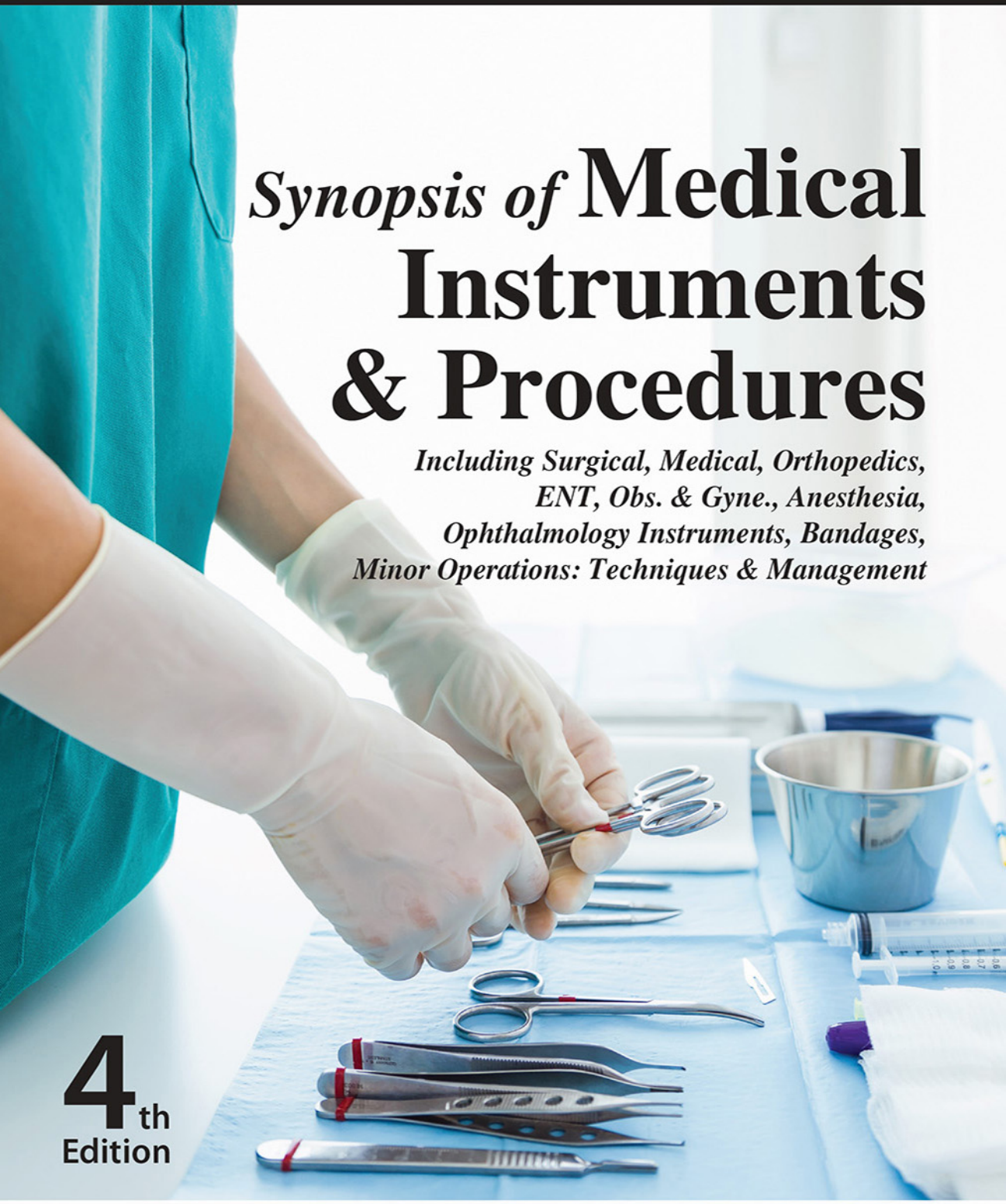


Synopsis of Medical Instruments & Procedures

Including Surgical, Medical, Orthopedics, ENT, Obs. & Gyne., Anesthesia, Ophthalmology Instruments, Bandages, Minor Operations: Techniques & Management

