Scrubbing

1. Hand scrubbing before gowning and gloving
2. To be done after putting on the scrubbing suits, OT slippers, face mask and cap
3. Area to be scrubbed: Both hands and forearm all around from finger tips to elbows.
4. Scrubbing solution (Povidon iodine, chlorhexidine) is to be rubbed in a systematic manner to include hidden areas.
5. Sufficient scrubbing is needed to have froth to form in all areas. Hand brush is to be used to take care of the nail tips and webs of figures.
6. Water should run from finger tips to elbow.
7. Recommended time of scrubbing: **3-5 minutes**
8. Hand towel is to be used from distal to proximal for moping up the water.
9. Spirit hand rub may be done to have a dry hand
10. Scrubbed hands must mot be considered sterile.

Gowning

1. Scrub nurse helps gowning by holding from outside as the surgeon put the hands through the sleeves touching the inner surface only.
2. Alternatively, surgeon can take the gown, unfold it and put the hands in the sleeve from inner side.
3. Scrub nurse does the rest of the gowning by covering the back. Gowns vary in back covering system keeping the back sterile and open back system keeping the back un-sterile.
4. Only fingers should come out of the sleeves to hold the gloves.
5. Sleeve end may be elastic (recommended) or may have string to tie. Sleeve end should not be touched but if string is tied by hand that part must be covered by the gloves.

Gloving

1. Gloving may be assisted by assistant as he holds the glove stretched open and surgeon put his hand into it. Surgeons never have to touch the gloves from outside by bare hand. (Recommended)

2. Alternatively, self gloving by non-touch method can be done. Care must be taken not to touch the outer surface of the glove by bare hand.

Require surgical instruments for BP blade attach with BP handle

1. Bard-Parker handle and blade
2. Dissecting forceps
3. Haemostasis

Bard-Parker handle and blade

1. Assistant would open the foil container of blade to expose the blunt end of the blade
2. You would draw the blade out holding it by a haemostat and than hold it in the middle by using a plain dissecting forceps in left hand
3. You would hold a BP handle of appropriate size in his left hand and align the blade in its groove. (*10, 11 & 15 BP blade for 3 size BP handle, 20,21&24 Bp blade for 4 size BP handle*)
4. Sliding the blade by the haemostat would make a click to fit it into the handle.
5. To remove the blade, surgeon would hold the blunt end (articulating edge) with a haemostat and disengage it from the groove holding the handle in left hand.
6. Sliding of the blade distally would make the blade detached.
7. Blade should be disposed into a '*sharps box*' in instrument table.
8. BP handle with a blade attached should be kept in a kidney dish.
9. Never ever this procedure be done or tried by hand.

Dissecting forceps

1. Dissecting forceps of toothed and non-toothed variety of different sizes are used to hold tough and delicate tissues respectively in the process of dissection
2. Dissecting forceps are held between the pulp of the thumb and radial border of the middle finger with a comfortable distance from the open end. Closure to the end gives stronger hold.

3. Joined ends of the forceps rest against the web between left thumb and index and index finger pulp supports the entire assembly during use.
4. Dissecting forceps are held also by right hand during haemostasis
5. Plain dissecting forceps for gut, vessel, tendon repair, tooth dissecting forceps for skin stitch

Dissecting scissors

1. Dissecting scissors are available in straight and curved variety and distinct from other scissors having shorter working limbs.
2. Scissors are held by inserting the thumb and ring fingers into the rings of the scissor handles making sure that only the distal phalanges are within the rings to avoid clumsiness. Index finger is used to steady the scissors placing the pulp on the fulcrum (joint).
3. Curve of the scissors are used to have the advantage of the curves to suit the situations with a comfortable position of hand between supination and pronation.
4. Greater precision of cut can be ensured by using the tips of the scissors.

Haemostasis

1. Haemostats are held as that of dissecting scissors engaging the catches to apply appropriate force in holding tissues.
2. Releasing by right hand would be demonstrated
3. Releasing by left hand would be demonstrated

Needle holders

1. Needle holders have specially designed jaws and ratchet lock.
2. It is held in a manner similar to the scissors.
3. Hold the needle in the tip of its jaw, at around 2/3rd of the way along the circumference from its tip.

Suture materials

1. Delivery from pack should be done by holding it by needle holder or plain dissecting forceps.
2. Changing the direction of the needle in needle holder should be done by the help of dissecting forceps in left hand, never by the hand.
3. Disposal of the used needle should be done in 'sharps' container or anchored with a needle holder in a kidney dish.

