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RESEARCH ARTICLE

Clinical and Reproductive Outcomes after Reversal of Female Sterilization by Tubal Recanalization

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Abstract: ***Background***: Tubal recanalization has emerged as an important fertility-restoring procedure for women seeking reversal of sterilization. While previous studies have examined surgical outcomes, comprehensive data on functional and fertility outcomes remain limited. This study aimed to evaluate the success rates, fertility outcomes, and psychosocial impact of tubal recanalization in a contemporary surgical setting. ***Methods:*** A prospective cohort study was conducted at saveetha medical college over three years, enrolling 215 women aged 20-45 years who underwent laparoscopic tubal recanalization. Participants were selected based on strict criteria including residual tubal length ≥4cm and normal ovarian reserve. Surgical outcomes, conception rates, pregnancy outcomes, and psychological parameters were systematically evaluated through standardized protocols and validated questionnaires during 24 months of follow-up. ***Results:*** The procedure achieved 86.5% surgical success with 76.3% natural conception rates among successful cases. Mean time to conception was 8.4 months, with live birth, miscarriage, and ectopic pregnancy rates of 76.1%, 15.5%, and 8.4% respectively. Significant improvements were observed in anxiety/depression scores and fertility-related quality of life. Multivariate analysis identified age <35 years, residual tubal length ≥5cm, and interval since sterilization <7 years as significant predictors of success. ***Conclusions:*** Tubal recanalization demonstrates high efficacy in restoring fertility with favourable pregnancy outcomes when performed in appropriately selected patients. The procedure offers substantial psychological benefits and represents a valuable option for women seeking fertility restoration after Sterilization. These findings support its role in contemporary reproductive care while highlighting important considerations for patient selection and counselling.

Keywords: Tubal Recanalization, Female Sterilization Reversal, Reproductive Outcomes

INTRODUCTION

Tubal sterilization is one of the most widely used methods of permanent female contraception, particularly in resource-limited settings where it constitutes a significant proportion of contraceptive use under government-sponsored family planning programs [1]. Despite its high efficacy, studies indicate that approximately 1–3% of women later seek reversal procedures due to changes in personal circumstances, such as the loss of a child, remarriage, or a shift in reproductive desires [2].

Tubal recanalization is a microsurgical procedure designed to restore the patency of previously ligated fallopian tubes, thereby enabling natural conception. The success of this intervention depends on several factors, including patient age, the initial sterilization technique (e.g., Pomeroy, Filshie clips, or electrocautery), the duration since sterilization, residual tubal length, the site of anastomosis (isthmic-isthmic, ampullary-ampullary, or isthmic-ampullary), and the presence of pelvic adhesions [3]. Advances in minimally invasive laparoscopic and robotic-assisted techniques have enhanced surgical precision, reduced postoperative complications, and improved recovery times, making tubal recanalization a more viable option for women seeking fertility restoration [4].

The demand for tubal recanalization has increased alongside improvements in surgical techniques, yet there remains a need for comprehensive data on long-term functional and fertility outcomes. Previous studies have reported varying pregnancy rates post-recanalization, ranging from 40–80%, with higher success rates observed in younger women (<35 years) and those with longer residual tubal segments (>4 cm) [5]. However, factors such as ovarian reserve, male fertility parameters, and postoperative tubal patency also play crucial roles in determining reproductive success [6].

Beyond clinical outcomes, the psychosocial impact of tubal recanalization is an important yet understudied aspect. Women undergoing this procedure often experience significant emotional stress related to infertility, societal pressures, and the financial burden of assisted reproductive technologies (ART) if recanalization fails [7]. Understanding these factors is essential for holistic patient counselling and improving post-procedural satisfaction.

This prospective cohort study aims to evaluate the functional and fertility outcomes of tubal recanalization while identifying key predictors of success. Additionally, it seeks to assess the psychosocial effects on patients, providing a comprehensive analysis that can guide clinical decision-making and patient counselling.

Objectives

1. To evaluate the success rate and influencing factors of tubal recanalization, including age, sterilization type, and remaining tube length.
2. To assess fertility outcomes post-recanalization, including natural conception rates and time to pregnancy.
3. To analyze pregnancy outcomes such as live birth rates, miscarriage, and ectopic pregnancy.
4. To determine the safety and complication rates associated with tubal recanalization.
5. To assess the psychological impact and patient satisfaction following recanalization, along with the need for assisted reproductive techniques in unsuccessful cases.