4th Edition

Varinder Singh Arora
Arun Yadav

Contents

Chapter 4

Hemostasis: The Methods and the Means

Hemostasis—control of bleeding, is a very important aspect of surgery, having direct implications over the outcome of surgical procedure. The natural method involved in hemostasis has essentially two important parts. First, the retraction of a vessel within its sheath following the contraction of the cut ends of the vessel. The second important part is the formation of a clot which blocks the bleeding vessel. The clotting factors are stimulated by the damaged intima of the vessels.

Hemostasis can artificially be obtained by any of the following means:

i. By pressure on the bleeder:
   a. Direct pressure by means of clamps and artery forceps.
   b. Indirect pressure by means of cuffs and tourniquets.
ii. By ligating the bleeder.
iii. By the heat coagulation of the bleeding end using diathermic procedure or lasers.
iv. By the application of styptics and vasoconstrictors locally.

One of the most important methods used for hemostasis during surgery is to catch hold of the bleeding vessel by an arterial clamp and ligate it. Some of the smaller vessels stop bleeding by simple application of artery forceps (hemostats) and they need not be ligated. Hemostatic forceps, called artery forceps loosely, stops bleeding by apposing the cut ends of the vessel and also by damaging the intima of the vessel thereby stimulating the natural mechanisms of clot formation and hemostasis.

TECHNIQUES OF USING AN ARTERY FORCEPS

- **Localization of the bleeder:** The bleeder can be localized exactly by either mopping the bleeding surface or by irrigating the bleeding surface with saline, in which case the bleeder is localized by the stream of blood.
- **Holding the bleeder:** The bleeder should be held securely, without causing any damage to the surrounding tissues. To ensure this, the hemostatic forceps are so designed that their blunt conical ends avert any damage to the surrounding tissues.
- **Ligation of the artery:** Once the bleeder is caught, the artery forceps are held by the assistant and the surgeon passes a ligature around its tip and then slips it beneath the tip of the forceps. The ligature is fastened neatly and tightly.
- **Release of forceps:** As the surgeon tightens the knot, the assistant releases the forceps. The extra length of the ligature is snipped off.

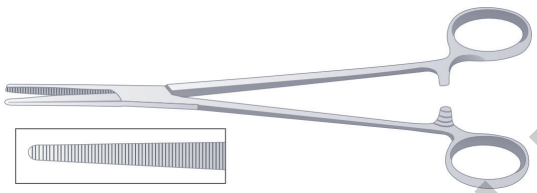
In cases of large vessels, such as those within the pedicle, e.g., hemorrhoids, where the slippage of ligature may lead to severe bleeding, it is always better to transfix the bleeder by passing a suture through it before ligation.

When a large vessel is to be divided, it should always be cut after holding it between two forceps and then each end should be tied off with nonabsorbable suture.

ARTERY FORCEPS

Classification on the Basis of Size and Shape

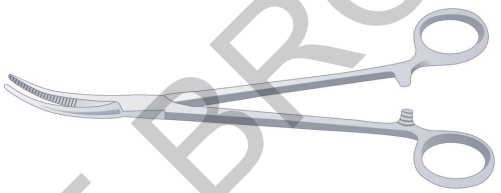
1. Small or mosquito
2. Medium
3. Large or pedicular
   Each can be again a straight type or a curved type of instrument.



Straight artery forceps

Artery forceps can also be classified as:

1. Toothed type, e.g., Kocher artery forceps, Lane artery forceps.
2. Non-toothed types, e.g., Crile artery forceps, Spencer-Wells artery forceps, Halstead artery forceps.



Curved artery forceps

Common Features of Artery Forceps

- It is a light but strong instrument.
- The inner margins of the blades are serrated and on closure the blades are well apposed, leaving no gap in between.
- The blades are conical and blunt.
- The blades can be held together by means of a catch-lock.

