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A Concise Book on Surgical Instruments (Part 1)

JV'n Dr. Hemant Vyas

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CHAPTER 1:

Introduction to surgical Instruments

Instruments which are commonly used during surgical practice, which may be of general surgery, ophthalmology, ENT, orthopedics or obstetrics and gynecology, are grossly divided into following categories:

I. Holding instruments: like needle holders, Hemostats, swab holding forceps, tissue holding forceps, etc
II. Cutting instruments: like scissors, surgical blades, etc
III. Retractors: like Morris retractor, Deaver's retractor, etc
IV. Dissecting instruments: like dissecting forceps, Lahey's forceps
V. Clamps: like Bulldog vascular clamp, Doyen's gastrointestinal clamp, Payer's crushing clamp, etc

Parts of a distinctive surgical instrument:

Typically a long surgical instrument has the following parts

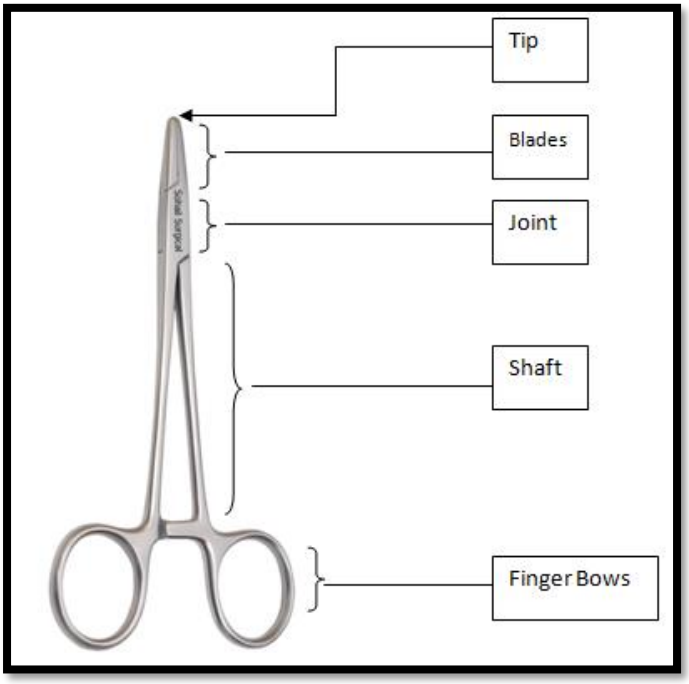
a) Tip: it is the terminal part of the blade which may be either sharp or blunt, depends on the purpose for which it is commonly used.
b) Blades: It is the part between the joint and the tip of the instrument. The blades are of different varieties (straight, curved) and designed as per the use of the instrument.
c) Joint: The shaft and the blades are kept attached by a joint. This joint is either pivot type or box type. When two shafts are attached to each other at one point with screw then it is called as Pivot joint (eg. Scissors) where as in

box type of joint there is a slot in one shaft and the other shaft passes through this slot.

d) Shaft: It is the part between catch and the joint. Shaft or handle of the instrument provides necessary length to the instrument.

e) Finger bows: A typical surgical instrument has two finger bows for holding the instrument properly.

f) Catch or Ratchet: The blades remain closed till the catch is released. It makes the instrument self-holding for the tissue held between the blades. Ratchet is meant for the tight holding of the tissue without slipping. Depending upon purpose of holding the tissue the surgical instrument can be locked at its first, second, third or fourth catch. In some instruments it may not be present (e.g. cheatle's forcep, scissors, sinus forcep, etc) where free movement of the instrument is required.



Technique of holding a surgical instrument having finger bows:

- ✓ Place thumb in one of the finger bows and ring finger into another one
- ✓ Put middle finger on catch while index finger has to be rested over the length of the shaft
- ✓ Tip of the instrument directed downwards while working with most of the instruments.

Wrong Method

Right Method

CHAPTER 2

FORCEPS

ARTERY FORCEP (Spencer Well's Haemostatic Forceps)

Types:

1. Straight artery forcep
2. Curved artery forcep
3. Mosquito forcep

Parts:

1. Tip: are conical
2. Blades: straight or curved, usually half the length of shaft, provided with transverse serrations
3. Joint : box type
4. Shaft: double the length of blades
5. Finger bows
6. Ratchet: tightly closes the blades.

