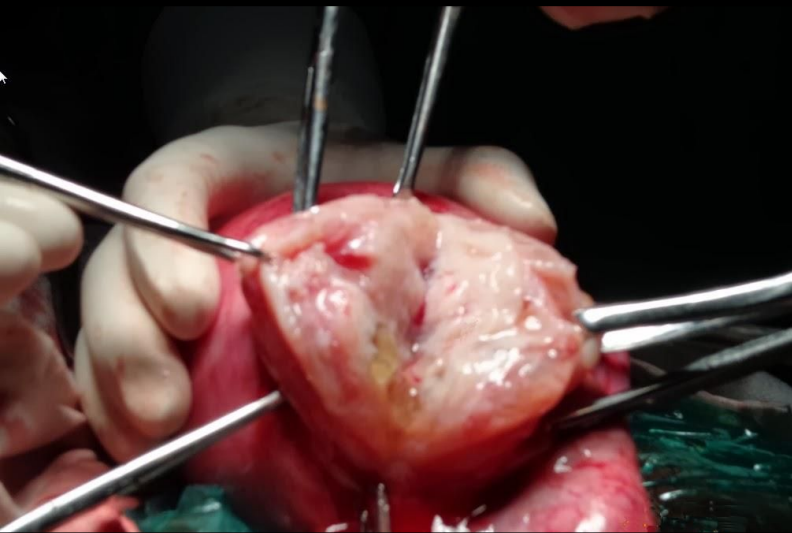


# Operation Theater Technique *Obstetrics & Gynecology*



**Shashank V. Parulekar**

# Operation Theater Technique

## *Obstetrics & Gynecology*

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## **Preface**

It gives me a great pleasure in taking out this book. The book is meant for resident doctors who are starting their training. Obstetrics & Gynecology is a subject that involves a lot of operative procedures. Just knowledge of which instruments to use and which steps to perform is not enough to perform an operation successfully. A lot depends on manual dexterity. A basic knowledge of the technique of holding different instruments correctly and passing sutures and tying knots is essential for performance of all types of operations. This aspect has not been dealt with by any book so far. I have written this book to bridge that gap in the educational resources available to students.

**Shashank V. Parulekar**

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# **Section 1**

## **Holding Surgical Instruments**

Rings are made on surgical instruments for passing fingers into them for holding. Always pass only the distal phalanx of a finger or thumb in a ring, and not more part of it, because it becomes easier and faster to remove the finger and thumb from the instrument when another instrument is to be used, or when the grip on the instrument is to be changed for use of the instrument after application. It also makes a greater length of the finger and thumb available for handling the instrument.

## **Scalpel**

To attach a blade to or remove it from a Bard Parker handle, hold the blade while clear of the sharp edge with

forceps or a hemostat, not with the fingers. If it slips while you are holding it with fingers, you can cut yourself. It is held near its slot, and lifted up to slide it onto the ridge or unlock it for removal.



Attaching a blade to or removing it from a Bard Parker handle.





Bow-string or violin-string grip on scalpel handle.

For cutting the skin during a laparotomy, hold the knife horizontal like a table knife (fiddle-bow or violin-bow grip) with your pronated hand between the thumb and middle finger.



Pen-like grip on scalpel handle.

Place your index finger on the back of the knife at the base of the blade, to control the pressure exerted on it. Wrap the ring finger around the handle to steady the grip. Rest the end of the handle against the hypothenar eminence for stability.

To make a short and precise incision, or cut a fine structure, hold the knife like a pen. Cut with the terminal part of the blade rather than its belly. Draw the cutting edge of the blade across the surface being cut rather than exerting excessive pressure which may cause an uncontrolled cut. Draw the blade towards you, which is from the cranial end to the caudal end when standing on the right side of the patient.

Use a stab knife (No. 11 blade) to make a stab, not make a cut by drawing it over the surface to be cut. It may be used to make delicate, fine cuts during vaginoplasty or excision of imperforate hymen. During a laparoscopy, cut the skin while withdrawing the blade after stabbing.

## Scissors



Method of holding scissors.

Insert only the distal phalanges of the thumb and ring finger through the rings of the scissors. Place the tip of the index finger over the hinge. Wrap the middle finger around the handle to grip and steady the scissors.



Holding scissors during dissection.

Keep the little finger flexed by the side of the ring finger. Scissors are made for right-handed persons, and do not work if held with the left hand, because the lateral pressure of the right thumb presses the blades together.

If held by the left hand the pressure of the thumb levers the blades apart. Hold your hand in mid-pronation during cutting. However it may be made supine or prone during dissection by spreading the blades open. Cut away from you, opposite to direction of cutting with a scalpel. If you have to cut in the opposite direction, reverse direction of the hand by rotating the body rather than reversing direction of the scissors.

## **Dissecting Forceps**

Hold them like a pen with the non-dominant hand, the dominant hand holding scissors or a needle holder. Do not hold tissue at the same place for prolonged period as it tends to get



Method of holding dissecting forceps.

damaged. Hold skin, subcutaneous tissue, rectus sheath, vagina and pelvic fascia with toothed forceps. Hold peritoneum, muscle, bowel, bladder,



Wrong technique of holding dissecting forceps.

and momentum, with non-toothed forceps.

An incorrect method of holding forceps reduces the mechanical advantage of the grip, and tires out the fingers.



## Hemostat



Method of holding a hemostat.

Insert only the distal phalanges of the thumb and ring finger through the rings of the forceps. Place the tip of the index finger over the hinge. Place the middle finger around the handle to

steady it. Flex the little finger fully, not holding anything. Hold the forceps with the hand in semiprone position, the curved tip of the forceps directed downwards rather than directly laterally. Locking only one ratchet will approximate only the tips of the blades. Locking it fully will approximate the entire blades. Releasing the forceps requires compressing the rings lightly to overcome the slight overhang of the ratchet, then separating the handles in a plane at right angles to the direction of movement of the blades, and then opening the handles. The forceps can also be released with the left hand, holding the ring on the left with thumb on one side and index and middle fingers on the other side. The other ring is pushed at right angles to the

direction of movement of the handles with the ring finger and then the handle is opened by the ring finger.