Uses of Artery Forceps

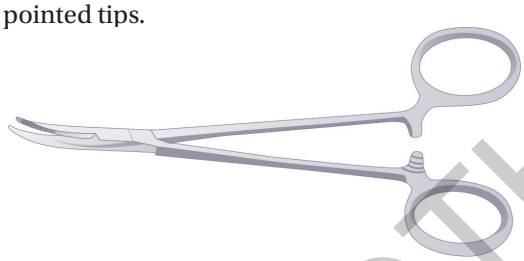
- As a hemostat.
- As a pedicular clamp for spleen and kidney.
- To crush the base of the appendix during appendicectomy.
- To hold the cut edges of fascia, aponeurosis, peritoneum, after incising them, during dissection or for closure after surgery.
- To open up the abscess cavity, breaking all the loculi and causing free bleeding (Hilton's method).
- To hold needles for suturing, as a substitute for a needle holder.
- To hold free ends of tension sutures as they are passed one after the other without tying, till the requisite number of sutures are given.
- Similarly, to hold the free ends of sutures left long during intestinal anastomosis, till they are finally tied off.

- To hold the tape of the abdominal packs to the drapes, thereby ending any chance of leaving the abdominal pack inside undetected.
- Can be used to hold umbilical cord in place of Kocher forceps.
- Can be used to clamp the uterine pedicle while removing the uterus as in rupture uterus.

MOSQUITO ARTERY FORCEPS

Feature

The basic features are essentially the same as above except that these forceps are very small in size and have relatively pointed tips.



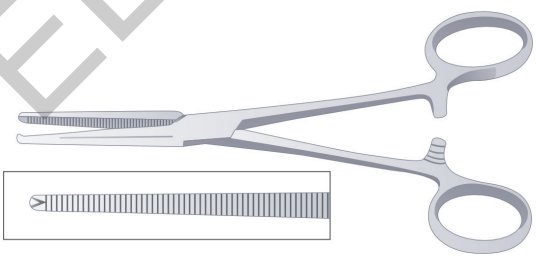
Uses

- It is used for holding small pointed bleeding sites. It stops bleeding by crushing the bleeder.
- It can be used for any of the uses mentioned above.
- To hold gauze-pellets for blunt dissection *(Peanut)*.

KOCHER HEMOSTATIC FORCEPS

Feature

It is a toothed variety of hemostatic forceps, having a single sharp tooth at its tip. It provides a better and effective grip. The rest of the features are same as mentioned earlier in context of artery forceps.



Uses

- It is specifically used to hold the retracting cut ends of the vessels in tough fibrous tissues such as in palms, soles and scalp.
- To catch hold of perforating vessels in radical mastectomy.
- To clamp the umbilical cord to occlude the vessels.
- To hold the fallopian tubes during hysterectomy or ectopic pregnancy.
- To hold gauze-pellets for blunt dissection.
- To hold superficial thyroid vessels, the original use of this instrument.
- To hold rib during rib resection.
- To cause artificial rupture of gestational membranes.
- To hold the incised peritoneal layer and tough fibrous fascia of palms and soles.

MAYO KIDNEY PEDICLE CLAMP

Features

- It is a stout large forceps with a screw joint.
- The blades have vertical serrations.
- The blades are doubly angled to give a good grip at depth without obstructing the operating surgeon's vision.
- The inner margin is pocked, to avoid slippage of tissue being held with this instrument.

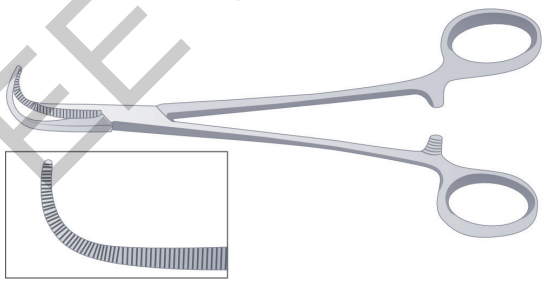
Use

It is used as a pedicular clamp to hold the kidney pedicle near its hilum during nephrectomy.