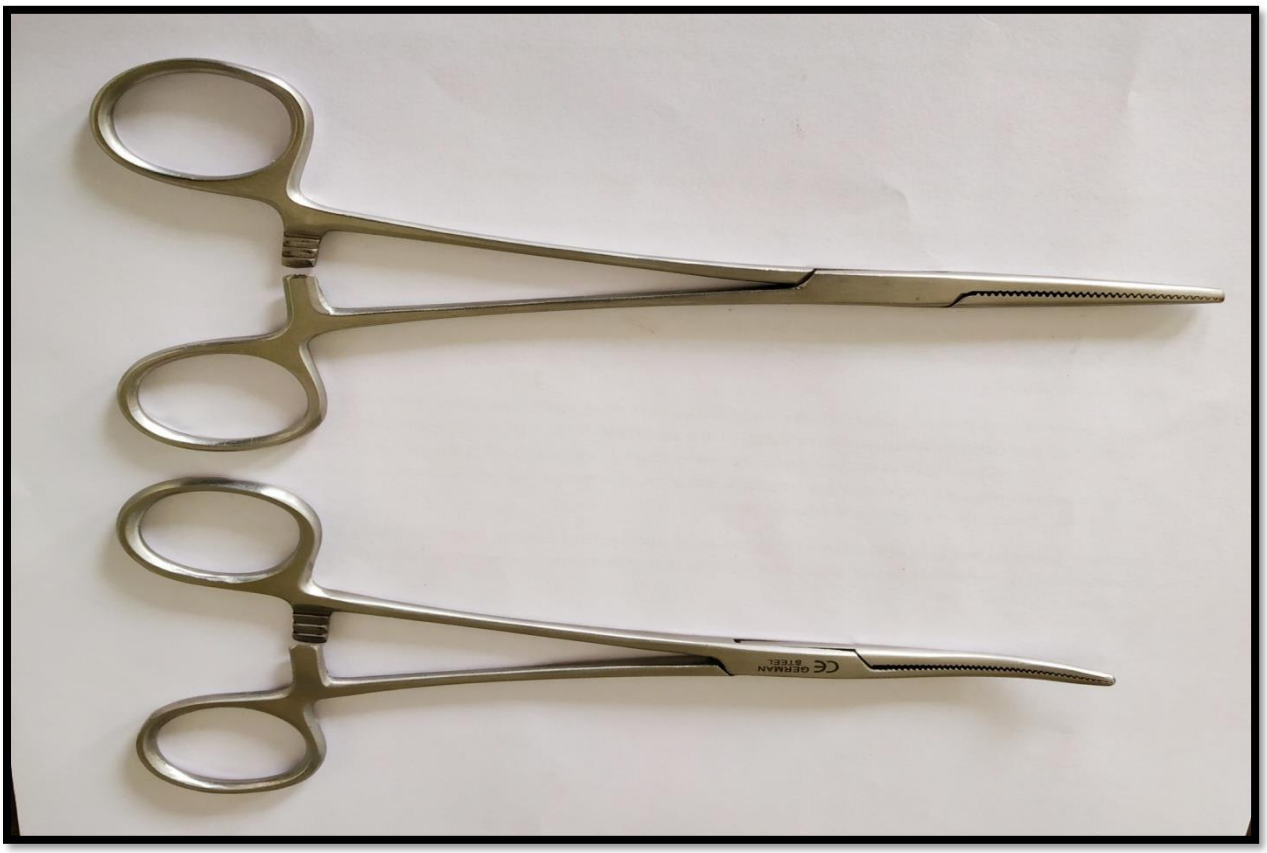
USES:

1) Artery forceps are primarily used for grasping blood vessels and allow ligation of those vessels to stop the bleeding.

2) They vary in size for use on fine, delicate vessels to large vascular pedicles.

3) Artery forceps can also be used to grasp tissues, sutures and other prosthetic materials.

4) Also used during Appendicectomy to crush the base of appendix before it is removed.
5) For blunt dissection
6) Used while dressing a wound
7) Mosquito forcep is used to hold the small, fine bleeding vessels and also used during circumcision and hair lip and soft palate surgeries.
8) Care must be taken as they are crushing forceps that can damage delicate vessels.



