

Original Research Article

Trends of various techniques of tubectomy among eligible couples: a five year study in a tertiary hospital

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ABSTRACT

Background: Female sterilization is one of the most popular methods of permanent contraception for women who have completed their families. Tubectomy during caesarean section and tubal sterilization either laparoscopically or by minilaparotomy are the favoured methods in the developing countries. The aim of the current study was to assess the incidence, details of the procedure and complications of various techniques of tubectomy among women at our tertiary institute.

Methods: A retrospective analytical study was conducted in the postpartum unit of the department of Obstetrics and Gynaecology, Government Medical College, Amritsar from January 2018 to December 2022. 3680 married women between 20-45 years were included in the study. The cases were grouped as caesarean tubectomy, postabortal tubal sterilization, laparoscopic sterilization and minilaparotomy.

Results: A total of 3680 cases of female sterilization were performed during the study period. Caesarean tubectomy was performed in 2921 women. 159 cases underwent postabortal sterilization while interval tubectomy by laparoscopic technique was performed in 583 cases. Only 17 cases had undergone tubectomy by minilaparotomy. Caesarean tubectomy and postabortal tubal sterilization were highly popular for puerperal sterilization.

Conclusions: Female sterilization technique in the puerperal or interval period need to be individualized based upon the timing, place and the surgical skills of the operating surgeon. An increasing trend of puerperal sterilization either by Caesarean tubectomies or postabortal laparoscopic sterilization was seen in our institute. Laparoscopic tubal ligation was preferred over minilaparotomy in the interval period.

Keywords: Caesarean tubectomy, Laparoscopic sterilization, Minilaparotomy, Postabortal sterilization

INTRODUCTION

Contraception is the deliberate prevention of pregnancy through the use of various devices, chemicals, drugs, sexual practices and surgical procedures. Tubal sterilization is one of the most popular methods of permanent contraception in women in the reproductive age group around the globe. In Asia, the incidence of tubal sterilization rose significantly from 34% of married women in 1980-1984 to 42-43% in 1985-2005 while it has been almost static at 5-8% in the developed

countries.¹ In India, according to the National Family Health Survey (2015-16), 37% of married women in the reproductive age group used tubal sterilization as their preferred method of contraception once they had completed their families.² This accounted for 66% of all contraception use making it the leading method of contraception. In order to achieve demographic targets, there may be preference for terminal surgical methods for women who have finished their child bearing.³ Tubal sterilization dominates all modern methods used for permanent contraception in the developing countries. On

the other hand, 10.3 million women in USA opted for tubectomy as their choice of contraception making it their second commonest method of contraception.

Depending upon the time selected for the procedure of female sterilization, there can be: caesarean tubal ligation where tubal ligation is done along with caesarean delivery as a combined procedure; postpartum sterilization done after twenty four hours to within seven days of delivery; postabortal ligation done immediately or within seven days of evacuation of the uterus after medical termination of pregnancy or incomplete abortion; interval ligation done six weeks after delivery in a nonpregnant woman; gynaecological ligation where tubal ligation is combined with various gynaecological surgeries like salpingectomy or salpingostomy done for ectopic pregnancy, myomectomy, ovariectomy, or Fothergill's operation.

Tubal sterilization may be performed either laparoscopically, as minilaparotomy or by use of hysteroscope. Laparoscopic sterilization is usually done in the interval period and for postabortal ligation. Postpartum sterilization may be performed either as minilap procedure or laparoscopically. Laparoscopic sterilization needs highly trained staff with expensive, high maintenance equipment and a sufficient case load to maintain specialized surgical skills but needs a tiny incision and very short hospital stay.⁴ Minilap procedure, though a simple surgical procedure, requires a comparative larger incision and longer hospitalization. Likewise, more complications like wound infections and postoperative pain occur. The rates of major complications and technical failure are comparatively low for laparoscopic sterilization and minilaparotomy.⁵ In both procedures, most major complications are due to general anaesthesia or abdominal entry. On the other hand, caesarean tubal ligation has an advantage of avoiding additional incision, anaesthesia, hospital stay and financial burden.