NEGUS ARTERY FORCEPS

Features

- It is a stout, long jawed forceps.
- The jaws are bent in the form of a hook.
- The inner margins of the jaws are transversely serrated.



Uses

It is used to ligate the vessels present at depth. The bleeder is held with a straight artery forceps and then Negus curved artery forceps is used to ligate it, e.g., cystic artery during cholecystectomy, bleeding points in tonsillar fossa following tonsillectomy.

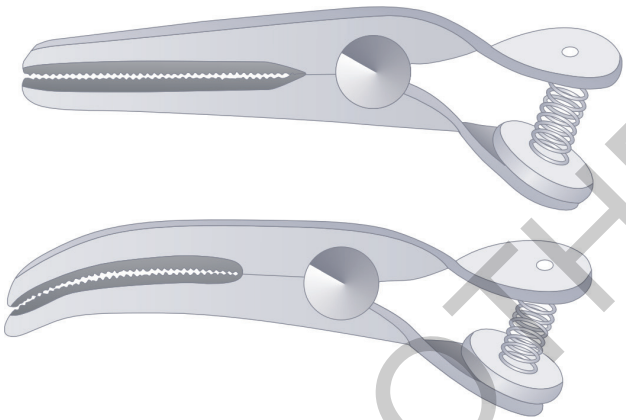
The forceps can also be used to pack wounds after the surgical procedure.

POTTS BULLDOG CLAMP

Features

- It is a paper clip-like instrument with large strong jaws.

- The handle of this clamp is spring loaded.
- The strong spring present in between the handles of these instruments ensures a very secure grip of the tissue held.
- The jaws are strong and have fine serrations on their inner margins. The jaws may be covered with red rubber tubing to prevent crushing of vessels.



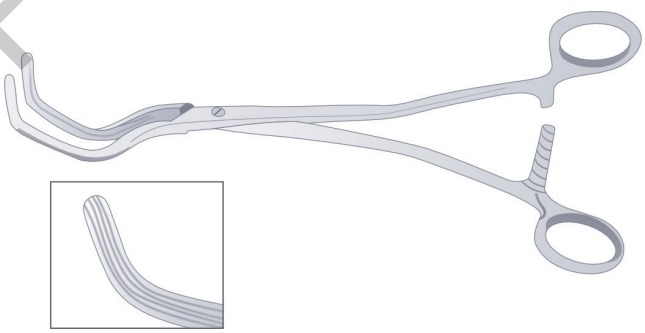
Use

It is used to clamp the large vessels during any surgery on them or for accidental bleeding from these vessels.

WELLS ARTERIAL CLAMP

Features

- It is an angled forceps with a screw joint.
- It has got doubly right-angled jaws.
- The jaws have longitudinal serrations.



Use

It is used as a pedicular clamp for nephrectomy or splenectomy.

Differentiation between an Artery Forceps and a Needle Holder

Features	*Artery forceps*	*Needle holder*
1. Size of the jaws	The jaws are usually at least half as big as the shaft.	The jaws are very small as compared to the shaft.
2. Serrations on the jaws	Usually transversely serrated.	Has criss-cross serrations and might have a longitudinal groove for needle.
3. Shape of the jaws	The jaws are conical and blunt but not very thick.	The jaws are blunt and stout.
		

ELECTROSURGERY OR DIATHERMY

The basic principle is to deliver a high-frequency electric current to the human body by means of an active electrode and this after passing through the target tissues returns via a return electrode. The intense heat produced by the passage of electric current destroys it in different ways depending on the type of current used. **Cutting current** is undamped and produces cutting effect secondary to intense heat generation within the tissues. It is not hemostatic, and bleeding can occur. **Coagulating current** is highly damped and coagulates by tissue dehydration. Its effect is mainly hemostatic. **Blended current** is a combination of two types of waves producing both cutting and coagulating effects. Newer surgical units deliver low voltage cutting or blended current from a solid-state generating unit through an isolated bipolar system which is considered the safest.

