Laparoscopic Sterilization

Prof. Dr. R. K. Mishra

INTRODUCTION

Laparoscopic sterilization was the first popular minimal access surgical procedure ever performed. Laparoscopic sterilization is very straightforward procedure. Worldwide laparoscopic sterilization is now the most commonly applied method for family planning **(Figs. 1A and B)**.

Laparoscopic tubal ligation is considered as a surgical sterilization procedure in which a woman's fallopian tubes are either clamped and blocked or severed and sealed. Both methods prevent eggs from being fertilized. Tubal ligation is a permanent method of sterilization. Laparoscopic sterilization has been evolved by Palmer and Steptoe in USA by monopolar technique. Rioux and Kleppinger developed the bipolar technique for sterilization because of more cases of bowel injury were being reported with the use of monopolar. Later silastic band and spring clips were invented for occlusive method of sterilization.

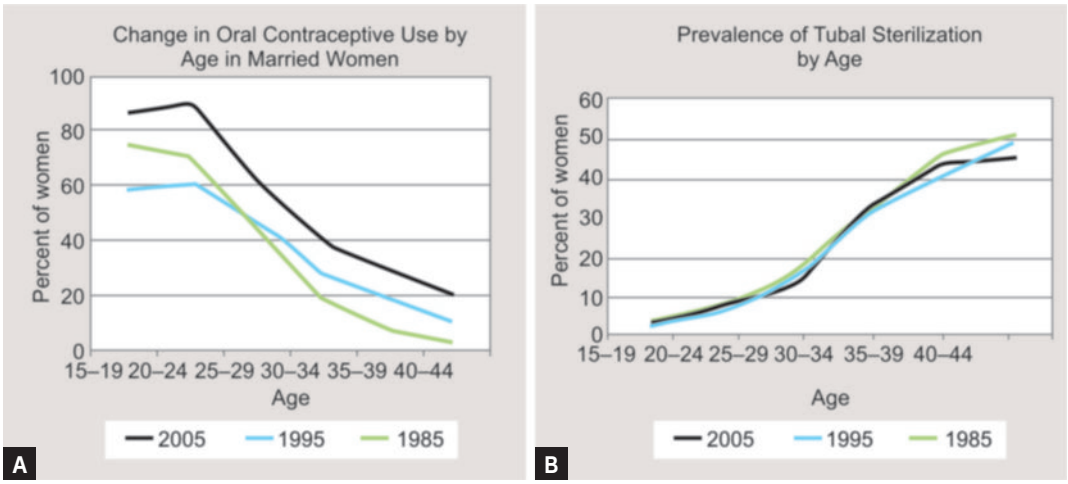
LAPAROSCOPIC ANATOMY

From anterior to posterior, following important tubular structures are found crossing the brim of true pelvis: the round ligament of the uterus, the infundibulopelvic ligament, which contains the gonadal vessels, and the ureter. The ovaries and fallopian tube is found between the round ligament and the infundibulopelvic ligament.

The main problem that can arise in laparoscopic sterilization surgery is mistaking the round ligament for fallopian tube. This mistake was more common when single puncture sterilization was used with laparocator. In laparocator, the image of the target organ and instrument were in the same axis and this was the cause of more incidence of failure. The next most common mistake is injury of the ureter during dissection of the infundibulopelvic ligament. If the uterus is deviated to the contralateral side with the help of uterine manipulator infundibulopelvic ligament is spread out and a pelvic side wall triangle is created. The base of this triangle is the round ligament, the medial side is the infundibulopelvic ligament, and the lateral side is the external iliac artery. The apex of this triangle is the point at which the infundibulopelvic ligament crosses the external iliac artery.

INDICATIONS

- Desire for permanent sterilization
- Completed childbearing



Figs. 1A and B: Trend of family planning.

CONTRAINDICATIONS

- Hemodynamic instability
- Uncorrected coagulopathy
- Severe cardiopulmonary disease
- Abdominal wall infection
- Multiple previous upper abdominal procedures
- Late pregnancy

Patient Position

Patient should be in steep Trendelenburg's and lithotomy position. One assistant should remain between the legs of patient to do uterine manipulation, whenever required.

Port Position

Generally, laparoscopic sterilization is possible with two ports only. Many gynecologists like to perform tube ligation with one port in umbilicus and other in suprapubic region. In our practice, we like to put port in left iliac fossa. The left iliac fossa port will allow elevation angle of instrument at 30° and this angle is better for manipulation of fallopian tube and good ergonomics **(Fig. 2)**.