Knot tying techniques

1. A secured knot that is unlikely to be loosened or slipped off is essential part of surgical skills. An ideal knot in surgery should have the following properties.
2. Throws should be tied with adequate and uniform tension at *180 degree pull with the end of the trends thrown with each other*.
3. At least three opposing throws should complete a knot. Excess throws do not secure a knot.
4. It should be a square (Reef) knot, not a granny knot or sleep knot.
5. It should not be too tight or too loose.
6. End of the strands should be *cut with adequate length (1 cm).*

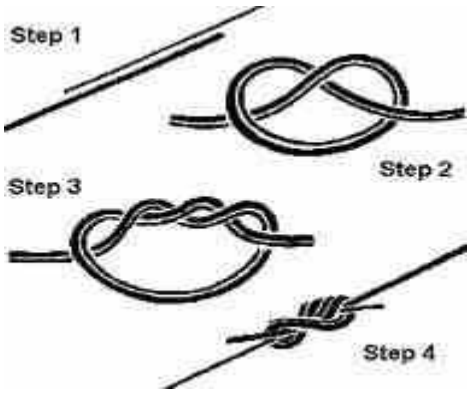
Varieties of knot tying techniques

1. One handed reef knot
2. Instrument tie
3. Surgeons knot
4. Slip knot preceding a reef knot
5. Tying knot in depth

Observe the knot tying techniques during demonstration.

Practicing of knot tying should continue until the techniques are performed correctly.

The Square Knot



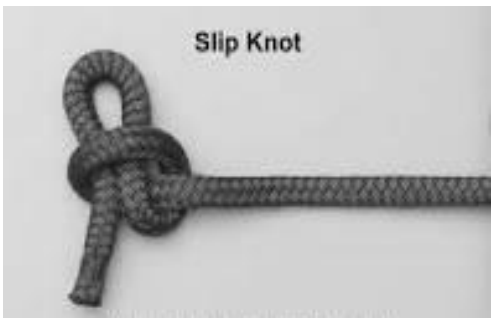


Fig: Varieties of knot tying techniques

Incision & suture techniques

Instruction:

- You would make incision on the simulated skin of the stitching board and practice stitching during its closing.

Basic principles of incision:

- Incision is made by holding the BP knife between thumb and middle and ring fingers. *The index finger should be on the top of the BP blade to stabilize it*. For fine works knife can be held like a pen.
- Incision should be *started by keeping thee knife at 45 degree angle* to the horizontal plane. Blade should follow a pre-drawn line without deviation and tentative cuts. Skin should be stabilizes by thumb and index finger of left hand or by left hand of surgeon and assistant's hands. When the knife comes to *the end it should be held gradually to 90 degree angle* with horizontal line to avoid tailing of the incision.
- After completing the incision the knife should be kept in a kidney dish.

Basic principles of suture techniques:

- There should not be excessive tension at the site of approximation.
- The needle should *enter at right angle to the tissue* to avoid shearing the tissue structures.
- The *distance of the suture entry and exit from the wound edge should be roughly equal in length to the depth of the wound and the distance between the sutures, two times that size*.
- All sutures should be at equal depth, equal distance from each other and the wound edge and at the same tension.

You will be demonstrated and expected to perform following types of suture.

- Simple interrupted sutures
- Interrupted vertical mattress sutures
- Interrupted horizontal mattress sutures
- Continuous sutures
- Subcuticular sutures

You need following instruments:

- Bard-Parker handle and blade

- Dissecting forceps
- Rough Scissors
- Haemostats
- Needle holder
- Suture materials and needles

On your work table is laid a simulated skin pad, suture material, forceps with teeth, needle holder and skin knife.

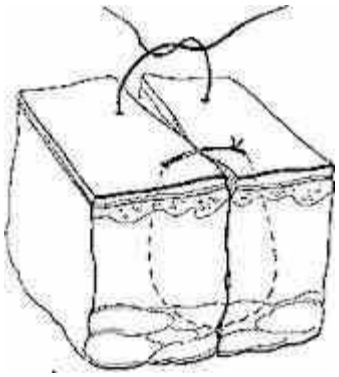


Fig: Simple interrupted sutures

Simple interrupted sutures

Instruction:

Make an incision in the skin pad & use the suture material and place interrupted sutures and cut this suture.

1. Take care to follow the basic principles as mentioned earlier while passing the needle and tying knots
2. Ensure to place the knot on one side of the wound
3. If the wound edges have a spring, place a surgical throw initially, and twist the threads in order that they are 90 degrees to their original tie. This will hold the throw in place, until the next throw is bedded down. Alternatively, an assistant may step on the throw until the next one falls.