CHEATLE'S FORCEP

Parts:

1. **Tip: Beak shaped**
2. **Blades: curved and dipping, provided with large serrations for better grip**
3. **Joint: Box type of joint**
4. **Shaft: long and straight**
5. **Finger bows without catch**

USES:

1) **Cheatle's Forceps are used to pick sterilized instruments from boilers and formalin cabinets.**
2) **They are used to make sure that as each item is picked, others are not infected.**
3) **They must be always kept in antiseptic solution in a bottle to maintain disinfection and keeping it ready for use.**

Both forceps and container would be sterilized in boiling water at the start of each operating session.

ALLIE'S FORCEP

Parts:

1. Tip: tips are slightly curved/angulated, provided with alternate fine, sharp teeth and grooves, which interlock within each other when the ratchet is closed.
2. Blades: long, slightly curved and having gap between whole of its length to make the place for accommodation of the tissue held at the tip**.**
3. Joint: box type of joint
4. Shaft: long and straight

5. Finger bows
6. Catch: tightly closes the blade

Uses:

1. This forcep is provided with sharp teeth or plane, used to grasp heavy tissue. It is also used to hold fascia and soft tissues such as breast or bowel tissue.
2. They are used to hold aponeurosis in order to approximate them while suturing
3. It is used to pick peritoneum during laparoscopy.
4. **It is** used to forcibly grasp or retract tough or dead structures.
5. Allis forceps can cause damage, so they are mainly used in tissue about to be removed

Sterilization is done with Autoclaving

BABCOCK FORCEP

Parts:

Tip: Provided with ridge- transversely serrated on one blade and groove on other

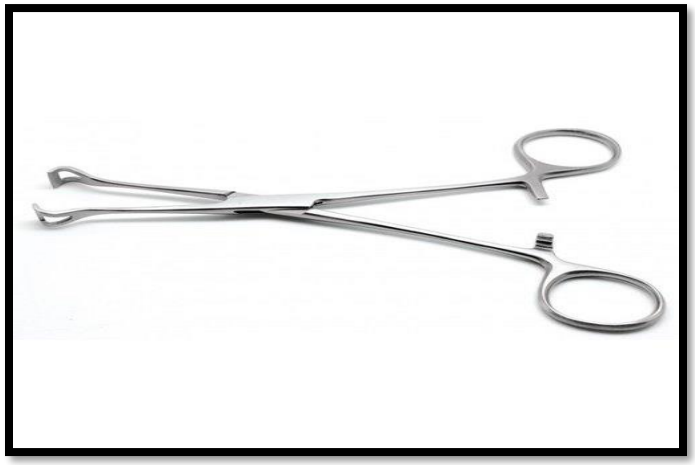
Blades: curved and fenestrated to hold delicate structures

Joint: Box type

Shaft: long and straight

Finger ring: provided with ratchet

Ratchet: for lock



Uses:

1) There are numerous surgical procedures where Babcock's forcep is used to hold the tube like structures.
2) It is most commonly used during appendicectomy (removal of appendix) to hold either appendix or caecum.
3) Moreover it is used to hold small bowel during exploratory laparotomy and sometimes during resection anastomosis.