Operative Procedure

Methods of Tubal Sterilization (Fig. 3)

- *Destructive*:
  - Unipolar
  - Bipolar
  - Coagulation using thermal cautery
  - Ligation and cutting by scissors (Pomeroy technique)
- *Occlusive **(Figs. 4 and 5)***:
  - Filshie clip
  - Falope ring
  - Hulka clip

Laparoscopic sterilization by occlusive method is most popular method of interval sterilization in USA. Use of laparoscopic sterilization in immediate postpartum period is not wise and usually planned 4–6 weeks after delivery. During the time of postpartum laparoscopic tubal sterilization, the chances of some complications if performed laparoscopically. Also in the period of immediate postpartum, the uterus is approximately 20 weeks in size and fills the entire pelvis, rendering insertion of the Veress needle and laparoscopic trocar difficult. Making the subumbilical minilaparotomy incision is fast and easy; often it can be performed under regional anesthesia. There seems no advantage to performing postpartum tubal sterilization laparoscopically.

Laparoscopic sterilization can be planned together with first trimester medical termination of pregnancy (MTP), but in second trimester again an interval of 6 weeks is essential. The main risk of laparoscopic sterilization just after delivery or after second trimester MTP is because uterus is large and may be injured by trocar.

The occlusion of tube in the luteal phase may lead to pregnancy just after sterilization. This may create a medicolegal problem for gynecologist. To avoid this problem, a urine pregnancy test should be obtained on the morning of surgery and patient should be advised to return for MTP, if sign of intrauterine or ectopic pregnancy develops.

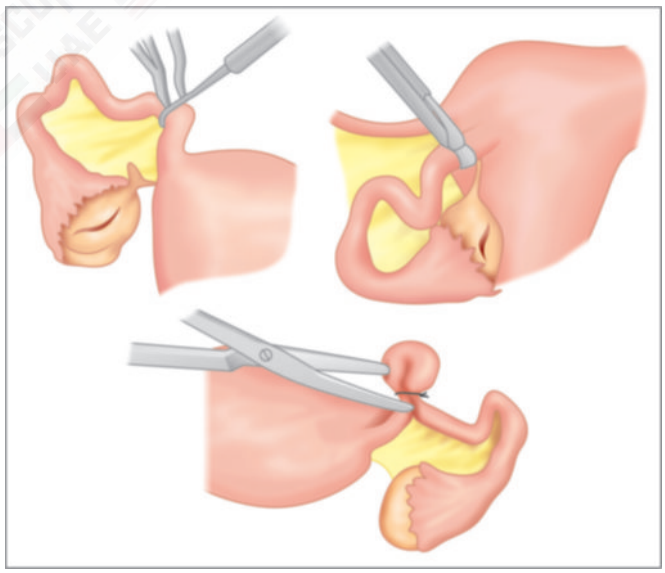


Fig. 3: Methods of sterilization.

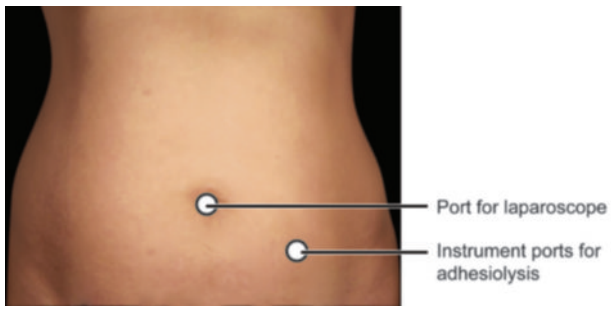
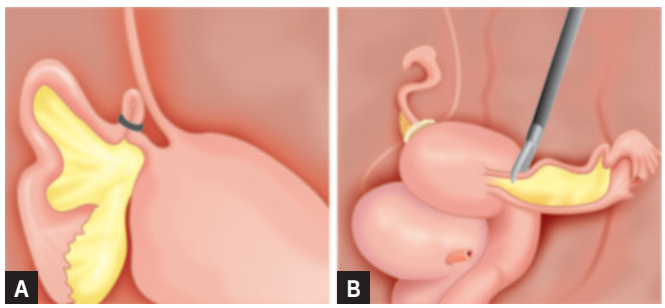
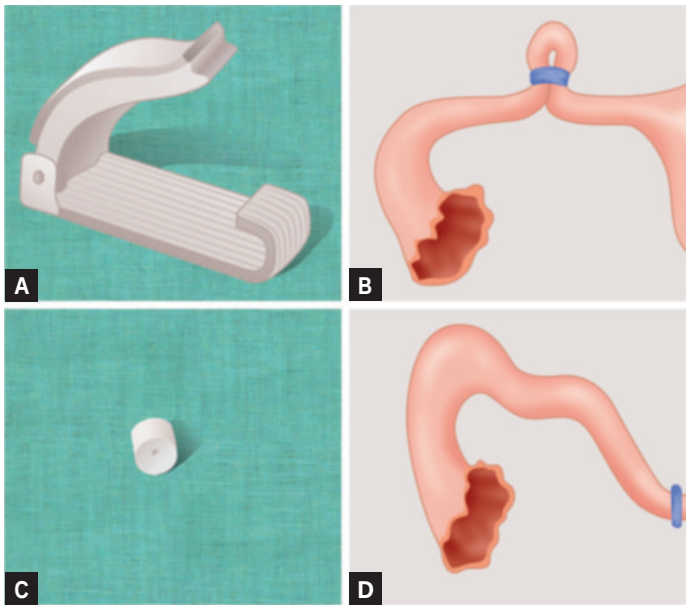