### **Needle Holder**



Conventional grip on a needle holder.

Hold the needle holder with the distal phalanx of the thumb in one ring and distal phalanx the ring finger in the other ring. Place the tip of the index finger on the hinge. Place the middle finger around the handle near the ring. Flex the little finger lightly. Grip the needle with the tip of the needle holder, at the junction of one-third from its tip and two-thirds from its base, its point upwards and to the left. Keep them at right angles to each other. Do not hold the needle obliquely, as it weakens the grip and the needle tends to wobble during penetration of the tissues.

The grip described above can be substituted for by a power grip while passing the needle through tissues.



Power grip on a needle holder.

In this grip the fingers are not passed into the rings, and the handle is held in the palm of the hand. It makes the maneuver easier, including rotation of the instrument for driving the needle through the tissues, and precision of movement of its tip holding the needle.

## **Sponge Holding Forceps**



Method of holding sponge holding forceps

Hold it with the distal phalanx of the thumb in one ring and distal phalanx the ring finger in the other ring. Place the tip of the index finger on the hinge. Keep the middle finger curled around the handle near the ring. Keep the little finger flexed lightly. This grip is used while holding or releasing a folded

gauze/cotton swab or tissues like cervix of a gravid uterus or cut edge of the lower uterine segment during cesarean section. Hold the handle of the instrument in the palm of the hand while painting surgical field with antiseptics or making pressure on a bleeding area to achieve hemostasis.

### **Babcock's Forceps**

Hold it with the distal phalanges of the thumb and ring finger in the rings. Place the tip of the index finger on the hinge. Keep the middle finger curled around the handle close to the ring. This grip is used while holding or releasing a tubular structure like the fallopian tube or ureter, or a delicate structure like urinary bladder or bowel.



Method of holding Babcock's forceps.

When the fallopian tube is to be held during a tubal sterilization operation, hold the instrument vertically, the distal phalanx of the thumb in one ring, the distal phalanx of the index finger in the other ring, and the other three fingers next to the index finger steadying the instrument.





Method of holding Babcock's forceps during tubal sterilization operation.

### **Allis' Forceps**

Hold it with the distal phalanx of the thumb in one ring and distal phalanx the ring finger in the other ring. Place the tip of the index finger on the



Method of holding Allis' forceps.

hinge. Keep the middle finger flexed around the handle near the ring. Keep the little finger flexed lightly. This grip is used while holding or releasing a tough structure like uterine corpus or cervix during hysterectomy, a leiomyoma during myomectomy, a cervical polyp during polypectomy and vaginal edges during a colporrhaphy or



Alternative grip on Allis' forceps.

closing the vault of the vagina after a hysterectomy.

When closing the rectus sheath after an exploratory laparotomy, hold the edges or the angles of the cut rectus sheath holding the instrument vertically, the

distal phalanx of the thumb in one ring, the distal phalanx of the index in the other ring, and the other three fingers next to the index finger steadying the instrument.

### **C-shaped Retractor**

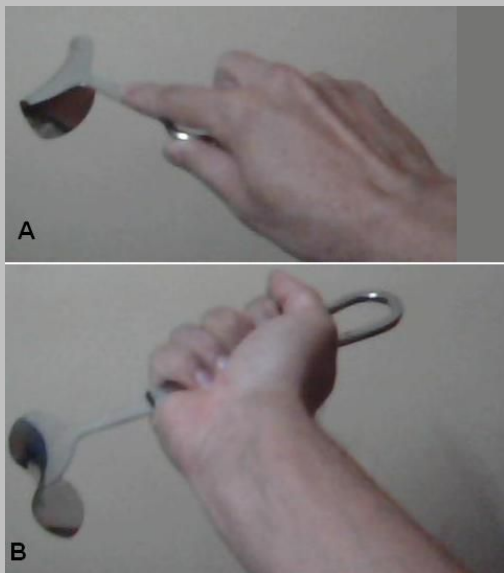
Hold the middle flat part of the instrument with the thumb on one side and the four fingers on the other side. Keep the hand in semiprone position when making moderate retraction. Keep it supine when making strong retraction, elevating the abdominal wall at the same time through an angle of about  $30^{\circ}$ , as is required sometimes.



Method of holding C-shaped retractor.

## **Doyen's Retractor**

Hold the middle part of the instrument with the thumb on one side and the four fingers on the other side. It is not necessary to put a finger in the ring that is found in the middle of the handle in some such retractors.



Method of holding Doyen's retractor. A. Conventional grip; B. Grip for strong retraction.

Keep the hand in semiprone position when making moderate retraction. Keep it supine when making strong retraction, elevating the abdominal wall at the same time through an angle of about  $30^{\circ}$ , as is required sometimes.

### **Deaver's Retractor**



Method of holding Deaver's retractor.

Hold the flat part of the instrument with the thumb on one side and the four fingers on the other side. Keep the hand in semiprone position. When greater degree of traction is required, it may be held with both the hands.

### **Landon's Retractor**

Hold the instrument with four fingers behind the handle and the distal phalanx of the thumb over the ring in the middle of the handle. Keep the hand in supine position and retract in the direction of the lateral aspect of the hand. Do not put a finger in the ring in the middle of the handle, as it reduces the efficiency of retraction, and also increases time spent when giving it to another assistant to hold.





Method of holding Landon's retractor.