In **monopolar diathermy,** the pointed tip pencil like active electrode is placed in the tissue to be cut or blood vessel to be coagulated. The large return electrode plate is separated and attached to the patient by conductive gel. In **bipolar diathermy,** the active and return electrode are side to side and is like forceps. Bipolar diathermy does not have separate return electrode and causes less thermal tissue damage. The electric current only passes through the tissue between the two electrodes of the instrument.

CRYOSURGERY

Cryosurgery is the technique of devitalization of living tissues by extreme controlled cooling. The cryosurgical system consists of a cryoprobe cooled by expanding either carbon dioxide, nitrogen or argon gas reaching temperatures of –60° to –190° Celsius. An automatic defrosting device reheats the probe. The subfreezing temperature so produced causes physicochemical changes leading to cellular death without producing a bleeding wound. It has been suggested that cell death occurs due to formation of intracellular ice crystals with resulting cell dehydration and denaturation of cell proteins.

The obliteration of microcirculation within frozen tissue causes further cell death. No cell can survive ischemic infarction, regardless of its ability to withstand low temperature. Because the biological tissues are poor conductors of heat, a prime safety factor of cryosurgery is the predictable extent and depth of coagulation necrosis with sharp margins. The lesion eventually assumes a spherical shape. There is a direct relationship between the size of lesion and the size of probe and its temperature.

LASER

Laser is an acronym for 'light amplification by stimulated emission of radiation.' A parallel beam of coherent light with uniform wavelength is focused by means of a lens to an area of small dimension of tissue where it can produce a power density of unprecedented magnitude causing photocoagulation of tissue proteins and destruction of blood vessels. The depth of destruction would depend on the power output received and the duration of exposure. The source of light varies with different types of lasers, e.g., xenon, argon, carbon dioxide and YAG lasers.

The effect of laser beam on tissues depends on its spectrum, energy and tissue absorption carbon dioxide laser uses a mixture of CO_2 and nitrogen, CO_2 being the active medium. Its emission is in the middle of infrared spectrum (10.6 μm) and is well absorbed by water. The cells are vaporized and the latent heat is transferred to adjacent cells. The adjacent area of damage is thus small, in spite of local rise of temperature to around 100°C. **CO_2 laser** is used for incisions or ablation of tissue by vaporization. The laser beam can be delivered via an operating microscope to well selected specific targets.

Argon laser utilizes argon gas as an active medium. The light is in visible green wavelength (0.5 μm) and is capable of producing very little energy. It is largely absorbed by hemoglobin and its main effect on tissues is coagulation. It is used to seal blood vessels, hemangiomas and other skin lesions. It can be delivered via flexible fiber optic rods using in conjunction with endoscopes.

Neodymium-yttrium-aluminum-garnet (YAG) laser is a solid-state laser utilizing krypton or xenon lamp as a pump. It produces an invisible beam of light (1.06 μm) and is capable of producing four times as much energy as an argon laser. Although it is less strongly absorbed by hemoglobin, its main effect is tissue coagulation. It cannot be delivered via fiber-optic rods.

Laser, though an expensive tool, has as advantage of being accurate in sealing small vessels as it cuts and is clean. The tissue healing following laser therapy is rapid.

Synopsis of
Medical Instruments & Procedures

The book *Synopsis of Medical Instruments and Procedures* is meant to serve the dual purpose of helping the final-year MBBS students to pass the examinations as well as assisting the fresh graduates to acquire proficiency in the skills they are going to practice in their clinical practice.

It contains a lucid, comprehensive account of instruments and procedures related to major clinical specialties taught to the undergraduate students. The description is well supported by neat three-dimensional illustrations of the instruments. All the chapters in the previous edition have been thoroughly revised and updated.

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