Fig. 2: Port position for tubal sterilization.



Figs. 4A and B: Falope ring and Filshie clip.



Figs. 5A to D: Various occlusive devices for sterilization.

BIPOLAR COAGULATION

Two port techniques are used for sterilization by electrosurgery. One in umbilicus and one in left iliac fossa. Gynecologist stands left to the patient and camera assistant right to the gynecologist. Uterine manipulator is helpful to bring both the tube under vision.

Fallopian tube is grasped 2 cm lateral to the uterine end and bipolar is activated. If tube is coagulated very close to uterus, there is chance of development of uteroperitoneal fistula containing endometrial tissue due to continuous contractility of uterus. Activation of bipolar should be intermittent and after each activation jaw of bipolar should be slightly opened to avoid sticking of jaw of bipolar with tube. The procedure should be repeated at three adjacent areas.

If the jaw of bipolar gets adhered with tube forceps should be gently twisted clockwise and counterclockwise and at the same time the pressure from the handle of grasper is decreased.

Some gynecologists prefer coagulation and division of tube between coagulated area, but study has shown that coagulation of 2–3 cm of tube without division is better because division lead to significant incidence of bleeding from underlying vessels. Bipolar should be applied always at three places. If only "one place bipolar coagulation" per tube is performed, there is always a risk of spontaneous recanalization in about 3 months.

It is worth noting that, in a study done, the risk of ectopic pregnancy was also highest among the bipolar coagulation group (65% of pregnancies were ectopic), Falope ring group (29%), and spring clip group (15%). The high bipolar cauterization ectopic rate is thought to result from inadequate cauterization. These cases were done prior to the routine use of a power meter to monitor tissue desiccation. The Filshie clip was not included in this study.

FALOPE RING APPLICATION

Yoon in 1974 described silastic band technique for occlusive tubal sterilization. The Falope ring is applied with the help of Falope ring applicator **(Figs. 6A to D)**.

Operative Technique

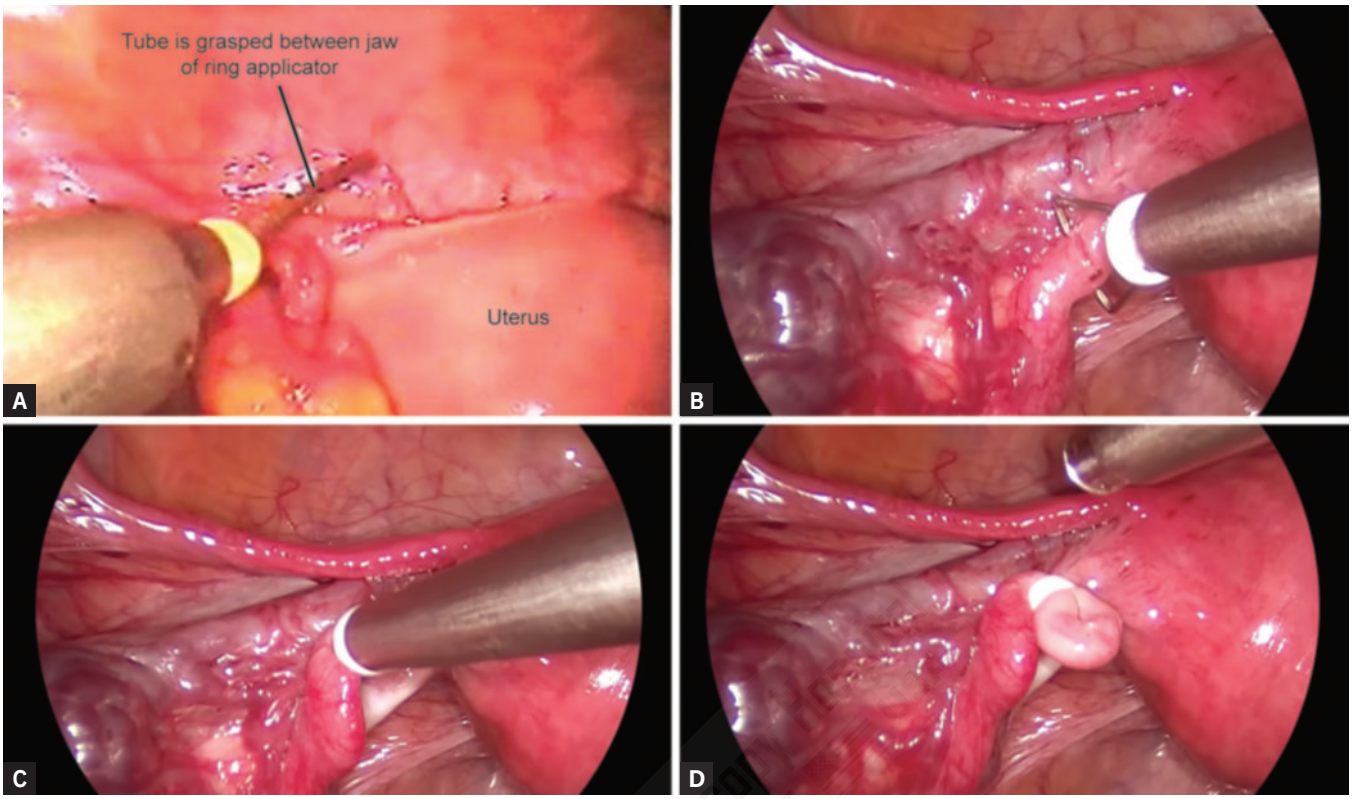
Sterilization using Falope ring application gained popularity in the 1970s. Initially, failure rate was high with single-puncture technique using laparocator **(Fig. 7)**.

