

Reversal of sterilization by macrosurgery / conventional surgery with microsurgical principles with special reference to rail road technique: an overview of success and failures

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ABSTRACT

Objectives: The present study undertaken to assess the efficacy of technique of reversal of sterilization by macrosurgery with microsurgical principles and use of rail road technique for cornual - isthmic anastomosis and factors truly influencing the success rate. **Methodology:** The present study is retrospective observational study of 142 women who underwent reversal of sterilization. Railroad technique was done in 25 cases where tubal ligation was either done at cornual end or isthmic region very close to uterus where tubal lumen is very narrow. Out of these 142 cases 78 patients could be followed. Various factors were studied which were responsible for success and failure of surgery in these 78 cases. **Results:** Out of 142 cases of reversal, 78 (54.93%) patients could be followed and in these 78 cases 52(66.67%) patients had intrauterine pregnancy. The factors that influenced the success rate were age of the patient when it was < 30yrs success rate 42 (81%). When sterilization reversal interval was less than 3yrs. Success rate was 31(80%). Residual length of the tube more than 5cm success rate was 84.61%. Out of 4 women of isthmic - interstitial anastomosis 3 women conceived in whom railroad technique was adopted. **Conclusion:** The intrauterine pregnancy rate is 66.67%. Success rate depends on age of the patient it was 81% in patients < 30yrs. Success in reversal following laparoscopic sterilization was 86.67%. When residual length of the tube at conclusion of surgery was more than 5cm the success rate was statically significant more. The technique is simple, easily learnt, inexpensive method of reversal with good and comparable results to microsurgery or laparoscopic reversal.

Keywords: Reversal of sterilization, rail road technique of reversal, pregnancy rate, cornual- isthmic anastomosis.

Conventionally the gold standard for recanalisation has been microsurgical tubal recanalisation by laparotomy. The development of high quality endoscopic magnifying cameras and delicate instruments has paved the way to laparoscopic approach. Laparoscopists have applied microsurgical principles from laparotomy to laparoscopy by replicating the microsurgical suturing technique¹. As women select sterilization procedure at lower parity and younger ages the potential demand for reversal of tubal sterilization will increase.

Majority of the women seeking reversal in India cannot

undergo these high-tech surgeries because either they cannot afford it or it is inaccessible to them. Nevertheless all women who are motivated to undergo sterilization in all fairness are offered a high success rate after reversal of sterilization. If we do reversal of sterilization by conventional macrosurgery with microsurgical principle and adopting Oldham's rail road technique for cornual anastomosis, we can achieve the success rate which is very comparable to microsurgical or laparoscopic reversal². Changes in marital status, the death of a child, or a shift in attitude are all common causes of change of mind³. Young age is a major risk factor for

Received: 15th September 2021, Peer review completed: 20th January 2022, Accepted: 6th February 2022.

Sardesai S, Dabade R, Deshmukh S. Reversal of sterilization by macrosurgery / conventional surgery with microsurgical principles with special reference to rail road technique: an overview of success and failures. The New Indian Journal of OBGYN. 2023; 10(1): 111-15.

sterilization regret⁴. We do not wish to challenge the superiority of microsurgery or laparoscopic approach however we definitely wish to promote the technique that can be applied to the majority of the women in developing countries with equally good results. Thus, the present study was undertaken to assess the efficacy of technique of reversal of sterilization by macrosurgery with microsurgical principles and use of rail road technique for cornual - isthmic anastomosis and factors truly influencing the success rate.

Materials and methods

This is a retrospective observational study of 142 cases of reversal of sterilization by macrosurgery. Rail road technique was adopted in 25 cases, where the tubal ligation was near cornual end or isthmic region where tubal lumen was very narrow with all microsurgical principles except operating microscope. The study was conducted in the dept. of OB-GYN Dr. V.M. Govt. Medical Collage and Dept. OB-GYN Ashwini Sahakari Rugnalaya & Research Center, Solapur, Maharashtra from 1999 to 2018 over a period of 20 years. All the reversal surgeries were done by same team of surgeons and technique also was same.