The World Health Organisation's (WHO) Task Force on Female Sterilization stated: the ideal female sterilization would involve a simple, easily learned, one-time procedure that could be accomplished under local anaesthesia and involve a tubal occlusion technique that caused minimum damage. The chosen sterilization procedure should have a high efficacy rate, be cost effective, with high safety index, readily accessible, able to be performed on an outpatient basis, producing a minimal or invisible scar, have a potential for reversibility and be culturally and personally acceptable. The WHO Task Force concluded that both laparoscopic tubal ligation and minilaparotomy were close to meeting the required criteria listed above according to the data of a large prospective multicentric study.⁶ The present study was done to know the trends, incidence and various complications involved in the various methods of tubal sterilizations performed in our tertiary institute.

METHODS

The study was conducted from January 2018 to December 2022 at Bebe Nanki mother and child care centre (BNMCCC), department of obstetrics and gynaecology, government medical college, Amritsar which is a tertiary obstetric referral hospital. We retrospectively analyzed the case files of all patients who underwent tubal sterilization from the medical records section. The cases were subdivided into subgroups based on the abdominal entry as laparoscopic sterilization, minilaparotomy and caesarean tubectomy. Interval ligation was done six weeks after delivery either by laparoscopic sterilization or minilaparotomy. The women who underwent tubectomy within seven days of vaginal delivery were taken as postpartum sterilization. Postabortal sterilization was done immediately or within seven days of abortion. Caesarean tubal ligation involves ligation of the fallopian tubes along with caesarean delivery as a combined procedure. Modified Pomeroy's technique was the procedure used for caesarean tubectomy and minilap surgeries. For laparoscopic sterilization, falope rings were used.

The inclusion criteria of my study included married women from 20 to 45 years of age who had completed their families and had voluntarily given their consent for tubectomy. Patients for puerperal sterilization who had delivered an alive full term healthy baby or had undergone an abortion at our institute were included in the study. For tubectomy in the interval period, women in the reproductive age group with no known medical complications were included. All the women who were indecisive for adopting a permanent method of sterilization, had recently delivered a dead, premature or sick baby or had known medical complications or were on prolonged antiplatelet aggregating drug therapy were excluded from the study.

Statistical data analysis was done using Karl Pearson's correlation coefficient method. This included searching the p-value and the statistical significance of increase or decrease in the various types of sterilization methods used over the period of five years. The Chi-square test was used to compare cases of laparoscopic sterilization and minilaparotomy based on the timing of sterilization and the complications involved. The p-value <0.05 was considered significant.

RESULTS

A total of 9442 females in the reproductive age group adopted the various available methods of contraception at our hospital. A sample size of 3680 women was used. These women underwent the various tubal sterilization procedures. The socio-demographic profile of the women were determined by modified BG Prasad classification (2008). The maximum number of women who underwent tubal ligation were in the age group of 20-29 years (Table 1).

Table 1: Age wise distribution of patients undergoing sterilization.

Age (Yrs)	No. of cases	%
20-25	1330	36.14
25-29	1221	33.18
30-35	669	18.18
35-39	441	11.98
>39	19	0.52
Total	3680	100

Laparoscopic sterilization was the preferred mode of ligation in the postabortal and interval period. It is clear

Table 2: Year wise distribution of sterilization cases based on the route of abdominal entry.

Year	Caesarean tubectomy (%)	Postabortal sterilization (%)	Laparoscopic sterilization (%)	Minilaparotomy (%)	Total
2018	668 (69.73)	55 (5.74)	235 (24.53)	0 (0.00)	958
2019	680 (72.73)	55 (5.88)	200 (21.39)	0 (0.00)	935
2020	550 (93.86)	10 (1.71)	26 (4.44)	0 (0.00)	586
2021	486 (95.11)	3 (0.59)	22 (4.31)	0 (0.00)	511
2022	537 (77.83)	36 (5.22)	100 (14.49)	17 (2.46)	690
Total	2921 (79.38)	159 (4.32)	583 (15.84)	17 (0.46)	3680