## **Sims' Speculum**

During insertion into the vagina, hold the instrument horizontally so that the blade lies in the sagittal plane in front of the introitus. Hold it with the distal phalanx of the thumb over the front of



Method of holding Sims' speculum.

the middle of the handle, and four fingers behind the handle. Rotate it through  $90^{\circ}$  after insertion of the blade into the vagina. Retract the posterior



Method of holding Sims' speculum during insertion into the vagina between the labia minora.

vaginal wall in a posterior direction. Move the instrument on one side or the other a little obliquely as required, in order to expose that part of the vagina. Combine the use of this instrument

with Sims' anterior vaginal wall retractor to retract the anterior vaginal wall.

### **Sims' Anterior Vaginal Wall Retractor**

Hold the instrument with the distal phalanx of the thumb in front of the middle of the handle, and distal phalanges of the four fingers behind it. Keep the hand in semiprone position. Use it along with Sims' speculum. Retract the anterior vagina with the serrated part of the angulated end of the instrument directed forward. Hold it obliquely so that the hand does not come in the line of vision and obstruct visualization of vagina and cervix.



Method of holding Sims' anterior vaginal wall retractor.

If it is being used for a blunt curettage to complete a spontaneous second trimester abortion, use it like an endometrial curette (see pages 43-45).



Use of Sims' speculum and Sims' anterior vaginal wall retractor together.

### **Cusco's Speculum**

Hold the instrument with the blades in approximated position, with the distal phalanx of the index finger under the proximal part of the lower blade, the



Method of holding Cusco's speculum.

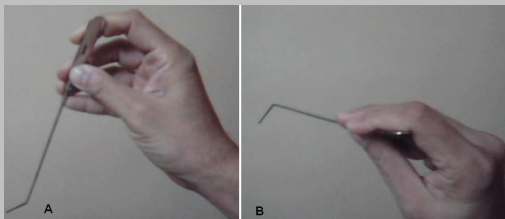
distal phalanx of the thumb in the center of the proximal end of the upper blade, and the middle and ring fingers on either side of the lever to steady it. Hold the closed blades in the sagittal plane during insertion between the labia minora, and rotate through 90°

once the blades are inserted fully so that they lie in the horizontal plane. Press the lever while holding the handle steady to open the blades and slide the nut to fix them in open state.

## **Uterine Sound**

For sounding an anteverted uterus, hold the handle of the instrument with distal phalanges of the four fingers in front of it, distal phalanx of the thumb behind it, elbow flexed through  $90^{\circ}$ , and hand in semiprone position. The angle of the instrument should be directed forward. For sounding a retroverted uterus, hold the handle of the instrument with distal phalanges of the four fingers behind it, distal phalanx of the thumb in front of it,





Method of holding uterine sound. A. For an anteverted uterus; B. For a retroverted uterus.

elbow flexed through  $90^0$ , and hand in supine position. The angle of the instrument should be directed backward.

## **Vulsellum**

Hold the instrument vertically, the curve of the blades facing forward, distal phalanx of the left hand in ring



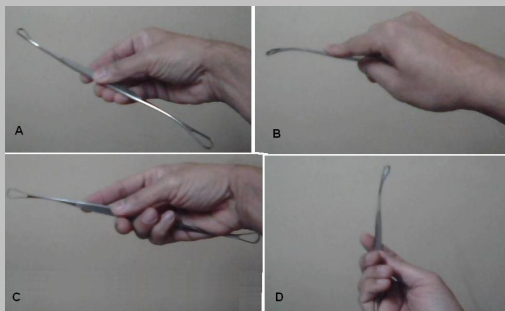
Method of holding a vulsellum.

towards you, distal phalanx of the left index finger in the other ring, and distal phalanges of the other three fingers around the handle of the instrument. The elbow is flexed more than  $90^{\circ}$ , and the hand is in semiprone position. The handle of the instrument

does not obstruct the line of vision when held this way while holding the uterine cervix. After application, the instrument is held by its handle, the hand in the same position, the thumb in the ring grip as before, the four fingers behind the handle. Pull the handle towards you with the fingers while the thumb is held steady, so that the cervix get pulled outward and the angle between the uterine corpus and cervix gets straightened. That is essential to avoid perforation of the uterus by the passage of a rigid, straight instrument.

## **Endometrial Curette**

For curettage of the anterior wall, hold an endometrial curette by placing the



Method of holding an endometrial curette. A. For curetting the anterior uterine wall; B. For curetting the posterior uterine wall; C. For curetting the right uterine wall; D. For curetting the left uterine wall.

distal phalanx of the thumb on the front of the middle of the handle, and the distal phalanges of the four fingers on its back, elbow flexed through  $90^{\circ}$ , hand in pronated position. For

curettling the right wall, turn the hand counterclockwise through  $90^{\circ}$ , and for the left wall clockwise through  $90^{\circ}$ . For curettling the posterior wall, hold it with the distal phalanx of the index finger on the front of the middle of the handle, distal phalanx of the thumb on the left edge, and the remaining three fingers curled around it on the other side.

## **Endometrial Biopsy Curette**

Hold it near the proximal end, elbow flexed through  $90^{\circ}$ , hand in supine position, distal phalanx of the thumb over the thumb rest, distal phalanx of the index finger behind the instrument, and the other fingers lightly flexed to lie behind the instrument.



Method of holding endometrial biopsy curette.

## **Cervical Biopsy Forceps**

Hold the instrument like a gun, with the distal phalanx of the thumb in proximal ring, proximal phalanx of the ring finger in the distal ring, distal phalanx of the index finger along the



Method of holding cervical biopsy forceps. A. Cervical punch biopsy forceps; Alligator jaw biopsy forceps.

lower handle to steady it, the middle



Alternative method of holding cervical punch biopsy forceps.

finger flexed around the handle. Keep the little finger lightly flexed. The angulation in the handle keeps the hand out of the line of vision when a biopsy is obtained from the cervix. Sometimes it is useful to hold the



instrument handle up, while obtaining a biopsy from the anterior lip of the cervix near the cervical os.