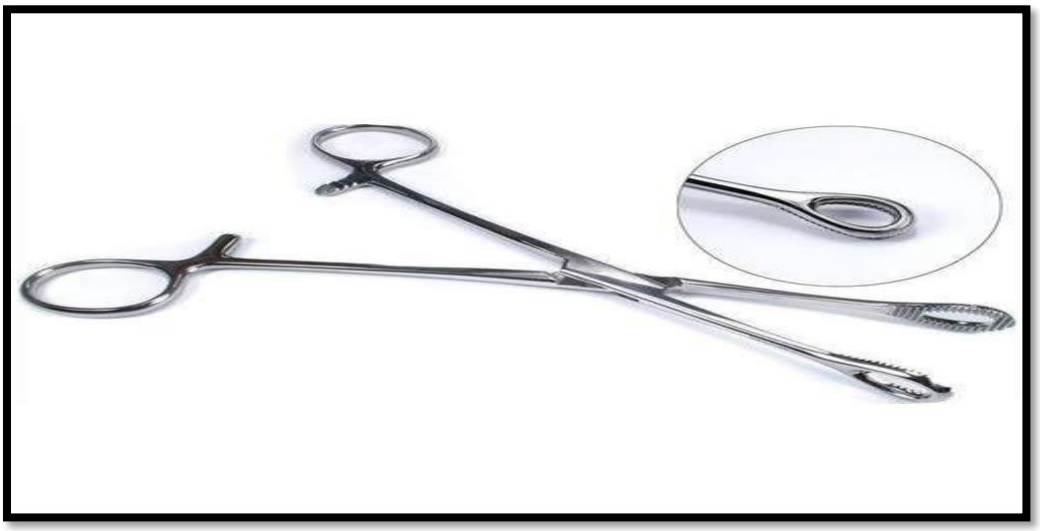
Sterilization by: Autoclaving

SPONGE HOLDING FORCEP

Sponge holding forceps or Rampley's swab holding forcep is instrument which is 9 and ½ inches long used by doctors to hold on to sponges and/or swabs while conducting their medical procedure. They are usually made in the shape of a scissor.

Parts:

a) Tip: Tips are oval, fenestrated and having transverse serrations on its inner surface
b) Blades: It has a pair of blades which may be curved or straight
c) Joint: Box type
d) Shaft: It is provided with long shafts to enable the surgeon to clean the operative area without touching the unsterilized area.
e) Finger Bows
f) Ratchet



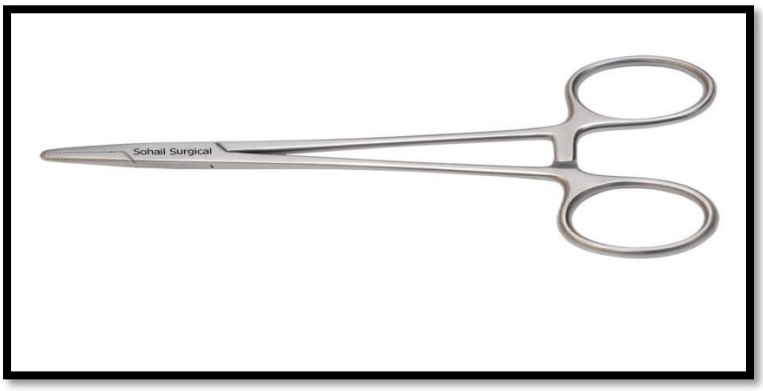
Uses:

1) **With the help of sponge holding forceps, surgeons are able to perform preoperative scrubbing of the operative and nearby skin.**
2) **Sponge holding forceps are used for holding tongue during oral surgeries**
3) **To hold cervix of uterus during per vaginal examination.**

NEEDLE HOLDING FORCEPS

Parts:

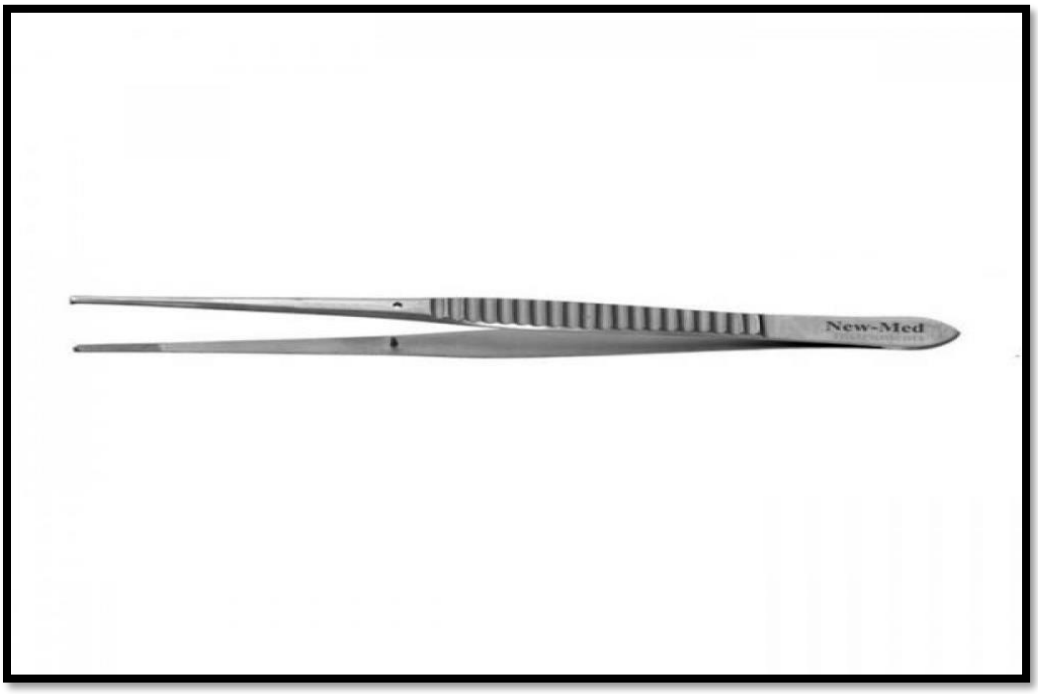
1. **Tip: blunt**
2. **Blades: are too short as compared to the shaft and they are always straight, they have criss-cross serrations for better grip on needle.**
3. **Joint: box type, length of joint is equal to the length of blades**
4. **Shaft: may be straight or curved**
5. **Finger bows**
6. **Ratchet: for self locking mechanism**



Uses:

1. **For holding different types of needles and sutures during surgery**
2. **For superficial suturing short and straight needle holder is used**
3. **For suturing in depth like abdominal cavity and pelvis long and curved needle holders are used.**

Dissecting forceps



HOW TO USE:

- The dissecting forceps are used to dissect tissue while surgery is being performed. The instrument has a spring which is found at the back of the instrument and jaws are in the front. These forceps are generally used by surgeons to further have a grip while they grab a hold of needles, tissue and while performing sutures and since surgeons deal with tissue, sutures and

needles when delivering a baby, dissecting forceps comprise an important aspect of gynecological instruments. Since surgeons need a clear vision when delivering a baby, dissecting forceps can come in handy as they are useful in keeping tissue out of the way while surgeries are performed.

CHAPTER 3:

CUTTING INSTRUMENTS

SCISSORS

Surgical scissors are instruments generally used for cutting.

Types:

- Mayo scissors
- Stitch cutting Scissor
- Bandage scissor
- Dissecting scissor
- Iris scissor
- Operating scissor
- Tenotomy scissor
- Metzenbaum scissor

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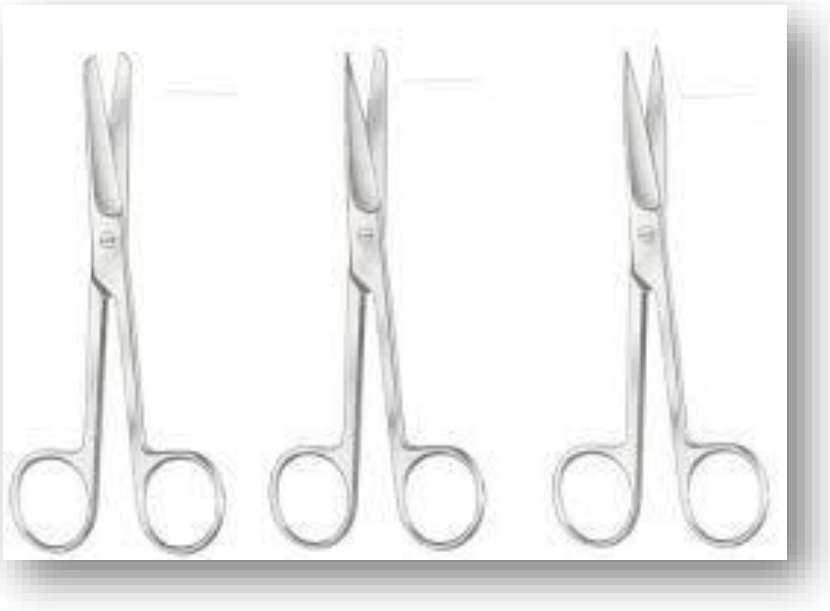
Surgical scissors are generally made tough of very hard stainless steel. Some scissors are provided with tungsten carbide reinforcements along their cutting edges.