Fig: Interrupted vertical mattress sutures

Interrupted vertical mattress sutures

1. These are useful to *achieve eversion*
2. Using a *half circle needle*
3. Place the first bites on either edges of the wound as for the simple suture. Now, reverse the direction of the needle, taking care not to use your fingers, and return the suture to where you began your stitch from, but now, taking only a few millimeters of the skin edges.
4. Tie the knot on the side of the wound that you began your stitch from
5. All the entry points through the skin should lie in the same transverse plane (four in all)

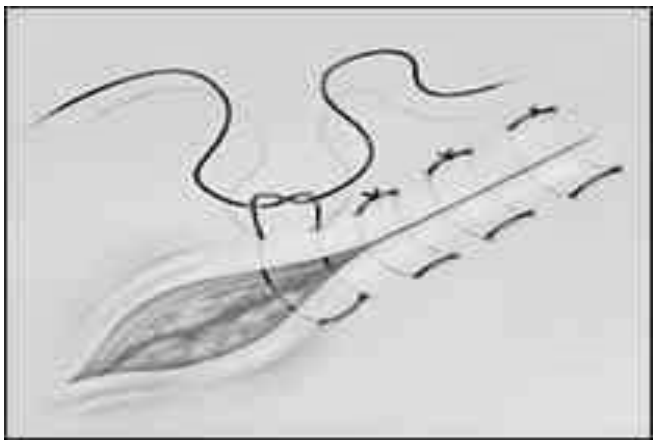


Fig: Horizontal mattress sutures

Horizontal mattress sutures

1. These are used to achieve inversions, and are useful in the bowel anastomosis
2. Take the first bites through the wound edges as for simple sutures
3. Reverse the direction of the needle, and reenter the wound edge, the same distance away from it, but few milimeters distal to your exit. Include the same thickness of wound in your bite, and exit the original wound edge at a corresponding site
4. Wound entry points, will be two on either side, the same distance away from the wound edge and including all the wound layers

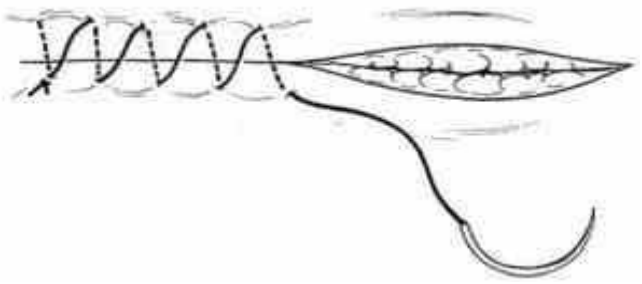


Fig: Continuous sutures

Continuous sutures

1. Place a simple suture and cut only the short end of the thread
2. Continue to place sutures, as for simple ones, along the length of the wound and keep the tension on the suture material on completing each bite
3. Though the sutures on the outside fall at an angle to the wound, those crossing the undersurface of the wound would remain at right angles to it, thereby not compromising with wound vascularity
4. Secure the end of the suture material with a reef knot. A preferable technique is the Aberdeen knot, which will be demonstrated.

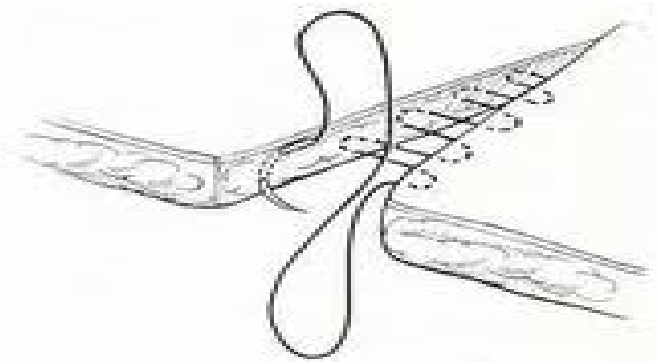


Fig: Subcuticular sutures

Subcuticular sutures

This technique can be used with absorbable and non-absorbable suture material. Use a cutting needle for this exercise.

1. Begin the suture a few millimeter away from the apex of the wound
2. Once inside of the wound, take successive bites of the subcuticular area, one on each side and pull the suture material through to approximate the edge of the wound
3. Each successive bite on wound edge has to begin at a level where previous bite exited.
4. All bites should be at equal depth
5. Suture exits the wound at the opposite apex, and the ends left long to be secured over a dressing
6. Only mono-filament material should be used, as it slides out easily during suture removal
7. Absorbable suture material like monocryl/vicryl will not need removal if the ends are buried by reentering the suture through the exit point of the needle before coming out through another point.