### **Spencer Wells Clamp**

This instrument is used mainly to hold traction sutures placed in the uterine cervix during vaginal hysterectomy. Pass the sutures twice between the blades near the hinge and lock the instrument. Then hold it by placing the index and middle fingers on either side of the sutures, the instrument in the palm of the hand, and the thumb around it, such that the instrument lies at an angle of  $90^0$  to the threads of the suture. Make traction along the direction of the long axis of the uterus.



The traction sutures on uterine cervix are held with Spencer Wells' clamp.

### **Pedicle Clamp**

Hold the clamp with the distal phalanges of the thumb and ring finger through the rings of the forceps. Place



Method of holding a pedicle clamp.

the tip of the index finger over the hinge. Place the middle finger around the handle to steady it. Flex the little finger fully, not holding anything. Hold the clamp with the hand in semiprone position, the curved tip of the clamp directed towards the surgical



Method of holding a pedicle clamp for clamping cornual structure during abdominal or vaginal hysterectomy.

specimen to be removed after clamping and cutting its pedicle.

When using a straight clamp to hold the adnexal structures for making

traction during an abdominal hysterectomy, hold it vertically, with the distal phalanges of the thumb and the index finger in the rings, the distal phalanges of the middle and ring fingers along the handle close to the index finger, and the little finger close to the ring finger, not touching the instrument.

### **Bonney's Myomectomy Clamp**

The instrument has two sets of rings. Use the proximal one (away from the hinge) for tightening and releasing the clamp. Use the distal one (nearer the hinge) to open the blades wide during application and removal of the instrument. Place the distal phalanges of the thumb and the ring finger in the



Method of holding Bonney's myomectomy clamp.

rings, distal phalanx of the index finger over the hinge or bear it, and the distal phalanx of the middle finger close to the ring held by the ring finger. Place the rubber capped blades over the uterine isthmus, including the round ligaments in the grip. Approximation of the rings closes the

blades, moving them apart opens them. Normally the angle of the instrument is kept downward to pass over the pubic symphysis. But in rare cases when the leiomyomas are very large and the isthmus is elevated, the clamp may be held with its angle upward for application.

## **Bladder Sound**

For sounding the urethra and the bladder contents, hold the handle of the instrument with distal phalanges of the four fingers in front of it, distal phalanx of the thumb behind it, elbow flexed through  $90^0$ , and hand in supination. The curve of the instrument should be directed forward. For sounding the posterior wall of the



Method of holding a bladder sound.

urethra and bladder trigone, hold the handle of the instrument with distal phalanges of the four fingers behind it, distal phalanx of the thumb in front of it, elbow flexed through  $90^{\circ}$ , and hand in supine position. The convexity of



the curve of the instrument should be directed backward, the handle elevated and tip downward.

### **Rubin's Cannula**



Method of holding Rubin's cannula.

For use in an anteverted uterus, hold the instrument in the middle of the shaft, curve directed forward, the distal phalanx of the thumb on the front and distal phalanges of the four fingers on the back, the elbow flexed through  $90^0$ , the hand in semiprone position.

For use in a retroverted uterus, hold the instrument in the middle of the shaft, curve directed backward, the distal phalanx of the thumb on the front and distal phalanges of the four fingers behind, the elbow flexed through  $90^0$ , the hand in semiprone position. In either case, hold it pushed in along with the vulsellum on the cervix pulled out.

## Colvin's Cannula



Method of holding Colvin's cannula.

Hold the instrument in the middle of the shaft, the distal phalanx of the thumb on the front and distal phalanges of the four fingers on the

back, the elbow flexed through  $90^0$ , the hand in semiprone position.

### **Shirodkar's Sling Needle**

Hold the handle vertical, the curved needle in the horizontal plane. Place the distal phalanx of the thumb on the back of the handle, the distal phalanges of the four fingers on the front of the handle, during insertion of



Shirodkar's sling needles. A. Needle for the right side; B. Needle for the left side.

the tip of the needle into the posterior peritoneal opening. Hold the handle in the fist during advancement of the needle so as to get a strong grip on it, which permits rotation which is not possible with a finger grip.



Method of holding Shirodkar's sling needle for insertion of transobturator tape.

For insertion of a transobturator tape for urinary stress incontinence, hold the handle in the fist, the arm and the forearm elevated, and needle drawn backward for entry into the space below the inferior pubic ramus through the suburethral incision in the anterior vagina.

## **Tenaculum**

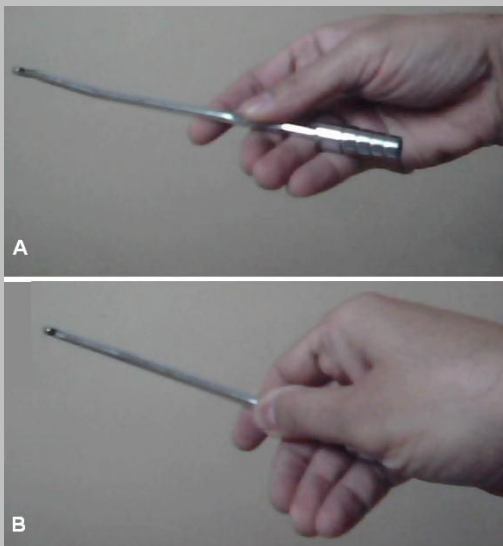


Method of holding a tenaculum.

Hold it with the distal phalanx of the thumb in one ring and distal phalanx of the ring finger in the other ring. Place the tip of the index finger on the hinge. Keep the middle finger curled around the handle near the ring. Keep the little fingers flexed lightly. This grip is used while holding or releasing tissues, like uterine leiomyoma, uterine cervix of corpus during hysterectomy. Hold the instrument in the fist of the hand while making traction.