These days double-puncture technique is preferred and has less failure rate compared to single-puncture technique. Pneumoperitoneum is created in usual manner. First of all diagnostic laparoscopy should be performed to exclude any other abnormality. The Filshie clip or Falope ring is loaded into the receiving edge of the applicator **(Figs. 8A to C)**. The clip or ring should be applied across the narrow ischemic area about 2 cm from the cornua **(Figs. 9A to D)**. This area is very mobile and easy to see. In case of desired reanastomosis, this area is easier to anastomose.

Once the fallopian tube is found, the atraumatic grasping forceps is used to pick up one of the tubes, around 2 cm lateral to the corneal end of uterus. The jaw of Falope ring applicator is pushed out and tube is then drawn into the inner cylinder of Falope ring applicator **(Figs. 6A to D)**. Once the Falope ring applicator is fully fired either one or two silicon rubber bands are applied to the grasped segment of the fallopian tube. After application of Falope ring the grasping forceps is moved forward out of the inner cylinder to release the occluded segment of tube **(Figs. 10A to D)**. In the similar manner, the contralateral tube is grasped and the ring is applied. After both the tubes are occluded, some gynecologists inject indigo carmine dye through uterus to confirm tubal lumen occlusion. The blanching of the tube after clip application can also be seen after successful application of ring. Blanch is due to ischemia and this means that the sterilization is perfect.

If everything goes well, then patient can be discharged on the same day. The snapshot pictures and video recording of all the procedure is good practice for future references.

Filshie and Hulka clip is also applied with same manner, only difference is that clips does not form loop. Hence, the chances of successful reversal of sterilization are better compared to Falope rings **(Figs. 11 and 12)**.



Figs. 6A to D: Tubal sterilization by Falope ring applicator.