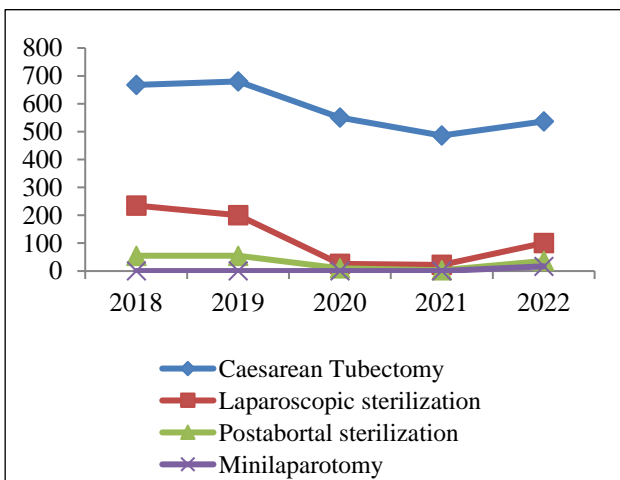


Figure 1: Trends of female sterilization over the last five years in our tertiary institute.

Out of 3680 cases of tubal sterilization, 2921 (79.38%) underwent caesarean tubectomy, 583 (15.84%) preferred laparoscopic sterilization and 17 (0.46%) had gone in for minilap procedure. The increase in the number of women opting for laparoscopic sterilization and caesarean tubectomy seen in the study period was statistically significant as shown in Figure 1. There is a decrease in the number of cases of minilaparotomy in our centre which proved to be statistically significant ($p < 0.001$) (Figure 1).

A total of 2921 (79.38%) opted for caesarean tubectomy and 159 (4.32%) cases underwent sterilization in the

that a significantly large number of cases opted for caesarean tubectomy. Most of minilap procedures were performed in women who had undergone one or more abdominal surgeries including caesarean deliveries and were suspected to be having considerable abdominal adhesions. There was also a need to halt a few laparoscopic sterilization operations midprocedure and switch over to minilaparotomy due to surgical or technical difficulties encountered. As shown in Table 2, the difference in the number of cases of tubectomy operated at the time of caesarean section or laparoscopically and by minilaparotomy was statistically significant ($p < 0.001$).

postabortal period. The remaining 600 (16.30%) women during the study period underwent interval sterilization. It is clearly evident that women opting for puerperal sterilization, which included caesarean tubectomy, postabortal and postpartum sterilization were significantly more (83.70%) than interval sterilization (16.30%). The distribution of cases of tubal sterilization based on the timing of sterilization is shown in Figure 2.

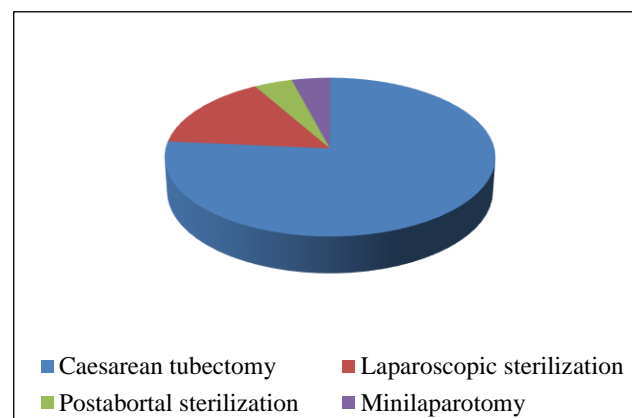


Figure 2: Distribution of patients of tubectomy by timings in their obstetrical phase.

In the year 2018, 668 (69.73%) patients opting for various kinds of tubal sterilization procedures underwent caesarean tubectomy. This increased to 680 (72.73%) in the following year 2019, 550 (93.86%) in the year 2020 and 486 (95.11%) in 2021. 537 (77.83%) opted for caesarean tubectomy in the year 2022 with

minilaparotomy cases decreased to the minimum of 17 (2.46%) in the year 2022 in our tertiary centre. This is because patients opting for interval sterilization in our hospital prefer laparoscopic tubectomy due to the immense popularity of minimal invasive surgery in this region, availability of expensive laparoscopic equipment in our centre, adequate surgical expertise, a very tiny incision and minimal hospital stay. The lack of this facility in the nearby district hospitals also significantly adds to the percentage of interval laparoscopic sterilization. Only those cases were selected for minilaparotomy where laparoscopic sterilization was cancelled due to adhesions, multiple abdominal surgeries, obesity, acute retroversion, undiagnosed adnexal masses or other pelvic disease.

