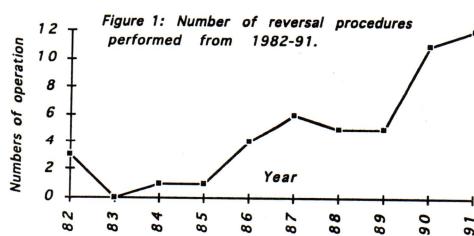


Fig. 1 Number of reversal procedures performed from 1982-91.

Table 1 *Residences of patients*

Province	Number	Percentage
Chiang Mai	32	65.3
- municipal	15	30.6
- suburbs	17	34.7
Chiang Rai	4	8.2
Lampang	3	6.1
Lumpoon	2	4.1
Nan	2	4.1
Maehongsorn	1	2.0
Payao	1	2.0
Pisanuloke	1	2.0
Prae	1	2.0
Rachaburi	1	2.0
Uttaradit	1	2.0
Tobal	49	

Table 2 *Occupation of patient*

Occupation	Number	Percentage
Merchant	12	24.5
Employee	10	20.4
Civil servant	10	20.4
Housewife	8	16.3
Agriculturer	7	14.3
Teacher	2	4.1

## Results

The number of reversal operation increased from 1985 to 1991 (Fig. 1).

Most of the 49 patients in this study were residents of Chiang Mai and other nearby provinces (Table 1). The mean age of the patients ( $\pm$  standard deviation) was  $32.3 \pm 3.6$  years, with a mean parity of  $2.2 \pm 0.6$ .

Most of them were merchants, employees or civil servants (Table 2).

Table 3 *Reason for requesting reversal*

Reason	Number	Percentage
Divorce and remarriage	27	55.1
Death of husband & remarriage	2	4.1
Desire for more children	11	22.4
Loss of a child	9	18.4

Table 4 *Site of tubal anastomosis and pregnancies<sup>@</sup>*

	Location of anastomosis					Total
	ampulla to ampulla (both)	cornual implant (both)	isthmus to ampulla & ampulla to ampulla	isthmus to ampulla (both)	Miscel- laneous #	
Not pregnant	4	1	1	10	3	19
IUP*	9	0	2	14	3	28
Ectopic	0	1	1	0	0	2
Total	13	2	4	24	6	49

@ Only the first pregnancy that occurred after reversal of tubal sterilization were included in this table

\* IUP = Intrauterine pregnancy

# Miscellaneous included: one case each of bilateral isthmus to isthmus anastomosis, isthmus to isthmus anastomosis on one side and isthmus to isthmus anastomosis plus fimbrioplasty on the other side, ampulla to ampulla anastomosis on one side and salpingo-oophorectomy on the other side, cornual implantation on one side and ampulla to ampulla anastomosis on the other side, and two cases where there were no record about the sites of anastomosis.

Pearson Chi square = 18.008, p = 0.0212, df = 8.

The mean time ( $\pm$ SD) from tubal sterilization to reversal was 76.9  $\pm$  42.3 months, with a range of 6 to 192 months. Forty one of them (83.7%) had tubal ligation done in the immediate postpartum period and eight (16.3%) had interval sterilization (5 suprapubic tubal resection and 3 laparoscopic Falope ring procedure). The most common reason for requesting reversal was a change in

marital status. Other reasons included desire for more children and loss of a child (Table 3).

The most common site of tubal anastomosis was isthmic to ampulla in 24 patients (49%), followed by ampulla to ampulla in 13 cases (26.5%) (Table 4).

The mean duration of operation was 188.3  $\pm$  43.3 minutes. There was no immediate postoperative com-

Table 5 *Pregnancy rate after reversal among different surgeon\**

Surgeon	A	B	C	D	E	F	Total
Not pregnant	10	3	3	2	0	1	19
Intrauterine pregnancy	16	6	4	1	1	0	28
Ectopic	2	0	0	0	0	0	2
Total	28	9	7	3	1	1	49

\* Only the first pregnancy that occurred after reversal was included in this table

P = 0.8941 (Pearson Chi square test)

plication and the patients stayed in hospital for an average duration of  $5.9 \pm 1.3$  days. The mean duration of follow-up from the date of operation to the end of the study on December 31, 1992, was  $21.1 \pm 20.2$  months (range 1.6-133 months.) During this period, 37 pregnancies occurred in 30 patients, giving a crude pregnancy rate of 30/49 (61.2%). Intrauterine pregnancy occurred in 28 of the 49 patients (57.1%). Ectopic pregnancy occurred in 5(13.5%) and abortion occurred in 9 out of the 37 pregnancies (24.4%). First patient had two episodes of ectopic pregnancy without any subsequent intrauterine pregnancy. Second one had an ectopic pregnancy and was then lost to follow-up at 26.8 months after reversal. The other two patients had an ectopic pregnancy followed by one full term delivery. One patient delivered a stillborn baby at term and subsequently delivered a normal fullterm baby two years later. Overall, 20 patients out of 49, each delivered at least one living child, giving a take-home pregnancy rate of 40.8%.