These Scissors are made up of hard material which allows creating sharper edges; this allows for easier and smoother cuts and keeps the scissors sharp for longer time without wear and tear.

Scissors are available in three configurations

- Blunt/blunt blade
- Blunt/sharp blade

- Sharp/sharp blade



- A typical Surgical Scissor has a pair of blades, pivot type of joint shaft, and finger bows.
- Length of the scissor is variable as per the purpose of its use
- Blades of the scissors are either straight or curved.
- Bevel varies according to the structure which has to be cut
- Joint is pivot type for free and smooth movement while cutting the tissue
- Autoclaving and boiling damages the sharpness of instrument that's why they are sterilized by dipping into concentrated Lysol for more than 1 hour.

MAYO’S SCISSOR

- It is available in different sizes
- The blades are always flat but they may be either straight or curved
- Tips may be kept Blunt, sharp or pointed according to use
- It is of two types Straight and curved

Heath’s Stitch Cutting Scissor: Used to cut the skin suture after healing of the wound.

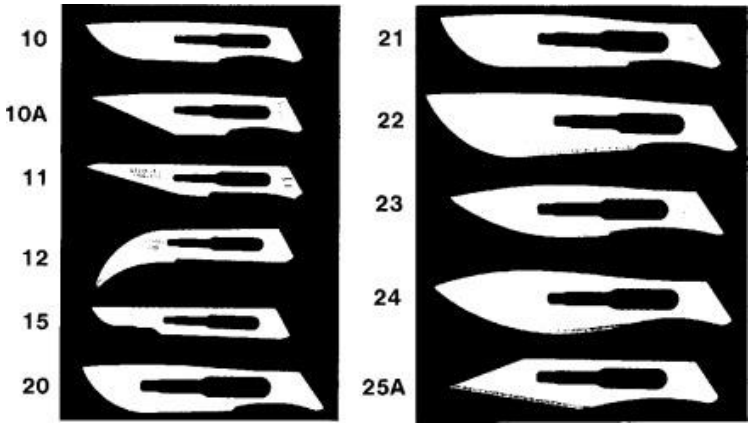
BARD PARKER'S HANDLE (Scalpel)

- These are Flat stainless steel surgical instruments
- It's One end is narrower which has a slot for attaching the scalpel blade
- The shaft is grooved or having serrations on whole of its length for better gripping of the handle, so that it can be used without slipping.
- Number of the handle which may be of 3,4 and 5 is written on its shaft, and blades are interchangeable with standard handles, which fits in their slots, according to the size of blades. They are Sterilized by autoclaving

SURGICAL BLADES

- Surgical Blades are detachable and disposable
- Surgical blades have straight back and cutting edge
- The function of the blade is decided by the shape of the cutting edge.
- Blades of different size and shapes are available from no.10 to 24
- Bard parker's (BP) handle number 3 and 5 accommodate blades No. 10, 11, 12 and 15.