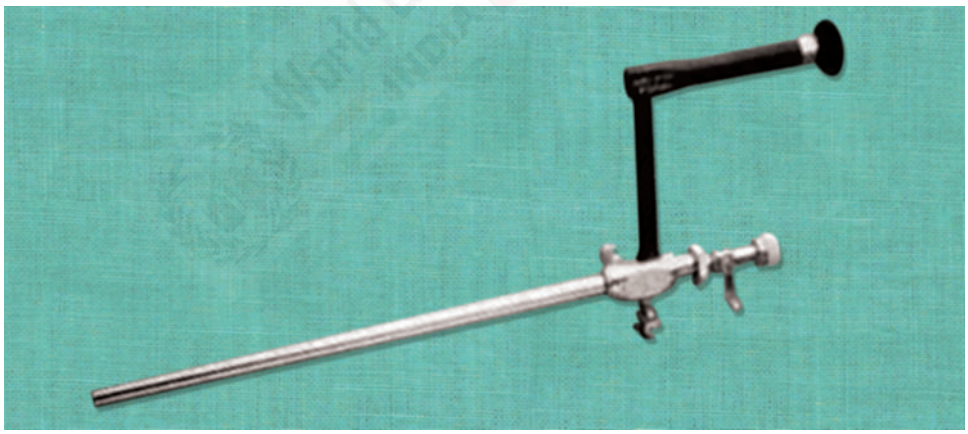
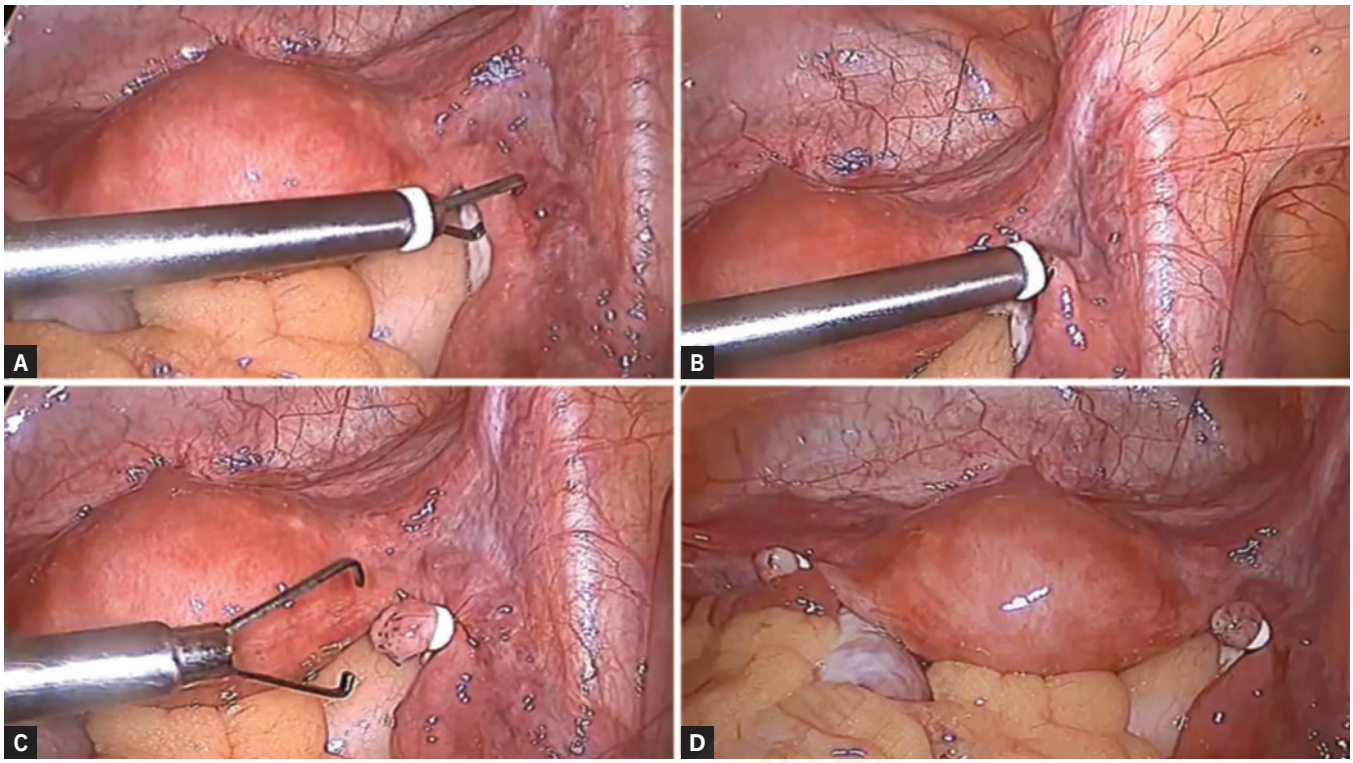
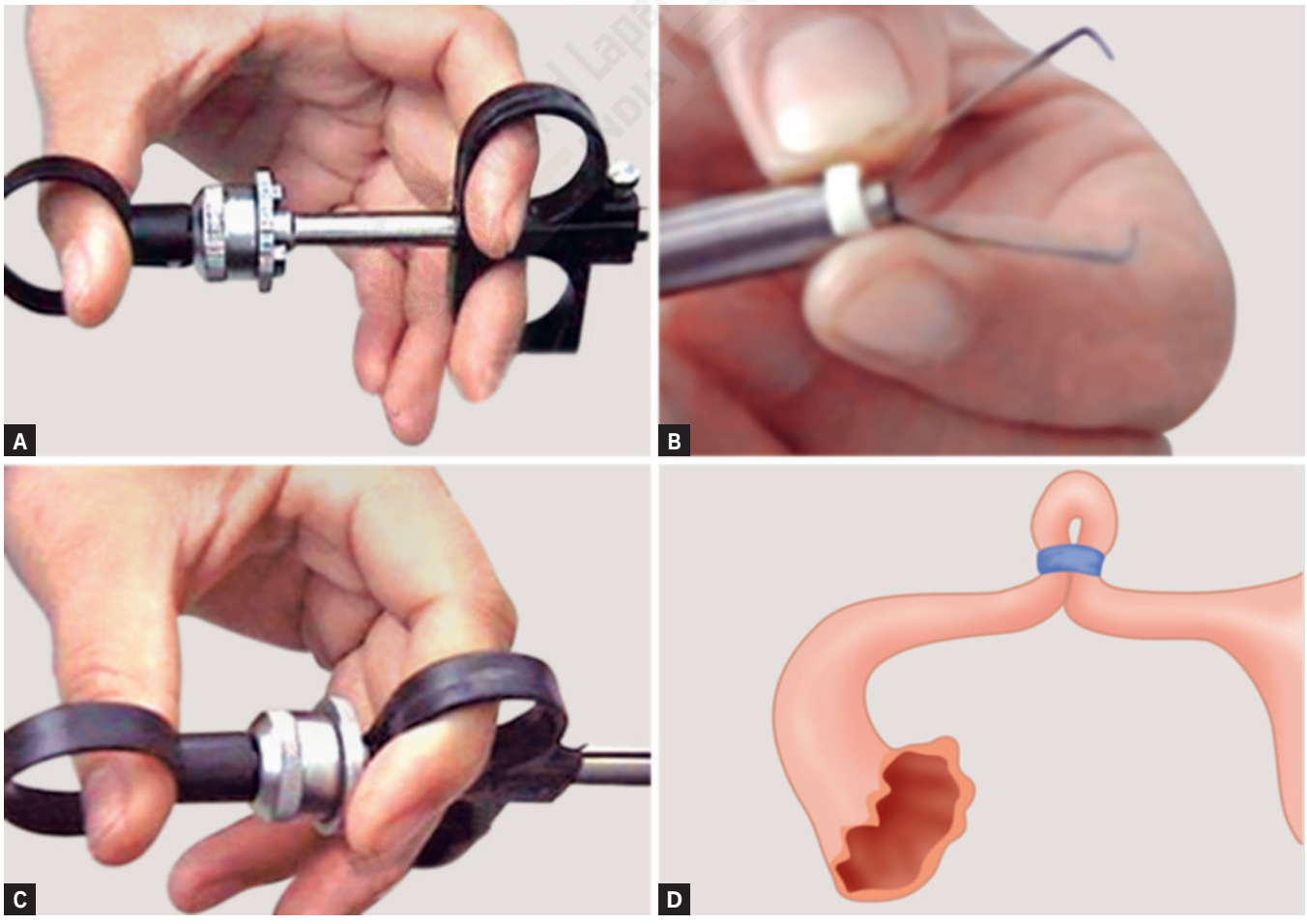