### **MTP Suction Cannula**

For an anteverted uterus, hold the instrument near the proximal end, elbow flexed through  $90^{\circ}$ , hand in supine position, distal phalanx of the thumb over the thumb rest, the distal



Method of holding an MTP suction cannula. A. Position for an anteverted uterus; B. Position for suction on right side of the uterus.



phalanges of the other fingers behind the instrument, and the hand in semiprone position. The curvature of the instrument should be directed forward. For a retroverted uterus, hold the instrument with the thumb rest and curvature directed backward, placing the thumb on the front, the distal phalanges of the fingers on the back. When it enters the uterus successfully, withdraw it, connect it to the suction tube that connects it to the suction machine, and reintroduce it into the uterus the same way as before. Once inside the uterus, place the distal phalanx of the index finger on the thumb rest, and the other fingers close to it. Twist the instrument so that the fenestrae face laterally periodically maintaining the grip. Remove the

thumb/finger from the thumb rest to break the suction before withdrawing the cannula.

### **Laminaria Tent Introducing Forceps**

Hold the instrument with the distal phalanx of the thumb in one ring, that of the ring finger in the other ring, that of the index finger behind the hinge, and the middle finger around the handle near the ring to steady it. Hold the laminaria tent in the groove between the blades, its tip projecting out, the thread at the proximal end. The curvature of the blades should be directed forward in case of an anteverted uterus, and backward in case of a retroverted uterus.



Method of holding laminaria tent introducing forceps.

## **Shirodkar's Cerclage Needle**

Hold the instrument with the handle horizontal, needle directed forward, tip



Method of holding Shirodkar's cerclage needle for the left side.

backward, curve laterally. Hold the handle in the fist. Use the left side needle for passage of the cerclage on the left side of the needle, and the right side needle for passage of the cerclage on the right side, from before backward.

## **Cervical Dilator**

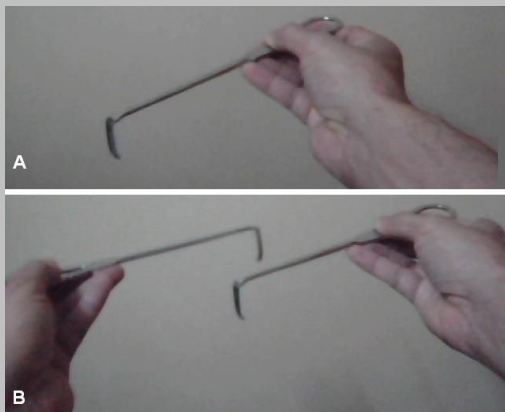
Hold the instrument like a pen, with the distal phalanx of the thumb on the left of the middle of the shaft, the distal phalanx of the index finger on the top at the same level, and the distal phalanges of the middle and the ring fingers on the right at the same level. Keep the little finger extended, so that it abuts against the patient's ischial tuberosity during cervical dilatation,



Method of holding a cervical dilator.

preventing uterine perforation by excessive penetration. For an anteverted uterus, keep the curve of the instrument directed forward. For a retroverted uterus, keep it directed backward.

## Right-angled Retractor



Method of holding a right-angled retractor for puerperal tubal sterilization. A. Method of holding the retractor; B. Two retractors used together.

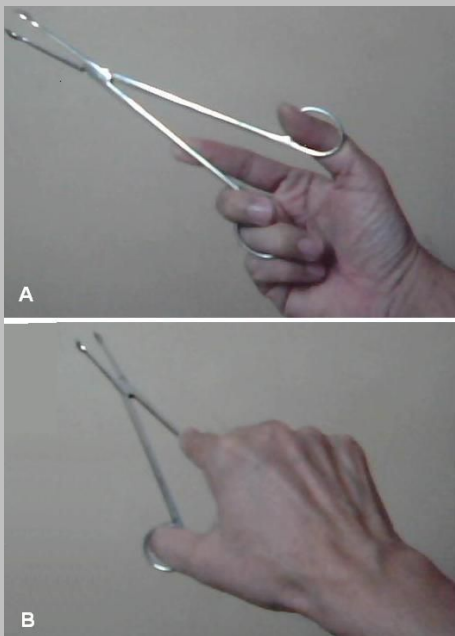
Hold it with the handle in the fist of

the hand, not digging into tissues with the distal edge of the blade. Hold the small right-angled retractor for use during puerperal tubal sterilization horizontally, with the distal phalanx of the thumb on the front of the handle and the distal phalanges of the other fingers on the back of the handle.

### **Ovum Forceps**

Hold the instrument with the distal phalanx of the thumb in one ring, that of the ring finger in the other ring, that of the index finger behind the hinge, and the middle finger curled around the handle near the ring to steady it. The position of the hand can be changed from prone to supine as required.





Ovum forceps. A. Method of holding the forceps; B. Method of using it in the uterus.

## Aspirotomy Forceps



Method of holding Aspirotomy forceps.

Hold the instrument with the distal phalanx of the thumb in one ring, that of the ring finger in the other ring, that of the index finger behind the hinge, and the middle finger around the handle near the ring to steady it. The position of the hand can be changed from prone to supine as required.

## **Shirodkar's Uterus Holding Forceps**



Method of holding Shirodkar's uterus holding forceps.

Hold the instrument vertically, with the distal phalanx of the thumb in one ring, that of the index finger in the other ring, and the middle and ring

fingers on the handle close to the ring, steadying the instrument. Keep one curved T-shaped blade forward and the other backward, so that they will go on the front and the back of the supravaginal cervix. Once it is applied, hold the handle in the fist for traction.

### **Hodge Pessary**

Hold it in the sagittal plane of the patient, long axis forward, thumb on middle of the upper edge, distal phalanx of the middle finger on the middle of the lower edge, the distal phalanx of the index finger near the front end, and the distal phalanx of the ring finger on the inside of the back end.