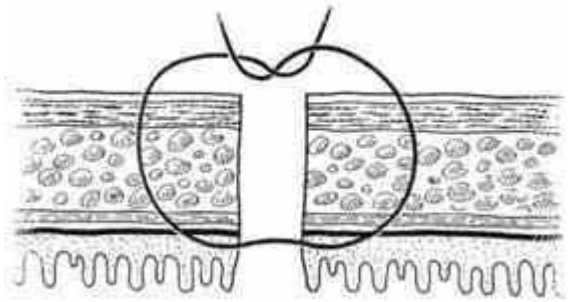


Fig: Bowel Anastomosis

Bowel Anastomosis

Bowel anastomosis should be done in one layer with interrupted sutures. An ideal anastomosis should achieve the following:

1. Adequate blood supply to anastomotic area with Perfect hemostasis
2. Water tight leak proof closure by apposition of serosa with inversion of the margins
3. No mucosal protrusion
4. Stoma of adequate size
5. No tension on the suture line
6. Isoperistaltic

Instrument require:

1. Bard-Parker handle and blade
2. Plain dissecting forceps
3. Rough scissors
4. At least two haemostats
5. Needle holder
6. 3/0 vicryl round body needle suture materials
7. Crush & occlusive intestinal clamps

NB:

Hands-on training, bowel anastomosis
Rule of 5
5mm apart from edge
5mm distance suture

The bowel resection involves the following steps:

1. Mesenteric division from bowel margin to its root: Layers of mesentery divided by scissors, vessels isolated and safeguarded.
2. Application of the bowel clamps on either sides to occlude lumen.
3. Division of the bowel at selected site between clamps, the crushing one on the resected side having the cut with knife flush on it.
4. Clearing the circumference of the bowel, not more than two to three millimeter of the mesentery in order to get good sero-muscular inversions ensuring that the blood supply to the bowel ends is not jeopardized

The technique demonstrated is a one layer technique of bowel anastomosis. Use three-zero absorbable suture material on a curved round body needle.

1. Place stay sutures on the mesenteric and ante-mesenteric border, taking care to include all the layers of the bowel. Do not tie the stay sutures.
2. Begin an interrupted closure of the anterior surface of the bowel, *beginning from the mesenteric border* of the bowel, towards the ante-mesenteric site. This is sero-muscular in thickness.
3. The distance of the suture away from the bowel edge should roughly correspond to the bowel thickness and the distance between the sutures, twice that distance.
4. Once the anterior bowel suture is complete, reverse the bowel by passing one of the stay sutures (the mesentery) towards the surgeon and the other (ante-mesenteric) away from the surgeon. This now presents the posterior anastomotic surface, which can be closed by the same technique.
5. On completion of the anastomosis, tie all the stay sutures and return the bowel to its original configuration.
6. Close the mesenteric defect carefully taking care not to include any vessels in the suture.

NB: In case of wedge section same as above procedure. Only 1 stay is need at anti mesenteric border.

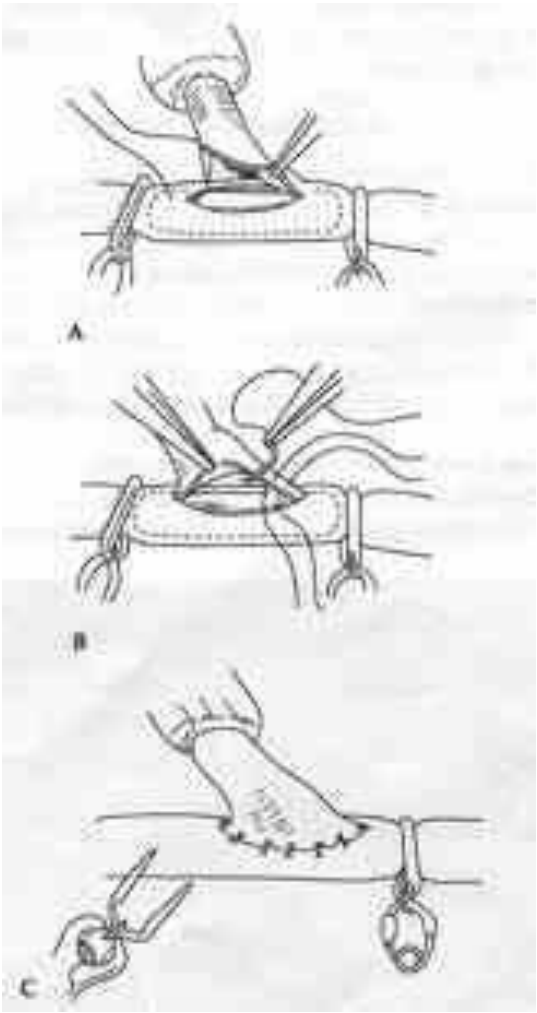


Fig: Vascular repair

Vascular repair

Instrument required:

- Bard-Parker handle and blade
- Plain dissecting forceps
- Rough scissors
- At least two haemostats
- Needle holder
- 3/0 vicryl round body needle Suture materials

- Buldock two clamps

NB:

Rule of 2
2mm apart
2mm distance
Needle pass away from heart
Continous nonabsorable suture

Principle of vascular intervention

1. Proximal and distal control to reduce the blood loss and to allow better visualization of the blood vessels. This control is achieved by slinging the vessels with siliconized rubber tapes or nylon tapes or size 5 infant filling tubes.
2. Preservation of the collaterals
3. Anticoagulation:
    a. Whenever vessel is clamped, stagnation of the blood predisposes to clot formation.
    b. Anticoagulation can be done systematically by IV heparin with a dose of 100 IU/kg body weight two minutes prior to clamping.
    c. Local anticoagulation can be undertaken by using heparin 5000 unit in 500ml of saline (heparinized saline) which is used to flush or prime the clamped ends of the artery.
4. Clamping of vessels:
    a. Vascular clamps allow the vessels lumen to be occluded without crushing the wall.
    b. The clamp selected depends on the amount of clamping pressure desired and its shape should allow it to occlude the vessel without coming in the way of operating field.
5. Arteriotomy:
    a. Arteriotomy is the incisions used to open the vessel longitudinally or transversely.
    b. The length being one third or half of the circumference of the vessels.
    c. Closure of arteriotomy: Arteriotomy can be closed primarily or with a patch anastomosis. Primary closure is used when it is certain that there will be no compromise of arterial movement. Interrupted

sutures are used while closing arteries in children where artery continues to grow.

d. *Longitudinal arteriotomy is generally closed using a patch made from a locally available vein*.

6. Suture used is a smooth monofilament non-absorbably sutures preferably proline 6/0 for popliteal or brachial. 7/0 for tibialis, radial and ulnar arteries. Sutures used for vascular suturing is provided with a needle at both ends of the suture.
7. Instrument used are dedbaky's forceps, netzenbaun's scissors, no. 11 b.p. Blade, pott's scissor with an angle of 45 degrees, fine tip vascular needle holder, mosquito artery forceps covered with rubber catheter called "rubber shods" (to hold the free ends of the suture)
8. Principles of techniques:
    a. Vessels need to be handled gently
    b. It is always preferred that needles pass from intima to adventitia to avoid shearing of the intima and consequent dissection. If at all it becomes necessary to pass the needle from adventitia to intima, take care to do this on the proximal side.
    c. Vascular repair requires careful hand tied knots with *at least eight square throws*.
    d. Securing threads has to be done with specially prepared rubber shods.
    e. Suture techniques involve the fine water tight sutures, at even distance, with accurate tension being maintained by the assistant.
    f. Needle should enter the vessel wall at right angles and it should be passed through the wall rather than pushing it. The supination action of the wrist helps greatly.
    g. There has to be accurate intimal apposition to create a good anastomosis, if adventitia inverts it becomes extremely thrombogenic.
    h. Anastomotic failure usually occurs due to suturing both walls together accidentally, traumatic vessel handling, improper apposition of the vessel edges, and inversion of vessel edges, improper suture tension, excessive clamp pressure and kinking of the vessel.

Longitudinal arteriotomy with patch closure

1. The stab knife is used to make the first arterial incision which is extended using a pott's scissor

2. a venous patch is fashioned so that it is ellipsoid at one end, around 5-6mm wide and is longer than the length of arteriotomy.
3. Suturing is commenced at the distal end of the arteriotomy called the heel of the suture line. The patch is held about 2cm away from the arteriotomy and suturing commenced.
4. The first suture is placed outside in on the patch at a point between five and six o'clock on one side. Once the needle traverses the patch it is then placed inside out on a corresponding point in the arteriotomy. The suture is continued 2mm apart and 2mm thick for two to three sutures. The sutures are not tightened thereby allowing adequate space for visualizing both walls being sutured.
5. The other needle is then taken and suture commenced as before between and six and seven o' clock on the other side of the distal end of the patch.
6. Once two sutures are completed the sutures are moistened with heparin saline and the patch is gently parachuted down on to the arteriotomy by carefully pulling the free ends of a suture removing the slack of the suture line and sliding the patch down to meet the arteriotomy.
7. The two free ends are kept unequal (1/3rd and 2/3rd) and pulled at 180 degrees care being taken that the patch sits on the artery and does not travel inside the lumen of the artery thereby allowing good intima to intima approximation.
8. The suture line is continued around on the shorter side so that the last stitch is a little away from the other corner of the arteriotomy called “the apex” of the suture line. The longer suture is then used to complete the suture line and used to go around the apex and meet the free end left previously.
9. The vessels are unclamped and flushed to get rid of the clots formed in the stagnant blood column.
10. The suture line is completed and the two ends are hand-tied with 8 to 10 knots. The suture ends are cut 1cm long so that there is no risk of not getting undone and can be used to identify the suture line at the time of re-exploration.
11. The vessels are then un-clamped and blood flow restored.
12. A figure of eight stitch is taken on either side of redundant loop using the two ends of the short suture held with a rubber shod.
13. Inside of the patched suture line is inspected to look for quality of intima approximation.