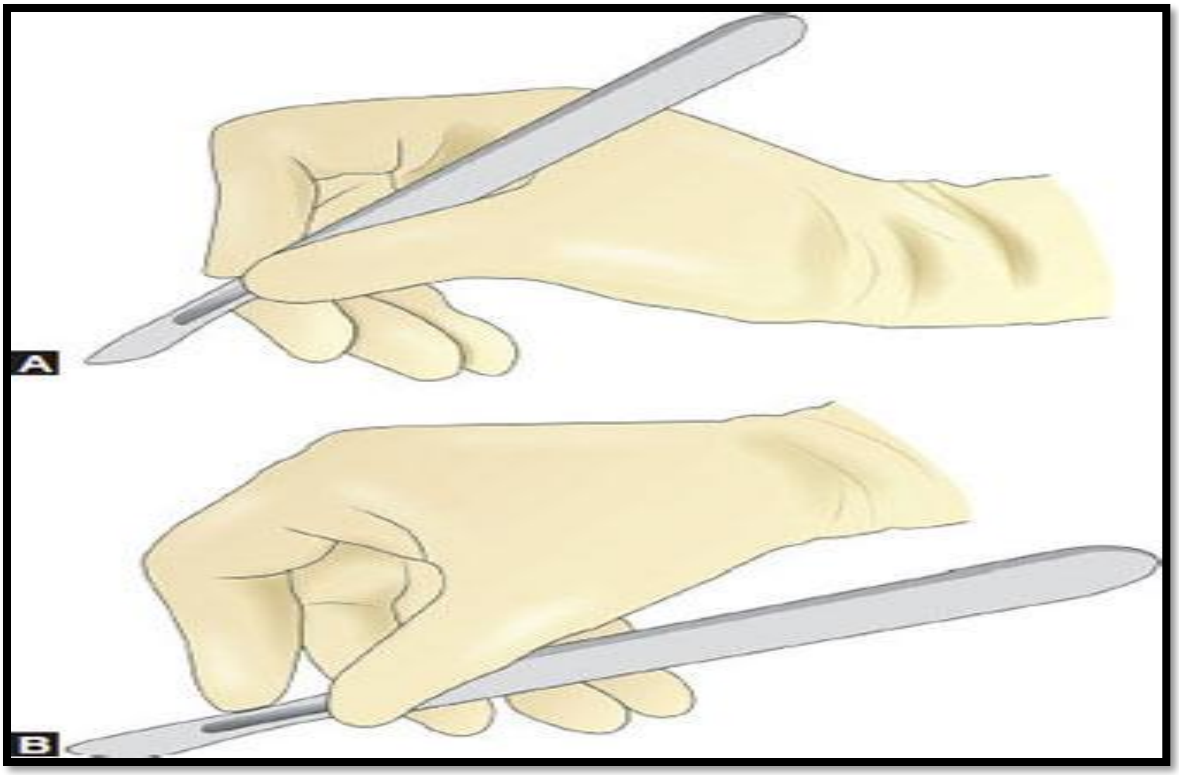
- Blades no.1,19,20,21,22,23 and 24 fits in the bard parker's handle no.4
- Surgical Blades are Supplied in pre sterilized packs



Methods of Holding the Bard Parker's Handle after Attaching Surgical Blade to It-

It depends upon the procedure for which the scalpel is used:

- Pencil Grip: Better control over the surgical blade is exercised in the position
- Dinner knife grip: Making an incision to avoid tailing at the end of the incision



Uses of Brad Parker's Handles and surgical Blades (Scalpel)

- To give the skin incision to start any operative procedure
- Surgical blades which have wide shaft are No 20,21,22,23 and 24.They are used to make larger incisions for mastectomy, laprotomy, etc.
- Scalpel is also used for sharp dissection procedures to raise the skin flaps during incisional hernia repair, radical neck dissection, etc.
- Because of the narrower shaft blade no. 15 are used to make smaller skin incision as well as dissection for excision of sebaceous cyst, lipoma, lymph node during venesection to cut the vain etc.
- Surgical blade No. 11 is also known as "stab Knife" as it has oblique edge with sharp pointed tip. This blade is commonly used to incise the skin, subcutaneous tissue, deep fascia to open the abscess cavity in a single stroke, during incision and drainage of an abscess. Blade no. 11 can also be used to

incise the skin subcutaneous tissues and the muscles while inserting drains like abdominal and intercostal drains.

CHAPTER 4:

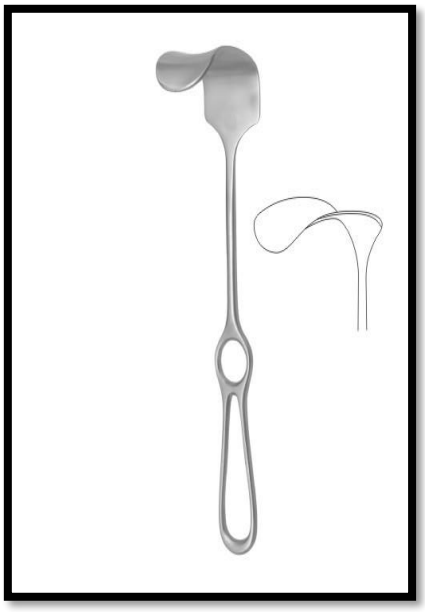
RETRACTORS

The word retractor generally describes a handheld tool containing a blade which is either hooked, curved or angled and fitted with a comfortable steel handle, that when in place maintains the desired position of a given region of tissue.