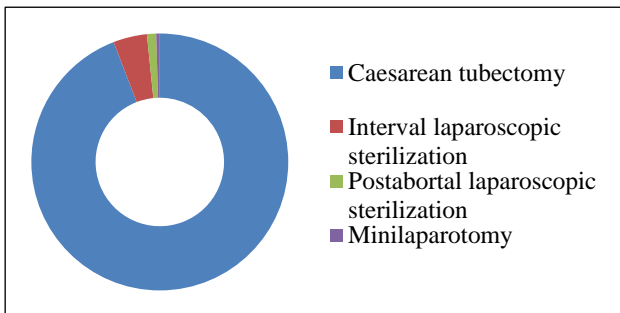


Figure 3: The overall trend of the various kinds of tubal sterilization procedures in the COVID phase.

A considerable number of laparoscopic sterilization cases were seen over the years. It was 235 (24.53%) in 2018 and 200 (21.39%) in 2019. However, a significant fall in the number of interval laparoscopic sterilization was seen due to the COVID pandemic being 26 (4.44%) and 22 (4.31%) in the years 2020 and 2021 respectively. The COVID-19 pandemic caused a significant reduction in surgical procedures including permanent tubal sterilizations. This caused an apparent increase in the percentage of patients opting for caesarean tubectomy during the COVID pandemic. This significant trend is illustrated in Figure 3.

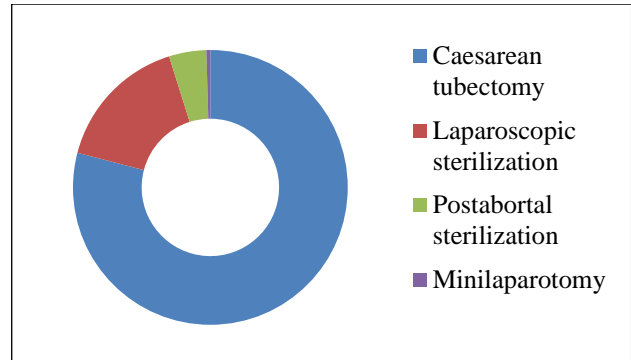


Figure 4: Distribution of patients by timings of tubectomy in the post COVID phase.

The problems of the various sterilization techniques which we encountered were either surgical complications, overall surgical difficulties, wound infections, technical failures or method failures. The surgical complications encountered during laparoscopic sterilization procedures were tears of the mesosalpinx leading to unusual bleeding and/or haematoma formation, tear of the fallopian tubes during falope ring application. The surgical difficulties encountered were cancelling of the procedure because of adhesions, adherent retroversion or other pelvic disease. In these cases, switching over to minilaparotomy emerged as a safe, economical alternative to conventional laparoscopy. The caesarean tubectomies performed were sometimes complicated with mesosalpinx haematoma formation and wound infection. One case of mesosalpinx tear with haematoma formation was seen in minilap procedure. The positive aspects of minilaparotomy were: no shoulder tip pain secondary to peritoneal insufflations and no contraindication for cases of obesity and previous surgery. It also offers greater operative simplicity and avoids the rare major complications of visceral, vascular and thermal injuries associated with laparoscopic sterilization procedures. However, wound infections were significantly less in laparoscopic sterilization procedures as compared to minilap procedures (Table 3).

Table 3: Various complications encountered during the various tubal sterilization methods available.