Intrauterine pregnancy occurred in 56.1%, 60% and 66.7% of patients who previously had postpartum, suprapubic and Falope-ring tubal ligation respectively (p=0.478). Intrauterine pregnancy occurred in 26 of the 45 couples with normal semen analysis and in 2 of the 3 couples whose male partners had oligospermia (defined as a sperm concentration of less than  $20 \times 10^6$ ). No pregnancy occurred in one couple due to asthenospermia (defined as forward motility of <50%). There was no statistical difference (p = 0.8941) in pregnancy rates among the cases operated on by anyone of the six surgeons in our clinic (Table 5).

Using Chi square test, there was also no statistically significant difference in pregnancy rates with regard to the use of dextran 70 (p = 0.2378) or the use of steroid in the irrigation (p=0.7563). However, there was a significant difference in intrauterine and ectopic pregnancy rates with regard to the site of tubal anastomosis (Table 4).

Nineteen patients were lost to

Table 6 Life-table analysis of cumulative pregnancy rate

Months after reversal sterilization	Number followed	Lost to follow-up	Pregnant	Exposed	Proportion Pregnant	Cumulative Preg. at end of interval
0 - 6	49	0	8	49	0.1633	0.1633
6 - 12	41	0	7	41	0.1707	0.3061
12 - 18	34	8	3	30	0.1000	0.3755
18 - 24	23	1	3	22.5	0.1333	0.4588
24 - 30	19	3	3	17.5	0.1714	0.5516
30 - 36	13	5	6	10.5	0.5714	0.8078
36 - 42	2	0	0	2	0.0000	0.8078
42 - 48	2	1	0	1.5	0.0000	0.8078
48 - 132	1	0	0	1	0.0000	0.8078
132 - 138	1	1	0	0.5	0.0000	0.8078

Table 7 Summary of stepwise survival analysis with covariates (Cox Models)

Step No.	Variable Entered	DF	Log Likelihood	Improvement Chi-square	p-value	Coefficient	SE	Exp (Coeff.)
0			-73.149					
1	Dur_Op	1	-69.956	6.387	0.011	-0.0274	0.0070	-
2	Dext_Use	2	-67.348	5.216	0.022	-1.7183	0.5963	0.1794
3	Location	3	-65.155	4.386	0.036	0.3425	0.1262	-
4	Age	4	-62.718	4.874	0.027	-0.1376	0.0623	-

Dur\_OP = Duration of operation (in minutes)

Dext\_Use = Dextran use (No or yes)

SE = Standard Error

Exp. (Coeff) = antilog of regression coefficient

follow-up at different time after the surgery. To account for such incomplete and variable follow-up, life-table analysis was performed, giving a cumulative pregnancy rates of 16.3%, 30.6%, 37.6%, 45.9%, 55.2% and 80.8% respectively at 6, 12, 18, 24, 30 and 36 or more months after surgery respectively (Table 6).

To evaluate for potential factors that significantly influenced the time to pregnancy after reversal procedures while statistically adjusting

for other variables, the following factors were tested in a stepwise survival analysis with covariates (Cox Models) : age (years), method of tubal sterilization (postpartum, suprapubic or Falope-ring procedure), duration from tubal sterilization to reversal (months), surgeons (A,B,C,D and others), length of the longer remaining tube after reversal (centimeters), location of anastomosis (5 in all, as shown in Table 4), use of dextran (yes, no), use of steroid (yes, no), duration of

operation (minutes) and the presence of other pelvic pathology (yes, no). Four factors namely duration of operation, dextran use, location of tubal anastomosis and age of the patient at the time of the operation emerged as significant predictors (Table 7).

The analysis revealed that the chance for pregnancy decreased as the duration of the operation increased. In patients who were not given dextran 70, the odds of pregnancy was only 0.1794 times of those who were given the medication. Bilateral ampulla to ampulla anastomosis was associated with the highest intrauterine pregnancy rate of 69.2% while no intrauterine pregnancy occurred in cases of bilateral cornual implantation. The age of the patient was found to adversely affect the time to pregnancy after reversal. In this regard, no pregnancy occurred in the two oldest women who were 39 and 41 years old at the time of their operation.

## Discussion

Tubal sterilization is one of the popular form of contraception among new acceptors of contraceptive methods in our family planning clinic. Nowadays, there is a tendency to perform sterilization at a younger age. In this study, 40.8% of patients had been sterilized under the age of 30. When the age and the volume are taken into consideration, it is not surprising that there has been an increasing number of requests for

reversal procedures. It is also noticeable that 84% of reversal patients had sterilization performed in the immediate postpartum period. These are times of special stress, and decisions made at such times may not be valid under less difficult circumstances. We recommend that more intensive counselling should be given to younger patients, with no more than two children, who request postpartum sterilization.

The most common reason for requesting reversal is divorce and remarriage, which is similar to those reported by Limpaphayom and Witoonpanich<sup>(2)</sup> and Yossing<sup>(3)</sup>. It is anticipated that the increasing divorce rate among Thai couples will result in an even higher increase in request for reversal in the future. The other contributory factor may be the fact that such services are now more readily available to patients at affordable cost.