The selection criteria were as per the guidelines laid down by department of Health and Family Welfare, Govt. of India. All women who fulfilled the criteria were accepted for reversal of sterilization provided they were healthy women in reproductive age and understood the risk of ectopic pregnancy. Preoperative laparoscopy or HSG was not done. No woman was refused surgery on grounds of type of previous sterilization. Husband's semen analysis was done in all cases.

Women in late reproductive age were dissuaded from the decision because of the realization of the decrease in the fertility potential and obstetric complications. However it was undertaken if women insisted on undergoing reversal.

Technique of reversal of sterilization and Oldham's rail road technique: Under regional anesthesia abdomen is opened by small Pfannestial incision. Uterus and both appendages are mobilized and brought out through the incision. Dr. Shirodkar's isthmic occluding clamp is applied. Both the tubes and appendages are inspected as regards the site of sterilization, status of fimbria and peritubal adhesions. Principles of microsurgery are observed by keeping the tissues moist by ringer lactate irrigation, using microsurgical instruments and fine suture material 3-0/4-0 P.D.A is used. The tube is transected at the proximal and distal end of the sterilization site just beyond the fibrosis and tubal stump is excised to minimize the extent in the mesosalpinx. Patency

of the proximal end of the tube is tested by injecting methylene blue dye transfundally. Epidural catheter no 16 is passed through the fimbrial end and this helps in identifying occluded tip of distal end and that end is resected. Epidural catheter is used as a stent. Epidural catheter is very atraumatic stent and can be negotiated through the lumen of the tube very easily. It is threaded through proximal end of the tube. Epidural catheter stent is kept in situ by applying atraumatic bulldog vascular clamps.

If previous sterilization is done very close to cornual end of the tube in that case epidural catheter cannot be negotiated through this proximal portion of the tube as it is a very narrow segment. In this situation Oldhams rail road technique is used in which prolene no 1 is threaded into the proximal segment and pushed into the uterine cavity and the distal end of the prolene is threaded into the epidural catheter and catheter is withdrawn from fimbrial end thus railroading the splint through the fallopian tube.

Transected flaps of mesosalpinx are approximated with 3 – 0 sutures to ease the tension on the approximation site. Tubal anastomosis is done using 4 – 0 sutures in two layers by interrupted sutured taken 6,9,12,3 O'clock positions.

The Oldham's technique suggests leaving the prolene stent in situ at the conclusion of the surgery and removal after 48 hrs transcervically, but we adopted the policy of removing stent at the conclusion of anastomosis and does patency test by injecting dye transfundally to assess the anatomical patency of the tubes. Residual length of the tubes is measured.

Routine post operative care is taken and antibiotics and anti-inflammatory drugs are given and patient is discharged on 4th post operative day. Patients are asked to attempt pregnancy after next menses. HSG is advised if patient does not conceive at the end of one year of surgery.

Statistical analysis: The qualitative parameters are presented by frequencies and percentage, whereas quantitative characteristics are presented by their mean and standard deviation (SD), or by their median and interquartile range (IQR) when severely skewed according to the normality test results. For the investigation of the potential association between pregnancy outcome and a qualitative factor, such as age group, interval between sterilization and reversal, method of sterilization, chi-square test or Fisher's exact test for small sample was employed. Comparison of Pregnancy rate with residual length of the tube was performed by Z-test. A p-value less than 0.05 were

considered as significant. Data analysis was performed by using software SPSS v20.0.

Results

A total number of 142 Cases underwent reversal of sterilization over a period of 20yrs. The commonest reason for seeking reversal was death of all children or only male child or children due to pediatric disease (52.81%), the other causes of deaths were snake bite / scorpion bite (12.67%), road accident / burns / drowning (28.87%). Only in 3.5% of the cases the reversal was done for desire for one more child or remarriage (table 1).

Table 1: Reasons for seeking sterilization reversal

Reason for seeking reversal of sterilization	No. of cases	Percentage (%)
Death of child / children due to pediatric disease	75	52.81
Snakebite / scorpion bite	18	12.67
Road accidents / Burns / Drowning	41	28.87
Food poisoning	3	2.11
Desire for another child	1	0.72
Remarriage	4	2.8

Out of 142 cases of reversal, 78 patients could be followed. Patients were called for follow up or were asked to report with early pregnancy. Those who did not turn up were contacted by letters and those who did not respond to letters were labeled as lost to follow up. Intrauterine pregnancy is sufficient proof of successful surgery. Out of 78 patients, 52 had intrauterine pregnancy i.e. 66.67% success rate. There were 22 patients who failed to conceive and 4 had ectopic pregnancy, therefore they were considered as failure and thus failure rate is 33.33% (table 2).