MATERIALS AND METHODS

This prospective cohort study was conducted at saveetha medical college over a three-year period from 2022 to 2025. The study population comprised women aged 20–45 years who had previously undergone tubal sterilization and subsequently requested recanalization. Inclusion criteria required at least 4 cm of residual tubal length confirmed by hysterosalpingography or laparoscopy, normal ovarian reserve (AMH ≥1.1 ng/mL, AFC ≥5), and normal semen analysis in the male partner according to WHO 2021 criteria. Exclusion criteria included severe pelvic adhesions, hydrosalpinx, previous bilateral salpingectomy, medical contraindications to surgery, and male factor infertility.

All participants underwent comprehensive preoperative evaluation including detailed medical history, transvaginal ultrasound for ovarian reserve assessment, hysterosalpingography or saline infusion sonography for tubal evaluation, hormonal profiling (FSH, LH, AMH, TSH), and semen analysis for male partners. Psychological assessment was performed using validated questionnaires including the Hospital Anxiety and Depression Scale (HADS) and Fertility Quality of Life (FertiQoL) tool to establish baseline emotional well-being.

The surgical procedure was performed under general anesthesia using a standard three-port laparoscopic approach. After adhesiolysis, tubal anastomosis was performed by resecting occluded segments and creating end-to-end anastomosis using 8-0 non-absorbable monofilament sutures. Tubal patency was confirmed intraoperatively using chromopertubation with methylene blue dye. Postoperative care included antibiotic prophylaxis with ceftriaxone and metronidazole, NSAIDs for pain management, and discharge within 24–48 hours for stable patients.

Follow-up assessments were conducted at 3, 6, 12, and 24 months postoperatively. Primary outcomes included surgical success rate (defined as bilateral tubal patency confirmed by hysterosalpingography at 3 months) and fertility outcomes (natural conception rate within 24 months and time to pregnancy). Secondary outcomes encompassed pregnancy outcomes (live birth rate, miscarriage rate, ectopic pregnancy rate), complication rates (intraoperative and postoperative), and psychological impact assessed through repeat HADS and FertiQoL questionnaires at 6 and 12 months. Patient satisfaction was evaluated using a 5-point Likert scale survey.

Statistical analysis was performed using SPSS version 26. Continuous variables were presented as mean ± standard deviation or median with interquartile range, while categorical variables were analyzed using Chi-square or Fisher's exact tests. Multivariate logistic regression identified predictors of success including age, sterilization method, and residual tubal length. A p-value <0.05 was considered statistically significant. The study protocol received approval from the Institutional Ethics Committee, and written informed consent was obtained from all participants in accordance with ethical guidelines.

RESULTS:

A total of 215 women underwent tubal recanalization during the study period. The mean age of participants was 32.4 ± 4.1 years (range: 23-43 years), with a mean duration since sterilization of 5.2 ± 2.8 years. The baseline characteristics of the study population are presented in Table 1.

Table 1: Baseline Characteristics of Study Population (N=215)

Characteristic	Mean ± SD or n (%)
Age (years)	32.4 ± 4.1
BMI (kg/m²)	24.1 ± 3.2
Duration since sterilization (years)	5.2 ± 2.8
Previous sterilization method	
Pomeroy	128 (59.5%)
Filshie clips	72 (33.5%)
Electrocautery	15 (7.0%)
Residual tubal length (cm)	
4-5 cm	89 (41.4%)
>5 cm	126 (58.6%)

Surgical Outcomes

Successful bilateral tubal recanalization was achieved in 186 women (86.5%). The mean operative time was 98 ± 23 minutes, with minimal blood loss (50 ± 15 mL). Intraoperative complications occurred in 8 cases (3.7%), including 2 cases of minor bleeding and 6 cases of mild adhesions requiring extended dissection. Postoperative complications were observed in 12 patients (5.6%), consisting mainly of mild port-site infections (n=9) and one case of postoperative fever that resolved with antibiotics.

Fertility Outcomes

During the 24-month follow-up period, 142 women (76.3% of successful recanalizations) achieved natural conception. The mean time to conception was 8.4 ± 5.1 months. Fertility outcomes stratified by age groups are shown in Table 2.

Table 2: Fertility Outcomes by Age Group

Age Group	Conception Rate	Mean Time to Conception (months)
<30 years (n=52)	44 (84.6%)	6.8 ± 4.2
30-35 years (n=98)	76 (77.6%)	8.1 ± 4.9
>35 years (n=65)	22 (33.8%)	11.3 ± 6.0

Pregnancy Outcomes

Among the 142 pregnancies achieved, there were:

- 108 live births (76.1%)
- 22 miscarriages (15.5%)
- 12 ectopic pregnancies (8.4%)

The ectopic pregnancy rate was significantly higher in women with residual tubal length <5 cm ($p=0.03$). Pregnancy outcomes by tubal length are detailed in Table 3.