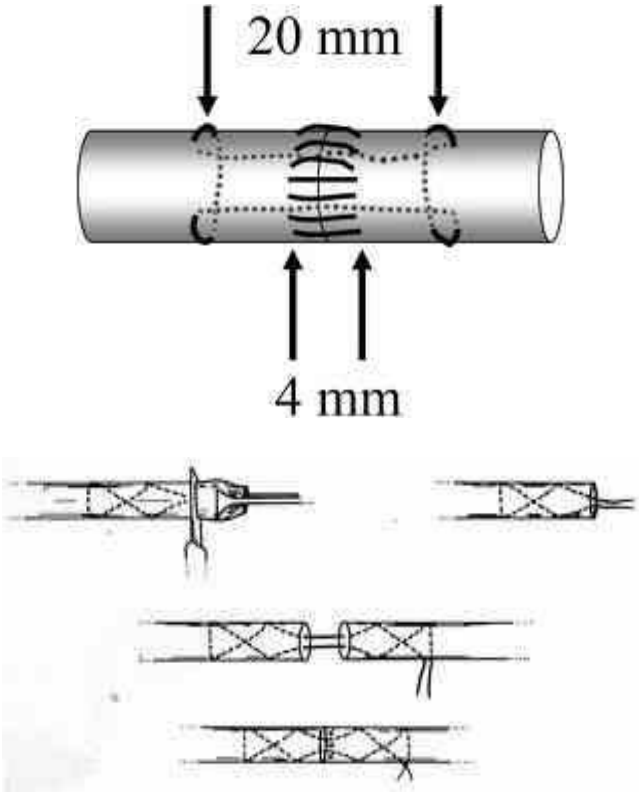


Fig: The Bunnell-Meyer tendon suture pattern.

Technique of tendon repair

Methods:

Two types of sutures are applied to achieve a secured tendon repair.

1. Core suture
2. Peripheral sutures on epitenon

Suture material used is a 4/0 proline with a 3/8th circle taper cut needle. This is used for both core and epitenon sutures.

The **instruments required** are

1. Bird parker handle no. 20 blade
2. BP Handle with no. 15 blade
3. Two no. 21 sized hypodermic needles
4. 2/0 black silk sutures on a half circle cutting needle

5. Adson forceps
6. Needle holder

This exercise is performed on a porcine trotter mounted on a hard-board

1. Make a longitudinal incision on the ventral aspect of the trotter with a no. 20 blade. a wide exposure is necessary for an adequate repair
2. Suture the wound margins to the adjacent skin on both sides of the incision at 4cm intervals to achieve adequate retraction. Use 2/0 black silk
3. The superficial palmaris tendon is usually used for this exercise.
4. The epitenon is the smooth gliding surface of the tendon. Avoid all temptation to handle this with forceps or haemostats.
5. Divide the tendon sharply in a transverse fashion using no. 15 blade. Make sure that you divide the tendon in the middle of the wound.
6. Stabilize both ends of the tendon by passing no.21 hypodermic needles into the tendon ends.
7. There should be at least 2cm of tendons available for repair on either side.
8. Application of the core suture: a modified Kessler's suture is applied using 4/0 proline on a 3/8 circle needle. Take a firm grip on the transected surface of the tendon with the Adson's forceps and insert the needle through this surface through the equator of the transected tendon around 1/3rd the distance away from the circumference.
9. The needle should pass parallel to the long axis of the tendon and exit the circumference laterally at least 1cm from the point of entry.
10. The needle then re-entered the tendon 2-3 mm away from the exit closer to the transected end. This is the horizontal pass which exits the tendon at a point diametrically opposite to this point. Take care to pass the needle carrying this transverse suture superficial to the longitudinal suture. This arrangement grasps about 25percent of the cross-sectional area of the tendon.
11. The longitudinal pass is now made on the opposite side of the tendon circumference bringing the needle out through the equator of the cross-section of the tendon, one-third the distance away from the circumference, diametrically opposite to where you entered the tendon. Ensure that this path is made deep to traverse suture line.
12. This procedure is repeated on the opposite cut end. Finally the tendon ends are brought together and the tension of the suture it adjusted to eliminate gaps.