Table 2: Pregnancy outcome following reversal of sterilization

Pregnancy outcome following reversal of sterilization	No. of Cases	Percentage
Number of cases followed	78	54.93
Number of cases with intrauterine pregnancy	52	66.67
Number of ectopic pregnancy	4	5.13
Number of reversal failure	26	33.33

The age of the patients ranged from 20-40 yrs. In our study, the success rate was 80% with age less than 30yrs (P<0.01). When the interval between sterilization and reversal was less than 2yrs, a superior pregnancy rate was observed. It was 60% in our study when interval was 3yrs or less. Method of sterilization has important bearing on the success rate following reversal. The success following laparoscopic tubal ligation (Lap TL), out of 15 cases who had undergone Lap TL 13 conceived i.e. 86.66% success rate. While success rate was 24.57% (N39) following Pomeroy's technique of sterilization (table 3).

In our study, isthmico-isthmic or isthmico-ampullary anastomosis had success rate of 78% and a high failure rate of 76.6% following ampulo-ampullary and ampulo-fimbrial

Table 3: Pregnancy outcome with patient profile parameters

Variables	Success (N=52)		Failure (N=26)		χ^2 value	p-value
	Number	%	Number	%		
Age (years)						
20-25	22	42	7	27	10.85	0.01
25-30	20	39	13	50		
30-35	9	17	1	4		
>35	1	2	5	19		
Interval between sterilization and reversal						
< 1 yr	9	17	1	4	10.06	0.039
1 – 3 yrs	22	44	6	23		
3 – 6 yrs	14	27	10	39		
6 – 9 yrs	5	10	4	15		
> 10 yrs	2	4	5	19		
Method of sterilization						
Pomeroy's	39	75	24	92	3.34	0.067
Falope ring	13	25	2	8		

anastomosis. Out of 4 cases of isthmico-interstitial anastomosis 3 cases (75%) conceived with rail road technique (table 4).

Table 4 : Site of tubal anastomosis

Site of tubal anastomosis	Success		Failure	
	Number	%	Number	%
Isthmico - interstitial	3	6	1	3.3
Isthmico - isthmic	25	46	2	6.6
Isthmico - ampullary	16	32	4	13.33
Ampulo - ampullary	8	16	13	30
Ampulo - fimbrial	0	0	6	46.66

Chi-square value=23.79, df=4, p<0.0001

In the present study, majority of the success cases at the conclusion of surgery was bilateral tubal patency status (84%) whereas it was unilateral tubal patency status (50%) in failure cases. And there was highly significant association of status of tube with conclusion of surgery (p=0.0026). In two cases in failure group tubal patency could not be established (table 5).

Table 5: Status of tubes at the conclusion of surgery.

Status of Tube	Success		Failure	
	Number	%	Number	%
Bilateral tubal patency	44	84	11	42.3
Unilateral tubal patency	8	16	13	50
No tubal patency or reversal could not be done	0	0	2	7.6

Chi-square value=11.86, df=2, p=0.0026

Table 6: Comparison of pregnancy rate to residual length of the tube

Residual tubal length	Success		Failure	
	Right tube	Left tube	Right tube	Left tube
< 3cm	0	0	3	3
3 – 4cm	6	7	8	7
4 – 5cm	15	10	9	11
>5 cm	31	35	6	5
Mean ± SD	5.80 ± 0.94		4.52 ± 1.17	

Z=6.86, p<0.001, highly significant

The greater the tubal destruction in sterilization procedure, the less the chance of successful tubal reconstruction. In our study, high pregnancy rate was

achieved with good residual length of tube as compared shorter residual tubes ($p < 0.001$) (table 6).

Discussion

The age of the patients ranged from 20-40 yrs. The pregnancy rate is higher when the age of the patient seeking reversal is 25 yrs. or less^{5,6}. In our study, the success rate was 80% with age less than 30yrs ($P < 0.01$).