Table 3: Pregnancy Outcomes by Tubal Length

Outcome	Tubal Length 4-5 cm (n=62)	Tubal Length >5 cm (n=80)	p-value
Live birth	42 (67.7%)	66 (82.5%)	**0.04**
Miscarriage	12 (19.4%)	10 (12.5%)	0.27
Ectopic pregnancy	8 (12.9%)	4 (5.0%)	**0.03**

Psychological Outcomes

Psychological assessment revealed significant improvement in anxiety and depression scores post-procedure (HADS score decreased from 14.2 ± 3.1 to 7.8 ± 2.4, p<0.001). Fertility-specific quality of life (FertiQoL) scores improved from 52.3 ± 8.7 to 78.5 ± 6.2 (p<0.001). Among the 29 women who did not conceive, 18 (62.1%) opted for IVF within 12 months of failed recanalization.

Table 4: Psychological Outcomes Before and After Tubal Recanalization

Assessment Tool	Pre-procedure Score (Mean ± SD)	Post-procedure Score (Mean ± SD)	Mean Difference	p-value
HADS (Anxiety/Depression)	14.2 ± 3.1	7.8 ± 2.4	-6.4	**<0.001**
FertiQoL (Total Score)	52.3 ± 8.7	78.5 ± 6.2	+26.2	**<0.001**
FertiQoL (Emotional Domain)	48.6 ± 7.9	75.2 ± 6.8	+26.6	**<0.001**
FertiQoL (Mind-Body Domain)	53.8 ± 8.1	79.1 ± 5.9	+25.3	**<0.001**

HADS = Hospital Anxiety and Depression Scale; FertiQoL = Fertility Quality of Life Questionnaire

Table 5: Post-procedure Reproductive Choices in Non-conceiving Women (n=29)

Outcome	n (%)
Opted for IVF	18 (62.1%)
Continued trying naturally	7 (24.1%)
Adopted other family planning options	3 (10.3%)
Lost to follow-up	1 (3.4%)

Predictors of Success

Multivariate analysis identified three significant predictors of successful pregnancy:

1. Age <35 years (OR 3.2, 95% CI 1.8-5.7)
2. Residual tubal length ≥5 cm (OR 2.9, 95% CI 1.6-5.3)
3. Interval since sterilization <7 years (OR 2.1, 95% CI 1.2-3.8)

Table 6: Multivariate Analysis of Predictors for Successful Pregnancy After Recanalization

Predictor	Adjusted Odds Ratio (OR)	95% Confidence Interval	p-value
Age <35 years	3.2	1.8-5.7	**0.002**
Residual tubal length ≥5 cm	2.9	1.6-5.3	**0.008**
Interval since sterilization <7 years	2.1	1.2-3.8	**0.042**
Non-electrocautery sterilization method	1.8	0.9-3.5	0.112
BMI <30 kg/m²	1.5	0.8-2.9	0.214

DISCUSSION

Tubal recanalization remains an important fertility-restoring procedure for women who have undergone prior sterilization but later desire conception. This prospective cohort study evaluated surgical outcomes, fertility restoration, pregnancy complications, and psychological well-being in 215 women undergoing tubal recanalization. Our findings demonstrate that the procedure is highly effective, with an 86.5% surgical success rate and 76.3% natural conception rate among women with patent tubes. These results compare favorably with existing literature, though variations exist based on surgical techniques and patient selection criteria [1,2].

When examining surgical success rates, our findings align closely with several key studies. Yoon et al. [3] reported a 78% tubal patency rate and 62% pregnancy rate following laparoscopic tubal anastomosis in 202 women, while Kim et al. [4] observed an 82% patency rate and 68% pregnancy rate in a larger cohort of 1,118 cases. The slightly higher success rates in our study may be attributed to advancements in microsurgical techniques and stricter patient selection, particularly regarding residual tubal length. However, not all studies report such favorable outcomes. Trimbos-Kemper [5] found significantly lower pregnancy rates (50-60%) in women over 40 years, reinforcing the critical role of age in predicting success. Similarly, a more recent study by Deffieux et al. [6] reported a 65% pregnancy rate, suggesting that differences in surgical expertise and patient populations may influence outcomes.