Fig. 7: Laparocator for single puncture tubal ligation.

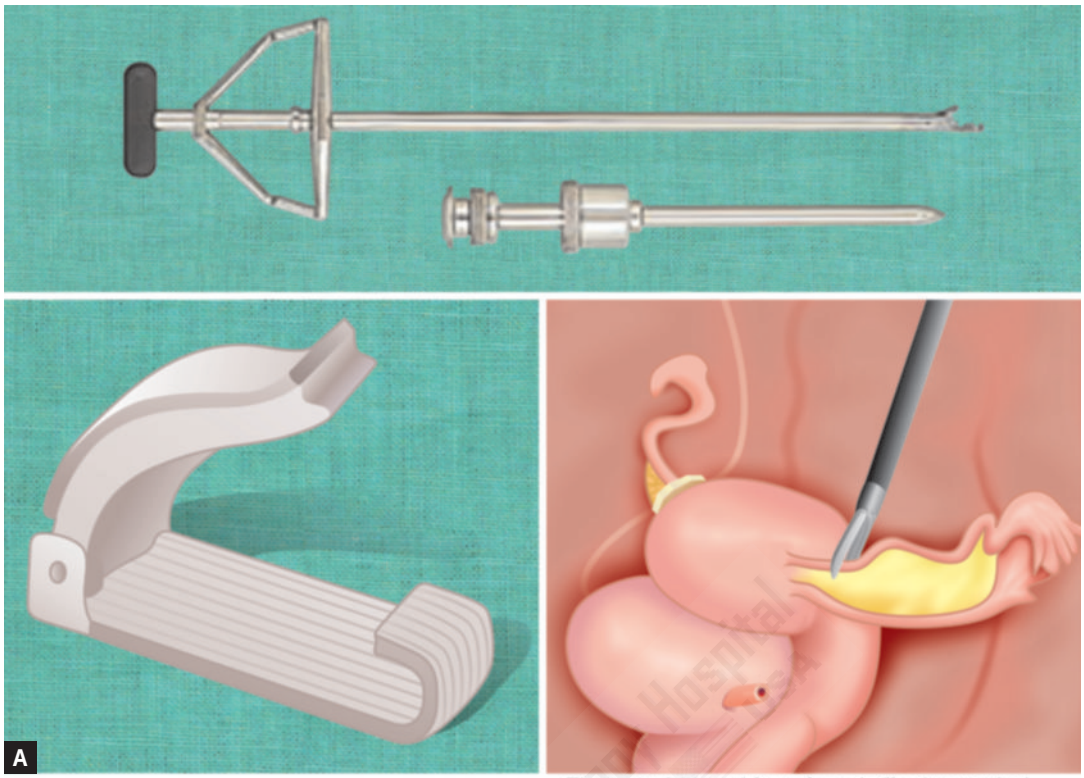
Figs. 8A to C: Ring loading.