13. Suture on the epitenon: running an epitendinous suture using 4/0 proline completes the tendon repair. Take care to start the suture from the inside of the cut end in order that the knot be buried.
14. Applying tension stress on the tendon can test the strength of the repair.

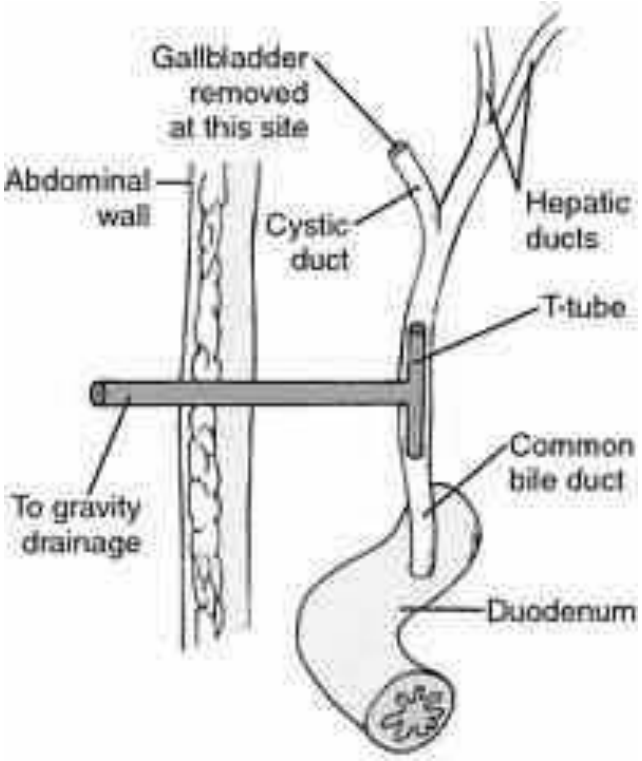


Fig: Insertion of T- tube

T- tube insertion

Instrument required:

1. Bard-Parker handle and blade (11 size)
2. Plain Dissecting forceps
3. Dyszerdain forcep
4. Rough Scissors
5. At least two Haemostats

6. Needle holder
7. 3/0 vicryl round body needle Suture materials
8. T-tube
9. Normal saline
10. 10 cc syringe

Procedure:

1. Take two stay suture
2. Hold two stay sutures by two haemostat and
3. Give a longitudinal incision
4. Stone is taken out and wash with N/S
5. Take a appropriate size T-tube check patency by 10cc syringe with N/s
6. Interrupted suture is give proximal to T-tube

Venesection

1. Wash hands & wear sterile gloves
2. Area clean with antiseptic wash drapping.
3. Anaesthesia—1% lignocaine
4. A small transverse is given
5. Subcutaneous tissue is incised
6. Vein is detected
7. Two ligatures are passed around the vein, distal one is tied.
8. A curve needle is passed through the middle of vein
9. Incised the vein wall infront of needle
10. 6/9 size sterile feeding tube is introduced through the venotomy.
11. Then the cannula is connected to an IV channel.
12. Skin incision is closed with interrupted suture.
13. Cannula is fixed by a suture to the skin.
14. Dressing is applied.

Fig: Catheterization

Catheterisation

Requirement:

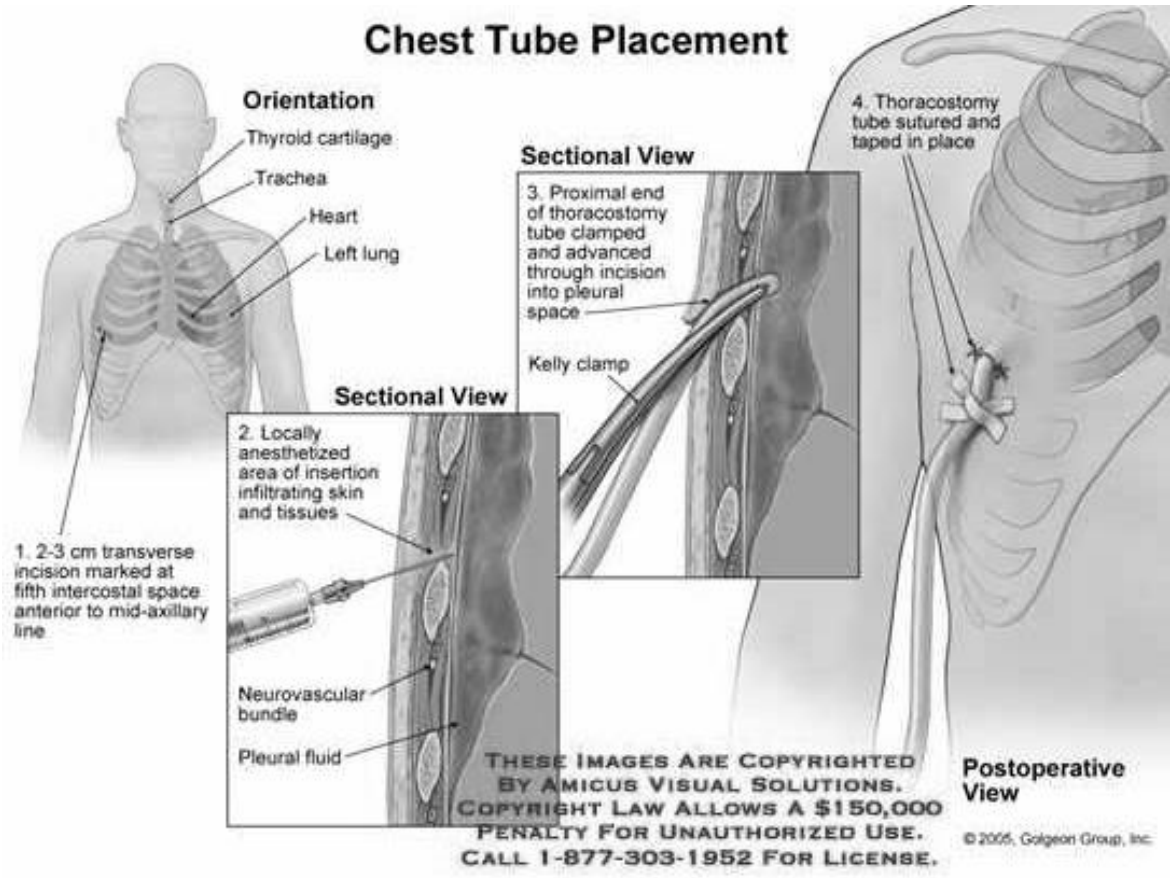
1. Sterile gloves
2. Foley's catyheter
3. 2% xylocaine jelly.
4. Povidone iodine solution
5. 10 ml syringe
6. Distilled water.
7. Urobag
8. Penile clamp
9. Gauze, drapping sheet.

Procedure :

1. Counselling.
2. Scrub & put on gloves
3. Patient position - supine & leg apart
4. Antiseptic wash
5. 2% xylocaine in the syringe and introduced through urethral meatus
6. Hold the gauze around the glans by penile clamp.

7. Wait 5 mins
8. Penis is hold vertically upwards.
9. Lubricated catheter is then push through the urethra.
10. Catheter is advanced upto side channel/ urine is come out.
11. 10-20 ml distilled water is introduced through side channel to inflate balloon.
12. Then catheter is pulled downward
13. Catheter is connected urobag
14. Catheter is fixed
15. Thanks the pt.

Chest drain



Procedure:

1. Site: triangle of safety —
    a. anteriorly- post border of pectoralis major,
    b. posteriorly- ant border of latissimus dorsi,
    c. inferiorly- superior border of 5th rib.
2. Position of pt—back rest lifted to 45 degree, hands over the head.
3. Anaesthesia- L/A
4. Incision- short transverse incision is made by no. 11 blade.
5. Dissection-
    a. Skin → sharp,
    b. Other structure → blunt
6. Clamed tube is inserted and is connected with water seal drainage
7. Pursting suture is given around the tube
8. Sterile dressing is given.

Tracheostomy

1. Position of pt: supine ,neck extended, sand bag in between shoulder blade, head supported with a ring
2. Anaesthesia: L/A
3. Incision:
    a. Elective → transverse neck crease (midway between cricoid cartilage and suprasternal notch)
    b. Emergence → vertical (lower border of thyroid cartilage to suprasternal notch
4. Skin, SC, platysma incised in same line, investing layer of deep cervical fascia incised in midline & strap muscles are retracted on either side, thyroid isthmus is divided in midline
5. 1-2cm vertical incision is made on the trachea centering 3rd & 4th ring by no. 11 knife, then knife is rotated 90 degree.
6. Tracheal dialator is inserted
7. Culf tracheostomy tube is inserted
8. Tube is fixed by strap tied around the neck
9. Haemostasis
10. Skin is closed with interrupted stitch.