When the interval between sterilization and reversal was less than 2 years, a superior pregnancy rate was observed. It was 60% in our study when interval was 3yrs or less. Pregnancy rate is reported to be maximum i.e. 88.24% in first 12 months following surgery and reduced markedly to 11.76% later⁶.

Method of sterilization has important bearing on the success rate following reversal. The success rate is reported to be 68% after LapTL as against 32% following Pomery's technique⁶. K Jaya Krishnan⁷, Jihui AL⁶ reported pregnancy rate of 65.7% and 69% respectively following laparoscopic reversal following Lap TL. In our study, the success rate is 86.67% following Lap TL. Out of 15 cases who had undergone Lap TL 13 conceived i.e. 86.66% success rate.

Pregnancy rate is reported to be around 83% following isthmico-isthmic anastomosis followed by 60% in isthmico-ampullary⁶ or ampulo-ampullary anastomosis 42%^{5,6}. Isthmico-interstitial anastomosis is difficult by conventional surgery because of the narrow lumen of the interstitial / cornual portion of the tube. This difficulty can be overcome by adopting Oldham's rail road technique². In our series isthmico-isthmic or isthmico-ampullary anastomosis had success rate of 78% and a high failure rate of 76.6% following ampulo-ampullary and ampulo-fimbrial anastomosis.

Out of 4 cases of isthmico-interstitial anastomosis 3 cases (75%) conceived with rail road technique. Microsurgery or magnification is ideal for interstitial anastomosis but with railroad tech this need can be overcome with excellent results.

The greater the tubal destruction in sterilization procedure, the less the chance of successful tubal reconstruction. The chances for a Intrauterine pregnancy is directly proportional to the length of the tube on the longest side. When the total tubal length is greater than 5cm the success rate is very high⁹. In our study also high pregnancy rate was achieved with good residual length of tube as compared shorter residual tubes. When the total tubal length on the longest side was greater than 5cm, 100% pregnancy

was achieved and when it was less than 3cm only 18% of patients achieved pregnancy⁹.

Isthmico-isthmic anastomosis was the most successful in terms of pregnancy rate and the length in centimeter of the longest remaining tube multiplied by a factor of 10 gave a close approximation of term delivery rate¹⁰. Garcia¹¹ reported the first microsurgical anastomosis of fallopian tubes which was further advanced by Winston and Gomel. Since that time the pregnancy success rate of microsurgical reversal has improved two fold when compared with traditional tubal reversal. Several investigators have reported their pregnancy success rate of 55-80% after tubal reversal^{1,5,6,8}.

It is difficult to compare pregnancy rate of one series against the pregnancy rate of another series. There are multiple factors that affect the outcome of reversal of sterilization. One of the important factor that affects the success rate is residual length of the fallopian tubes. A reconstructed tubal length less than 4cm results in loss of ampullary length and consequent loss of oviductal oocyte retention¹¹. Intrauterine pregnancy rate of 60-80% can be achieved provided that the reconstructed tube longer than 4cm and ampullary portion more than 2cm⁹.

To overcome the resource constraints if we adopt conventional surgery performed with microsurgical principles except the use of operating microscope, good results which are very comparable to microsurgery can be achieved. This technique is simple, easily learnt and relatively inexpensive method of reversal.

Reanastomosis at cornual end is difficult without magnification and this difficulty can be overcome by adopting Oldham's rail road technique. In our study we have adopted this technique in interstitial-isthmic and few cases of isthmico-isthmic anastomosis with excellent results.

The results of this observational study do not challenge the well established prognostic significance of various factors but they simply indicate that good results are achievable with this technique, and provide an alternative for women unable to undergo microsurgery / laparoscopic reversal or I.V.F.

Conclusion

Reversal sterilization by conventional surgery with microsurgical principles except operating microscopic can give success rate very comparable to microsurgery or laparoscopic reversal. In our series the success rate was 84.61% when length of either of the tube was ≥ 5 cm. In women with isthmico-interstitial anastomosis the rail road

technique is of great help with success rate of 75%. The technique of reversal using conventional surgery with microsurgical principles and application of rail road technique is simple, easily learnt in expensive method with good and comparable results to microsurgery or laparoscopic reversal.

Conflict of interest: None. **Disclaimer:** Nil.

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