A retractor is a surgical instrument used to hold back
underlying organs and tissues so that body parts under the incision may be accessed. It is also used to separate the edges of a surgical incision or wound.

These simple retractors are designed to be generally handheld, clamped in place, or suspended at the end of a robotic arm.

Retractors are self-retaining surgical tools



CHAPTOR 5:

SUTURING MATERIALS AND NEEDLES

Surgical sutures are used for **closure of cut and lacerated wounds**. The ideal suture material should allow the **tissue** to heal sufficiently **to keep the wound closed** together once they are **removed or absorbed**.

Regardless of suture composition, the body will react to any suture as a foreign body and produces a foreign body reaction to varying degrees.

Classification of Suture Materials

Broadly, sutures can be classified into

1. **Absorbable** materials
2. **Non-absorbable** materials.

They can be again sub-classified into

1. **Synthetic or natural** sutures
2. **Monofilament or multifilament** sutures.

Qualities of The ideal suture

- ✓ They should be smallest possible to produce uniform tensile strength
- ✓ They should securely hold the wound for the required time for healing
- ✓ It should be absorbed.
- ✓ It should be predictable
- ✓ It should be easy to handle,
- ✓ It should Produce minimal reaction,
- ✓ The knot which is tied, should be non slippery and secure.

Suture Size

The smallest size possible should be chosen, when choosing suture size, taking into account the natural strength of the tissue.

The diameter of the suture affects its handling properties and tensile strength.

The larger the size ascribed to the suture, the smaller the diameter is, e.g. 5-0 suture is smaller than a 2-0 suture.

Surgical Needles

The surgical needle provides placement of the suture within the tissue, carrying the material through with minimal residual trauma.

The ideal surgical needle must be:

a) Rigid enough to resist distortion

b) Flexible enough to bend before it breaks

c) It should be as slim as possible to minimize trauma

d) It should be sharp enough to penetrate tissue with minimal resistance

e) It must be stable within a needle holder to permit accurate placement.

1. Commonly, surgical needles are made from stainless steel.

2. The swaged end: connects the needle to the suture

3. The needle body or shaft: is the region grasped by the needle holder. Needle bodies can be round, cutting, or reverse cutting

Round bodied needles are used in delicate tissues such as liver and kidney

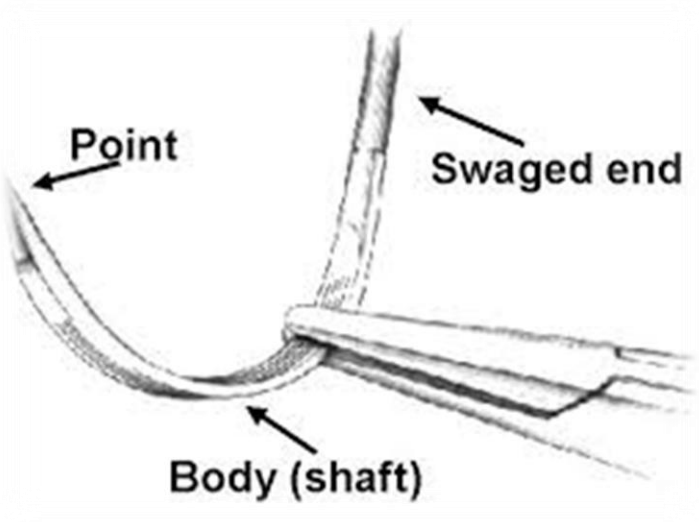
Cutting needles have 3 cutting edges to penetrate tough tissue such as the skin and sternum and are triangular in shape and have a cutting surface on the concave edge

The needle point: acts to pierce the tissue, beginning at the maximal point of the body and running to the end of the needle it can be either sharp or blunt:

Blunt needles are used for closure of abdominal wall, and in delicate tissue, and can potentially reduce the risk of blood borne virus infection from needle stick injuries.

Sharp needles: Pierce and spread tissues with minimal cutting, and are used in areas where leakage must be prevented.

The needle shape varies in their curvature.



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