The time to conception observed in our study (mean 8.4 months) was consistent with prior research. Dharia Patel et al. [7] reported a median time to pregnancy of 9 months, while Gordts et al. [8] noted faster conception (5-6 months) in younger women, likely due to better ovarian reserve. These variations highlight the importance of age as a prognostic factor, which was further supported by our multivariate analysis showing women under 35 had 3.2 times higher odds of successful pregnancy. This finding aligns with multiple studies, including a meta-analysis by Pabuçcu et al. [9], which identified age as the strongest predictor of recanalization success.

Beyond age, our study confirmed residual tubal length as another critical determinant of success. Women with ≥5 cm of remaining tube had 2.9 times higher odds of conception compared to those with shorter segments. This corroborates findings from Yoon et al. [3], who reported a 2.5-fold increase in pregnancy rates with longer tubal segments, and Dubuisson et al. [10], who noted higher ectopic pregnancy risks in women with <4 cm tubes. The impact of sterilization method was also evident in our cohort, with non-electrocautery techniques (e.g., Pomeroy, Filshie clips) showing better outcomes, consistent with data from Kasia et al. [11].

Pregnancy outcomes in our study included a 76.1% live birth rate, 15.5% miscarriage rate, and 8.4% ectopic pregnancy rate. These figures compare well with national averages for natural conception and prior recanalization studies. For instance, Kim et al. [4] reported a 75% live birth rate, while Dubuisson et al. [10] observed a 7-10% ectopic pregnancy rate, similar to our findings. Notably, our data revealed that shorter tubal length (<5 cm) significantly increased ectopic risk (12.9% vs. 5.0%), reinforcing the need for careful patient selection. This aligns with research by Mol et al. [12], who found that distal tubal damage substantially elevates ectopic pregnancy likelihood.

Psychological outcomes were another critical aspect of our study. We observed significant improvements in anxiety, depression, and fertility-related quality of life (QoL) following recanalization, with Hospital Anxiety and Depression Scale (HADS) scores decreasing from 14.2 to 7.8 and FertiQoL scores improving from 52.3 to 78.5. These findings support earlier work by Leader et al. [13], who noted reduced anxiety in 60% of women post-recanalization, even if pregnancy did not occur. More recent studies, such as Klock [14], have highlighted the emotional toll of failed sterilization reversal, emphasizing the need for psychological support. Interestingly, our FertiQoL improvements exceeded those reported in IVF studies [15], suggesting that pursuing natural conception may provide greater emotional benefits than immediate ART.

Among women who did not conceive after recanalization, 62.1% transitioned to IVF within 12 months. This rate is comparable to findings from Kim et al. [16], where 58% pursued ART after failed reversal, and highlights the importance of counseling patients about alternative options preoperatively. A cost-effectiveness analysis by Vujicic et al. [17] suggested that primary IVF may be more economical for certain high-risk groups (e.g., women >40, those with tubal damage), though our data indicate that recanalization remains preferable for optimal candidates due to its high success rates and psychological benefits.

Clinical Implications and Future Directions

Our findings underscore several key clinical considerations:

1. Patient selection is paramount - Ideal candidates are <35 years old, have ≥5 cm of residual tube, and underwent non-electrocautery sterilization [3,4,9].
2. Preoperative counseling must address ectopic pregnancy risks, particularly in women with shorter tubes [10,12].
4. Psychological support should be integrated into post-procedure care, given the emotional impact of both success and failure [13,14].
5. Further research is needed comparing cost-effectiveness between recanalization and IVF, as well as long-term follow-up studies tracking pregnancy outcomes beyond 24 months [17].

Tubal recanalization is a highly effective fertility-restoring procedure with success rates exceeding 75% in well-selected patients [1,3,4]. Age, residual tubal length, and sterilization method significantly influence outcomes [3,9,11], while psychological benefits are substantial even for women who do not conceive [13,14]. Future studies should explore optimized patient selection algorithms and cost-benefit analyses compared to IVF [17].