Method of holding a Hodge pessary.

## **Ring Pessary**

Hold it vertically, compressed between the distal phalanges of the thumb and the middle finger, supported by the distal phalanx of the index finger over the most distal part to be inserted into the vagina.



Method of holding a ring pessary.

## **Towel Clip**

Hold it with the blades angled toward the operative surface (e.g. abdominal wall or perineum for abdominal and vaginal operations respectively) with the distal phalanx of the thumb in one ring, that of the ring finger in the other ring, that of the index finger on the



Method of holding a towel clip.

back of the hinge, and the middle finger curled around the handle close to the ring with the ring finger in it.

### **Auvard's Speculum**

Hold the shaft above the weight or the weight itself after confirming that the weight is not loose on the shaft. A loose weight might fall off and cause



Method of holding an Auvard's speculum.

an injury to the foot of the surgeon or an assistant nearby.

### **Veress' Needle**

Hold the needle like a pen, between the distal phalanx of the thumb on one





Method of holding a Veress' needle.

side of the expanded part, the distal phalanges of the index and middle fingers close to each other on the other side. Keep the hand semiprone, the elbow flexed through  $90^0$ , and the ring and index fingers next to the middle finger. Leave the hub of the inner

needle free to move as the tissues are penetrated by the needle.

## **Trocar and Cannula for Laparoscopy**

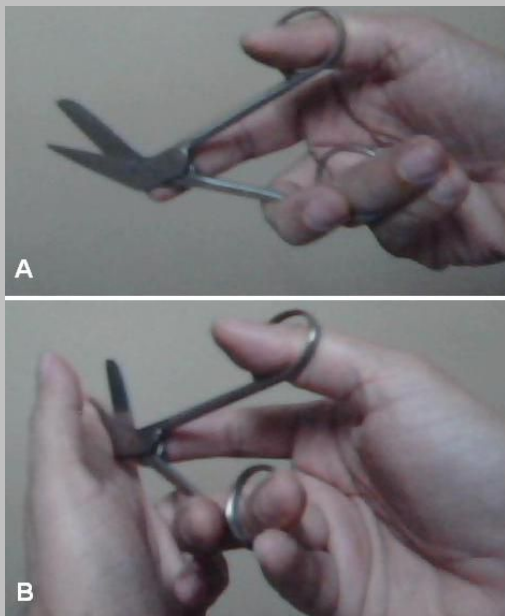


Method of holding trocar and cannula for laparoscopy.

Hold the trocar and cannula with the proximal end of the trocar resting on the thenar eminence, the index finger extended along the length of the cannula, and the other three fingers flexed, the middle finger cradling the cannula. The valve of the cannula should be closed.

### **Episiotomy Scissors**

Insert the distal phalanges of the thumb and ring finger through the rings. Place the tip of the index finger over the hinge, the middle finger around the handle near the ring and the little finger flexed next to the ring finger. Keep the angle upward, and the blades in the groove between the index and middle fingers of the left hand.



Episiotomy scissors. A. Method of holding the scissors; B. Method of protecting the fetus while making an episiotomy.

## **Umbilical Cord Scissors**



Method of holding umbilical cord scissors.

Insert only the distal phalanges of the thumb and ring finger through the rings of the scissors. Place the tip of the index finger over the hinge. Wrap the middle finger around the handle to grip and steady the instrument. Keep the little finger flexed next to the ring finger.

## Fetoscope



Method of holding a fetoscope.

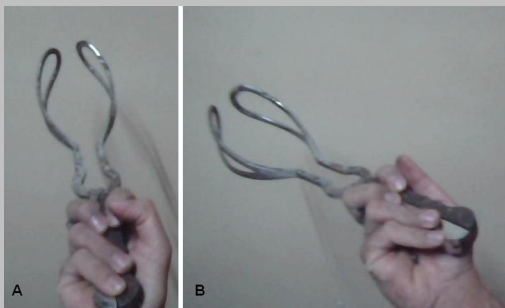
Hold the fetoscope around its funnel while placing it on the maternal abdomen. But remove the hand when the ear is placed over its flat end, because holding it with a hand dampens the transmission of sound waves through it.

## Obstetric Forceps



Method of holding an obstetric forceps branch.

Hold the left branch of the forceps vertically at the proximal end of the handle with the thumb and index finger of the left hand. Place the right thumb on the heel of the blade and tips of the index and middle fingers on the outer surface of the tip of the blade.



Method of holding assembled obstetric forceps.  
A. Front view; B. Oblique view.

Reverse hands for the right branch.

Hold the locked forceps by the handle with the right hand in supine position under the handles, the index and middle fingers flexed around the finger grips, and the ring and little fingers flexed around the handle.



## Vacuum Cup



Method of holding a vacuum extractor cup.

Place the obstetric vacuum cup pressed against the fetal head with left index and middle fingers placed on either side of the attachment of the traction handle to the cup. Hold the traction

handle with the right hand, the direction of the chain along the curve of Carus.

### **Green Armytage Forceps**

Hold the instrument vertically with the distal phalanges of the thumb and index finger in the rings, and the distal phalanges of the other three fingers along the handle to steady the instrument. Alternatively it may be held horizontally too, with thumb and ring fingers in rings, index finger over lock, middle finger around handle, and the little finger flexed lightly next to the ring finger.



Method of holding Green Armytage forceps.

## **Uterus Packing Forceps**

Hold the instrument with the right hand in prone position, the thumb and the ring fingers in the rings, the distal phalanx of the index finger on the handle to steady the instrument, and



Method of holding uterus packing forceps.

the middle finger flexed around the handle near the ring. Keep the little finger flexed next to the ring finger. Pass the instrument along the groove between the palmar aspect of the left index and middle fingers passed into the maternal vagina, to protect maternal soft parts from the tip of the instrument.