Figs. 9A to D: Methods of sterilization in isthmus.



Figs. 10A to D: Loading of Falope ring.



Figs. 11A to D: Filshie clip.

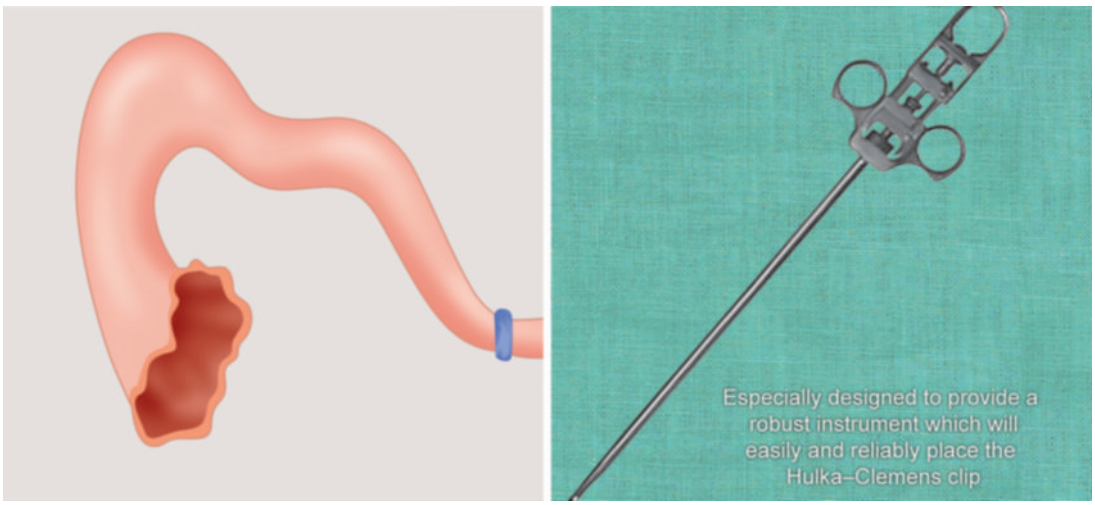


Fig. 12: Hulka clip.