Complications	Caesarean tubectomy (n=2921)	Postabortal laparoscopic sterilization (n=159)	Interval laparoscopic sterilization (n=583)	Minilaparotomy (n=17)	Total (n=3680)
Surgical complications	14 (0.48)	3 (1.88)	11 (1.89)	1 (5.88)	36 (0.98)
Visceral injuries	0 (0.00)	0 (0.00)	0 (0.005)	0 (0.00)	0 (0.00)
Mesosalpinx tears	3 (0.10)	1 (0.63)	3 (0.51)	0 (0.00)	13 (0.35)
Broad ligament haematoma	4 (0.14)	0 (0.00)	2 (0.34)	0 (0.00)	6 (0.16)
Tears of fallopian tubes	3 (0.10)	2 (1.26)	4 (0.69)	1 (5.88)	13 (0.35)
Injuries of the gut	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Vascular injuries	4 (0.14)	0 (0.00)	0 (0.00)	0 (0.00)	4 (0.11)
Wound infections	20 (0.69)	3 (1.89)	3 (0.51)	1 (5.88)	30 (0.82)
Surgical difficulties	25 (0.86)	4 (2.52)	7 (1.20)	1 (5.88)	37 (1.01)
Technical failures	0(0.00%)	0(0.00%)	3(0.51%)	0(0.00%)	3(0.08%)
Method failure	1(0.03%)	1(0.63%)	2(0.34%)	0(0.00%)	6(0.16%)

DISCUSSION

Tubal sterilization is one of the most popular and reliable mode of irreversible contraception worldwide. The technique and timing of the operation have changed drastically over the years.

Caesarean tubectomy has become increasingly popular method of permanent sterilization in the developing countries. There has been a marked increase in the number of caesarean deliveries over the years due to various maternal and foetal indications. The convenience of combining tubal ligation with the caesarean delivery with no added postoperative duration and discomfort or financial expenses at a single setting adds to the popularity of this method of tubectomy. Also, in the developing countries, due to younger age of marriage and childbearing, the woman completes her family at a younger age. Hence, opting for caesarean tubectomy with no repeated follow up and care proves to be a boon to such women.^{7,8} In our study of 3680 women seeking sterilization, 2921 (79.38%) women underwent caesarean tubectomy, making them 30.94% of all acceptors of family planning methods. Hence, a markedly increased preference for this method of sterilization was seen in the study group. A study in Nigeria by Swende et al showed a majority of women (47.4%) representing 2.7% of all acceptors of family planning methods preferring caesarean tubectomy over other methods of tubal sterilization. A study by Soares et al in Brazil showed caesarean tubectomy dominating 70% of female sterilization operations.⁹

However, this extremely popular method of caesarean tubectomy has brought up an increasing number of sterilized women turning up for tubal recanalisation due to deaths of their neonates or infants, as a significant number of the caesarean sections are done due to foetal indications which put the foetus at a higher risk of survival.¹⁰⁻¹² The women who had undergone laparoscopic sterilization had much better results of restoring fertility with tubal recanalisation rather than sterilization by minilaparotomy or caesarean tubectomy where Pomeroy's technique was performed.¹¹ A study by Jayakrishnan et al supported our observation as all cases with laparoscopic sterilization in his study had one or both tubes suitable for tubal recanalisation while many women with Pomeroy's sterilization technique had unsuitable tubes calling for cancellation of the procedure of tubal recanalisation.

With the advent of minimal invasive surgery, laparoscopic tubal ligation has gained immense popularity as the most preferred method of interval sterilization in tertiary hospitals in both developing and developed countries.^{13,14} In our study, 583 (15.84%) out of 3680 women underwent laparoscopic sterilization with falope rings. There were 235 (24.53%) cases of laparoscopic sterilization in 2018 and 200 (21.39%) in 2022. The increase in the number of cases is attributable

to the increasing popularity of minimal access surgery, a very tiny incision and minimal hospital stay.^{15,16} The increased expertise of the performing surgeons and increasing availability of the expensive equipment in tertiary hospitals adds to the increasing incidence of the given method of tubal sterilization.

In our study, 600 (16.30%) patients underwent interval sterilization, out of which 583 (15.84%) underwent laparoscopic sterilization and 17 (0.46%) had minilaparotomy. Besides the interval laparoscopic sterilization cases, all 159 women who underwent postabortal sterilization had opted for laparoscopic tubectomy. This depicts the preference of laparoscopic sterilization over minilaparotomy during postabortal and interval tubal ligations. Out of 600 patients who underwent tubal sterilization, 583 were done laparoscopically and minilaparotomy was performed only in 17 women. The preference of laparoscopic sterilization over minilaparotomy in the interval period is statistically significant ($p < 0.001$). The size of the uterus and the hyperemic and oedematous tubes during puerperium make laparoscopic sterilization technically difficult.