Method of passing uterus packing forceps into the maternal vagina and uterus.

## **IUCD Hook**

In case of an anteverted uterus, hold the handle of the instrument with distal

phalanges of the four fingers below it, distal phalanx of the thumb in front of it, hand in semiprone position, the elbow flexed through  $90^0$ , and the angle of the instrument directed forward. In case of a retroverted uterus, the instrument is held the same way, but is rotated through  $180^0$ , so that the angle is directed backwards.



Method of holding an IUCD hook

## **Section 2**

# **Preparing Self For Operating**

## Scrubbing



Getting scrub solution using an elbow operated dispenser.

Stand straight in front of a scrub sink with a foot or elbow operated tap.



Soak both hands and forearms under running water, held with hands uppermost. Stop the flow of water with pressure on the foot pad or closing the tap with an elbow. Take povidone-iodine scrub solution in cupped palm of one hand using an elbow operated dispenser. Scrub the hands and forearms thoroughly, taking care to clean all areas, but especially between fingers, over the tips of fingers and the dorsum of hands, which tend to be missed. After three minutes, rinse the hands and forearms under running water, holding hands up and elbows down, so that water runs from the hands to the forearms. This is important as the hands have to be the cleanest parts. Stop the flow of water. Then repeat the scrub-rinse cycle two

more times, each lasting for three minutes. After the last rinse, hold the hands together, elbows flexed and down, so that water drains down the forearms into the sink. Hold them the same way until a gown is worn.



Holding hands up, elbows down, to let the water drain down.

## **Wearing Surgical Gown**



Drying hands and forearms with a sterile towel or mop.

Do not dry the forearms and hands with the sterile gown to be worn. That transfers bacteria from the forearms and hands to the gown. Remember that

surgical scrubbing just reduces the number of bacteria on the skin, not eliminate them. Dry first the hands and then the forearms with a sterile mop or towel. Discard it.



Passing upper limbs in the sleeves, while an assistant pulls the gown back.

Pick up a sterile gown from an autoclaved drum after someone opens it for you. Do not open the drum yourself, as your hands must not touch anything after scrubbing them. Hold it up and unfold it, without letting it touch anything or anyone in the vicinity. Keep its outer surface forward, away from you. Slide one upper limb into one sleeve and then the other one in the other sleeve. Let an assistant pull it back over your upper limbs. Do not hold it near its neck and pull it on, as that may result in your hand touching your neck, hair or shoulder. Let that person tie the gown behind you. Roll its sleeves around the wrists and tuck their edges in without touching the skin.



Pulling the sleeves back, while an assistant ties the gown.

## **Wearing Surgical Gloves**

It is important to wear surgical gloves in such a way that the outer surface of the gloves is not touched by the skin.



Holding the fold of the left glove with the right hand.



Passing the left hand in the glove.



The left glove has been pulled back over the hand, leaving the folded part as it is.



Right glove is picked up with gloved fingers of the left hand passed into the fold.





Passing the right hand into the glove.



Right glove has been pulled back fully..



Gloved fingers of the right hand are passed into the folded part of the left glove to unfold and pull it back of the left wrist and forearm.



Left glove has been pulled back over the left wrist and lower forearm.

Let someone open a packet of sterile gloves and drop the inner packet on a sterile trolley kept for this purpose.

Open the inner pack. Pick up the folded left glove with the right thumb and index finger holding it at the fold, thus touching only its inner surface.

Slide the left hand into it. Pull it with the right hand over the left hand and leave it as it is at that stage. Do not unfold its folded sleeve over the left wrist as it would result in

contamination of the outer surface of the glove by coming in contact with the fingers of the right hand. In case the fingers get entangled inside the glove and do not pass into the respective fingers of the glove, do not adjust the glove fingers with the bare right hand, as that would cause

contamination of the outer surface of the glove. Leave their adjustment until after the right glove is worn. Slide the four fingers of the gloved left hand into the folded part of the right glove. Thus the left glove fingers touch only the sterile outer surface of the right glove and do not touch the bare right hand. Slide the right hand into the right glove and pull the glove back over the right hand and lower forearm with the gloved left hand. Once the fingers of the right hand pass into the fingers of the glove, unroll the folded part of the left glove over the left wrist. Pass the four gloved fingers of the right hand into the folded part of the left glove and unroll that part over the left wrist. Adjust improperly positioned fingers of the gloves over the respective

fingers of the hands after this stage. Note that no part of the outer surfaces of the gloves has come in contact with bare skin at any stage. Hold the hands up in front of the chest, their fingers intertwined.

### **Posture While Waiting For Surgery**



Posture while waiting for surgery, after washing up and wearing sterile gown and gloves.

Stand at one side, away from any surface or person, so as not to touch it or him accidentally and contaminate the sterile surface of the gown and gloves worn. Hold the gloved hands up in front of the chest, their fingers intertwined. Do not let them hang down, as they may touch an unsterile surface in that position. Do not put them in your axillae, as that area tends to become moist with sweat and hence contaminated.

### **Steady Hands**

Stand upright with arms outstretched. Press your elbows against your sides. Sit or brace your hips against a fixture to become even steadier. Rest your

elbows on a table and rest the heel of your hand on the table.

### **Steady An Instrument**

Rest the heel of your hand on the table. If you are cutting a suture, rest the scissors on the fingers of the inactive hand. Then the instrument will not wobble or shake.



Holding scissors steady while cutting a suture.

If you have to thread a needle, press your wrists together while threading the needle.

If you are making an incision with a scalpel, place the wrist and the little finger on the surgical field (e.g. abdominal wall). They form a two point bridge and steady the hand.



## **Section 3**

### **Suturing**

## **Suturing**

Start with the hand fully pronated so that the needle enters the tissues perpendicularly. As the needle is passed progressively through the tissues, supinate the hand so that the needle passes along a circular path along its curve. Finally the needle should emerge perpendicularly from the tissues.