BIBLIOGRAPHY

1. Benhamou D, Narchi P, Mazoit JX, Fernandez H. Postoperative pain after local anesthetics for laparoscopic sterilization. Obstet Gynecol. 1994;84:877-80.
2. Bordahl PE, Raeder JC, Nordentoft J, Kirste U, Refsdal A. Laparoscopic sterilization under local or general anesthesia? A randomized study. Obstet Gynecol. 1993;81:137-41.
3. Cooper JM. Hysteroscopic sterilization. Clin Obstet Gynecol. 1992;35:282-98.
4. Davis A, Millar JM. Postoperative pain: a comparison of laparoscopic sterilisation and diagnostic laparoscopy. Anaesthesia. 1988;43:796-7.
5. De Wilde RL. Goodbye to late bowel obstruction after appendicectomy. Lancet. 1991;338:1012.
6. Diamond MP, Daniell JF, Feste J, Surrey MW, McLaughlin DS, Friedman S, et al. Adhesion reformation and de novo adhesion formation after reproductive pelvic surgery. Fertil Steril. 1987;47(5):864-6.
7. Easter DW, Cushieri A, Nathanson LK, Lavelle-Jones M. The utility of diagnostic laparoscopy for abdominal disorders. Audit of 120 patients. Arch Surg. 1992;127(4):379-83.
8. Fraser RA, Hotz SB, Hurtig JB, Hodges SN, Moher D. The prevalence and impact of pain after day-care tubal ligation surgery. Pain. 1989;39:189-201.
9. JF Kerin, Cooper JM, Price T, Herendael BJ, Cayuela-Font E, Cher D, et al. Hysteroscopic sterilization using a micro-insert device: results of a multicentre Phase II study. Hum Reprod. 2003;18:1223-30.
10. Kerin JF, Carignan CS, Cher D. The safety and effectiveness of a new hysteroscopic method for permanent birth control: results of the first Essure PBC clinical study. Aust NZJ Obstet Gynecol. 2001;41:364-70.
11. Kerin JF, Williams DB, San Roman GA, Pearlstone AC, Grundfest WS, Surrey ES. Falloposcopic classification and treatment of fallopian tube lumen disease. Fertil Steril. 1992;57:731-41.
12. Kerin JF. New methods for transcervical cannulation of the fallopian tube. Int J Gynaecol Obstet. 1995;51:S29-39.
13. Klaiber C, Metzger A. Manual der laparoskopischen Chirurgie. Bern: Verlag Hans Huber; 1992. pp. 185-206.
14. Kolmorgen K, Schulz AM. Results of laparoscopic lysis of adhesions in patients with chronic pelvic pain. Zentralbl Gynakol. 1991;113(6):291-5.
15. Kresch AJ, Seifer DB, Sachs LB, Banner I. Laparoscopy in 100 women with chronic pelvic pain. Obstet Gynecol. 1984;64(5):672-4.
16. Ligt-Veneman NG, Tinga DJ Kragt H, Brandsma G, van der Leij G. The efficacy of intratubal silicone in the Ovabloc hysteroscopic method of sterilization. Acta Obstet Gynecol Scand. 1999;78: 824-5.
17. Lindblom B, Norstrom A. The smooth-muscle architecture of the human fallopian tube. In: Siegler AM, Ansari AH (Eds). The Fallopian Tube. Mount Kisco, New York, USA: Futura Publishing Company, Inc; 1986. pp. 13-20.
18. Luciano AA, Maier DB, Koch EI, Nulsen JC, Whitman GF. A comparative study of postoperative adhesions following laser surgery by laparoscopy versus laparotomy in the rabbit model. Obstet Gynecol. 1989;74(2):220-4.
19. MacKay AP, Kieke BA Jr, Koonin LM, Beattie K. Tubal sterilization in the United States, 1994-1996. Fam Plann Perspect. 2001;33:161-5.
20. Mecke H, Semm K. Pelviscopic adhesiolysis. Successes in the treatment of chronic abdominal pain caused by adhesions in the lower and middle abdomen. Geburtshilfe Frauenheilkd. 1988;48(3):155-9.
21. Nezhat CR, Nezhat FR, Metzger DA, Luicano A. Adhesion reformation after reproductive surgery by video-laseroscopy. Fertil Steril. 1990;53(6):1008-11.
22. Peters AA, Trimbos-Kemper GC, Admiraal C, Trimbos JB, Hermans J. A randomized clinical trial on the benefit of adhesiolysis in patients with intraperitoneal adhesions and chronic pelvic pain. Br J Obstet Gynaecol. 1992;99:59-62.
23. Peterson HB, Xia Z, Hughes JM, Wilcox LS, Tylor LR, Trussell J. The risk of pregnancy after tubal sterilization: findings from the US Collaborative Review of Sterilization. Am J Obstet Gynecol. 1996;174:1161-70.
24. Räf LE. Causes of abdominal adhesions in cases of intestinal obstruction. Acta Chir Scand. 1969;135:73-6.
25. Rapkin AJ. Adhesions and pelvic pain: a retrospective study. Obstet Gynecol. 1986;68:13-5.
26. Riedel HH, Haag GM. Late sequelae of appendectomy with special reference to adhesions in the lower abdomen, chronic abdominal pain and sterility. Zentralbl Gynakol. 1989;111(16):1101-12.
27. Ryder RM, Vaughan MC. Laparoscopic tubal sterilization: Methods, effectiveness, and sequelae. Obstet Gynecol Clin North Am. 1999;26:83-97.
28. Sciarra JJ, Keith L. Hysteroscopic sterilization. Obstet Gynecol Clin North Am. 1995;22:581-9.
29. Tool AL, Kammerer-Doak DN, Nguyen CM, Cousin MO, Charsley M. Postoperative pain relief following laparoscopic tubal sterilization with silastic bands. Obstet Gynecol. 1997;90:731-4.
30. Valle RF, Carignan CS, Wright TC. Tissue response to the STOP microcoil transcervical permanent contraceptive device: results from a prehysterectomy study. Fertil Steril. 2001;76:974-80.