Although the number of laparoscopic sterilization cases was considerable before the COVID pandemic being 235 (24.53%) in 2018 and 200 (21.39%) in 2019, very few cases underwent laparoscopic sterilization during the COVID phase being 26 (4.44%) and 22 (4.31%) in the years 2020 and 2021 respectively. This caused an apparent increase in the percentage of patients opting for caesarean tubectomy during the COVID pandemic. The COVID-19 pandemic had affected every aspect of medical care, including permanent tubal sterilizations.^{17,18} The study by Mattingly et al showed a 48.0% decrease in total surgical procedure volume immediately after the March 2020 recommendation to cancel elective surgical procedures.

Cochrane review demonstrates major morbidity as a rare outcome of laparoscopic sterilization and minilaparotomy.^{19,20} The complications seen in our study were minor and mostly related to tears of mesosalpinx and tubes which could be managed conservatively. There were more complications related to minilaparotomies as compared to laparoscopic sterilizations in our study. This may be related to the selection of cases complicated with previous abdominal surgeries for minilap procedures rather than due to the surgical technique as such. Klarke et al showed 1.4% patients developed tears of the mesosalpinx during laparoscopic sterilization and required laparotomy to control the bleeding.

Mumford et al compared laparoscopic sterilization and minilaparotomy procedures in 23 countries.²⁰ According to their study, 7053 cases underwent laparoscopic sterilizations and 5081 cases had opted for minilaparotomy by modified Pomeroy's technique. The surgical complication rate was lesser in minilaparotomies (0.79%) as compared to laparoscopic sterilizations

(2.04%) whereas the technical failure rate was double that of laparoscopic sterilizations.^{21,22} However, this was in direct contrast to our study where minor morbidity was significantly less in the laparoscopy group. Duration of operation was about 5 minutes shorter in the laparoscopy group as compared to the minilap technique.

Our study showed puerperal sterilization as the preferred mode of sterilization at our centre.²³ Caesarean tubectomy is a very popular method of puerperal sterilization opted for by patients undergoing repeat caesarean deliveries (67%) as the sterilization procedure is combined with the major surgery at no extra postoperative discomfort. However, they opted for laparoscopic tubal ligation over minilaparotomy in the interval period.

CONCLUSION

An increasing trend in Caesarean tubectomy and interval laparoscopic sterilization is seen in our study. Female sterilization should be individualized based on the timing in the obstetrical career of the woman, place of surgery and the surgeon's expertise. Puerperal sterilization is a highly preferred mode of sterilization at our centre. The convenience of combining tubal ligation with the caesarean delivery with no added postoperative duration and discomfort or additional financial expenses at a single setting proves to be a boon to such women. Also for the same reason, undergoing tubal sterilization at the time of surgical abortion is very popular among married women who have completed their families. Given a choice, patients opting for interval sterilization prefer laparoscopic tubectomy over minilaparotomy due to the immense popularity of minimal invasive surgery in this region, a very tiny incision, small duration of procedure and minimal hospital stay. Adequate surgical expertise allows proper selection of cases, good surgery which in turn minimises the complication and failure rate.

However, the preference by majority of the patients in our hospital for laparoscopic tubectomy jeopardized our efforts to compare this technique properly with minilap procedure. The lack of this procedure in the nearby district hospitals drew more patients opting for laparoscopic sterilization to our tertiary institute. Hence, a concerted effort to popularise the interval laparoscopic sterilization technique by increasing the availability of the expensive equipment in tertiary and districts hospitals with adequate training of qualified staff is the need of the hour. Also, very few cases underwent laparoscopic sterilization during the COVID phase as all elective surgical procedures were halted at that time. This caused an apparent increase in the percentage of patients opting for caesarean tubectomy during the COVID pandemic.

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