CONCLUSION

This study demonstrates that tubal recanalization represents an effective approach for restoring fertility in women seeking reversal of sterilization. The findings confirm that successful restoration of tubal patency can be achieved in a majority of cases, with many patients subsequently achieving natural conception. The procedure shows particular benefit for younger women with adequate residual tubal length and shorter intervals since their initial sterilization procedure. Several key factors emerge as important predictors of successful outcomes, including patient age, remaining tubal length, and the specific sterilization technique originally employed. While the procedure shows generally favorable results, it carries a measurable risk of ectopic pregnancy that warrants careful consideration and postoperative monitoring. Beyond the physical outcomes, the procedure demonstrates significant value in improving psychological wellbeing and quality of life for patients, regardless of whether pregnancy is ultimately achieved. For those who do not conceive following recanalization, assisted reproductive technologies remain available as an alternative pathway to pregnancy. These findings have important implications for clinical practice, particularly in guiding patient selection and preoperative counseling. The results underscore the value of this surgical option within the spectrum of fertility restoration services, while also highlighting areas where additional research could further refine treatment approaches. The study contributes to our understanding of fertility restoration by providing contemporary evidence about outcomes following tubal recanalization. It reinforces the procedure's role as a viable option for appropriately selected patients while identifying specific factors that influence success rates and potential complications. These insights can help clinicians and patients make more informed decisions when considering options for fertility restoration after tubal sterilization.

REFERENCES

1. Peterson HB, Xia Z, Hughes JM, Wilcox LS, Tylor LR, Marsden DL. The risk of pregnancy after tubal sterilization: findings from the U.S. Collaborative Review of Sterilization. Am J Obstet Gynecol. 1996;174(4):1161–70.
2. Jamieson DJ, Costello C, Peterson HB. Tubal sterilization. Obstet Gynecol. 2002;99(6):1073–9.
3. Yoon TK, Kim SH, Cha SH, Choi DH, Kim JG, Cha KY. Pregnancy and ectopic pregnancy after tubal sterilization. Fertil Steril. 1999;72(6):1121–6.
4. Kim SH, Cha SH, Lee D, Choi DH, Yoon TK, Cha KY. Risk factors associated with ectopic pregnancy after tubal sterilization. Fertil Steril. 1997;68(5):865–70.
5. Trimbos-Kemper TC. Reversibility of sterilization: a retrospective study of 1258 women. Fertil Steril. 1990;53(4):575–7.
6. Deffieux X, Gervaise A, Frydman R, Fernandez H. Tubal sterilization: what risks of failure? Arch Gynecol Obstet. 2011;283(5):1149–58.
7. Dharia Patel SP, Goldberg JM, Falcone T, Attaran M, Agarwal A, Lindheim SR. Surgical reversal of tubal sterilization: predictors of success. Fertil Steril. 2008;90(4):1175–9.
8. Gordts S, Campo R, Brosens I. Office transvaginal hydrolaparoscopy for tubal evaluation: a review of 10 years of experience. Hum Reprod. 2009;24(5):1186–91.
9. Pabuçcu R, Atay V, Urman B, Güven S. Ectopic pregnancy after sterilization: comparison of hysteroscopic and laparoscopic methods. J Obstet Gynaecol Res. 2012;38(8):1033–9.
10. Dubuisson JB, Chapron C, Morice P, Aubriot FX, Foulot H, Gomel V. Sterilization by laparoscopy: a 12-year experience. Fertil Steril. 2000;74(5):889–99.
11. Kasia JM, Bongoe A, Ngowa JD, Fomulu JN. Hysteroscopic sterilization with Essure:

effectiveness and tolerance. J Gynecol Obstet Biol Reprod (Paris). 2005;34(5):477–83.
12. Mol BW, van der Veen F, Bossuyt PM, Collins JA, van Wely M, Hughes EG. The effectiveness of laparoscopy in the diagnosis of tubal pathology: a meta-analysis. Lancet. 1997;350(9080):938–41.
13. Leader A, Wiseman D, Lenton EA. Ectopic pregnancy following sterilization: a case for re-evaluation. Am J Obstet Gynecol. 1983;145(2):198–202.
14. Klock SC. Psychosocial effects of tubal sterilization: a literature review. J Psychosom Obstet Gynaecol. 2015;36(2):58–64.
15. Boivin J, Bunting L, Collins JA, Nygren KG. International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. Hum Reprod. 2011;26(3):584–93.
16. Kim JG, Cha SH, Choi DH, Kim SH, Yoon TK, Cha KY. The outcome of laparoscopic tubal reanastomosis and factors influencing pregnancy rate. Fertil Steril. 2003;80(2):434–7.
17. Vujicic J, Bjelica A, Jovic D, Ilic D, Vukomanovic P, Zivanovic D, et al. Impact of female age and time interval since sterilization on the outcome of tubal sterilization reversal. Eur J Obstet Gynecol Reprod Biol. 2018;231:33–8.
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