In this study, the most common site for tubal anastomosis is isthmic-ampullary anastomosis which agrees with other reports of reversal procedures<sup>(3-7)</sup>. A crude intrauterine pregnancy rate of 57.1% in our series compares favorably with that of other reports from abroad i.e. 69% reported by Henderson<sup>(4)</sup>, 75.4% by Owen<sup>(5)</sup>, 64.4% by Seler<sup>(6)</sup>, 60% by Winston<sup>(7)</sup>, 64.4% by Gomel<sup>(8)</sup>, 67.7% by Decherney et al<sup>(9)</sup>, 57.5% by Grunert et al<sup>(10)</sup>, and with reports from Thailand 69.2% by Limpaphayom and Witoonpanich<sup>(2)</sup> and 44.9% by Yossing<sup>(3)</sup>. Fifteen of the 28 intrauterine

pregnancies (53.6%) had already occurred within one year of reversal. This number increased to 20 (71.4%) within two years. It is, therefore, reasonable not to offer in vitro fertilization (IVF) to such couples before they have an adequate trial at conception for at least 1-2 years. Some authors<sup>(7,11)</sup> reported that isthmic-isthmic anastomosis has the highest success rate followed by isthmic-cornual and ampullary-ampullary anastomosis respectively. In this report, we have no case of isthmic-cornual anastomosis and only two cases of isthmic isthmic anastomosis, one of which was complicated by pelvic adhesion. This may explain why ampullary-ampullary anastomosis stands out as the most favorable site in terms of pregnancy rate in our series. However, other authors such as Henderson<sup>(4)</sup>, Seiler<sup>(6)</sup> and Grunert et al<sup>(10)</sup> were unable to identify a significant difference in success rate when comparing ampullary ampullary, ampullary isthmic and isthmic-isthmic anastomosis. Obviously, further study is needed in this regard.

Many authors considered tubal length as critical for success after reversal operation<sup>(8-9,11)</sup>. In this study, we required a minimum of 4 cm of remaining tube to be present before the patient was accepted for surgery. In this regard, we did not find that tubal length beyond the set minimum of 4 cm. had any prognostic implication on pregnancy rate. In multivariate analysis, we do find that the duration of operation, the age of the patient at

operation, the use of dextran and the location of tubal anastomosis had prognostic implication on the success after reversal operation. The reason why operative time is important is not known. It is possible that the longer time used implies that anastomosis may not be proper and has to be revised, causing more tissue trauma and less chance of pregnancy. Other possibilities such as less surgical skill and other associated pelvic pathology may also prolong operative time and decrease the success rate. Although there was no statistically significant difference in pregnancy rates among the six surgeons in this series, the numbers operated on by some of them are still too small to make a firm conclusion. The fact that no pregnancy occurred in women 39 years or older at the time of operation suggests to us that the age limit of patients for reversal should be 38 years or less.

Several high-molecular-weight polymers have been evaluated as intraperitoneal solutions for adhesion prevention. Among others, the polysaccharide dextran of varying molecular weights and concentrations are presently of interest<sup>(12,13)</sup>. Utian et al<sup>(14)</sup> reported both a lower adhesion score and improved fertility when 6% dextran 70 or 32% dextran 70 (Hyskon) in dextrose was instilled intraperitoneally following bilateral tubal resection with subsequent anastomosis. Dextran appears to have a coating or siliconizing effect on denuded surfaces, preventing apposition

and adherence. Dextran also modifies fibrin structure, making it more susceptible to plasmin degradation.<sup>(12,13)</sup> Moreover, it creates an osmotic gradient producing ascites by drawing fluid into the peritoneal cavity. Such artificial ascites will produce hydroflotation effect and prevent tissue contact<sup>(11)</sup>. Studies in laboratory animal have almost uniformly shown dextran 70 to be effective in reducing adhesion formation after a peritoneal injury<sup>(15)</sup>. Unfortunately, clinical studies in human are conflicting. Two prospective randomized studies by the Adhesion Study Group<sup>(16)</sup> and Rosenberg and Board<sup>(17)</sup> showed dextran 70 to be quite effective in adhesion prevention, while another two randomized trials by Jansen<sup>(18)</sup> and Larsson et al<sup>(19)</sup> found dextran 70 ineffective in clinical usage. In our study, 6% dextran 70 was apparently effective in promoting pregnancy rate after reversal of tubal sterilization procedures. However, the study has limitation in that it was retrospective in nature and patients allocation to dextran use was not randomized.

## Conclusion

Patients under 30 years of age with parity of 2 or less, who requested postpartum sterilization, should be carefully counseled before operation. Reversal sterilization should only be considered in women age 38 years or below. To optimize the pregnancy rate, we recommend the use of microsurgical techniques and dextran-70.

If pregnancy does not occur within one or two years after reversal, in vitro fertilization should be offered.

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