Hold the needle at the point of exit with forceps along with the adjacent tissue so that it is steadied and does not wobble when the grip of the needle holder is released. If it is a big needle, move the grip of the needle holder towards the eye of the needle (on the part still to enter the tissues) and

advance the needle further out. It may have to be repeated a few times so that a significant portion of the needle emerges from the tissues and can be grasped with the needle holder and taken out of the tissues. Draw it out of the tissues along its curved path by further supinating the hand.

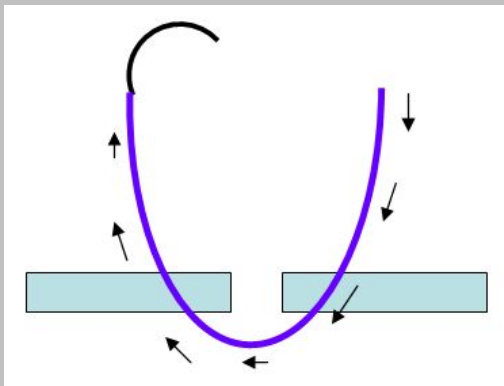
A forehand movement is easier and more natural than a backhand movement. It may be more convenient to rotate the shoulders and put a needle through tissues by using the technique just described when passing a suture in the reverse direction, rather than reverse the grip of the needle holder on the needle and pass it with a backhand movement.

Do not draw the thread out by pulling on the needle, as that may

cause a needle-stick injury to your assistant or pulling the thread off the needle. Hold the thread with a finger and draw it out. Do not grasp the thread with the needle-holder, dissecting forceps or a hemostat as it gets damaged and may break at that point during subsequent suturing.

### **Simple Interrupted Suture**

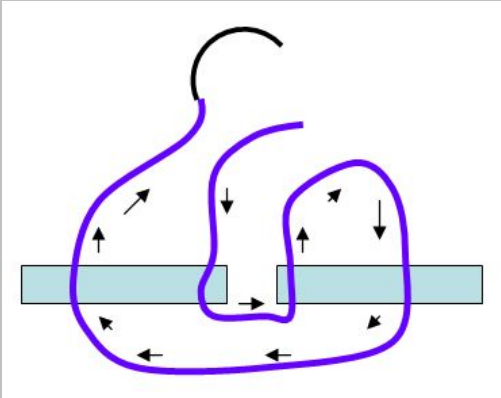
Use it to join two edges of tissue. Pass the needle a few millimeters from one edge, through the floor of the gap between the edges, and out through the other edge at the same distance from the edge as at the point of entry. Tie the two ends with a reef knot. Pierce the tissue perpendicular to the edges,



Simple interrupted suture.. The arrows indicate the direction of passage of the needle and the suture.

or the suture line gets everted. Do not tie the knot too tightly, as it tends to cause the suture to break or cut through tissues.

## Vertical Mattress Suture



Vertical mattress suture.. The arrows indicate the direction of passage of the needle and the suture.

It is a double stitch. Put a simple stitch, the points of penetration being

very close to the edges (1 mm). Reverse the direction of the needle. Reinsert the needle at a distance of a few millimeters from where it emerged, pass it through the depth of the tissue and exit on the opposite side at the same distance as between the two points on the other side. The direction of the suture should be perpendicular to the length of the cut edges being sutured. Tie a reef knot. This suture is less likely to cut through because there is tissue between two lengths of thread instead of one. It is important that the knot lies over the skin puncture away from the edge rather than over the puncture near the edge, because the latter tends to irritate the skin more, the thickness of tissue being less at that location. If the suture is begun

away from the edge rather than near the edge, the knot will lie over the puncture near the edge.

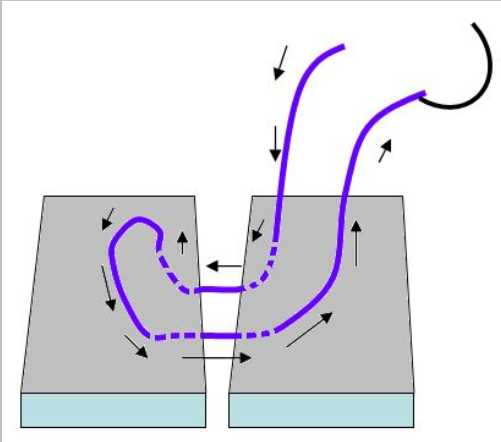
A vertical mattress suture achieves very precise approximation of the edges and produces a neat scar.

### **Horizontal Mattress Suture**

Enter the tissue at a distance of a few millimeters from the edge and exit at a point on the same side, at the same distance from the edge. Carry the suture to the other side, and pass it through the tissues as just described, but in reverse direction. Tie a reef knot. This suture does not achieve as precise an approximation of tissue edges as a vertical mattress suture does. It is



better for achieving hemostasis when the tissues are bleeding.



Horizontal mattress stitch.. The arrows indicate the direction of passage of the needle and the suture.

Interrupted sutures have two advantages.

1. They do not cut off the blood supply to the suture line as much as the continuous sutures do.
2. In case a simple suture gives, the entire suture line does not open like it does with a continuous suture.

Interrupted sutures have two disadvantages.

1. Each stitch is held by a knot. Even when knots are perfectly tightened and tied, the strength of the thread is reduced significantly. If it is tied imperfectly, roughly or not

tightly enough, the strength of the stitch may reduce by 50%.

2. If one knot gives way, the adjacent stitches are subjected to greater tension and may give way too.

### **Figure-of-Eight Suture**

Insert the needle 1-2 mm beyond the area to be covered by the suture, both along and perpendicular to the edge. Take it out symmetrically through the other side. Go obliquely across the area to be covered to the first side, and pass the needle the same way as the first time. Tie a reef knot, approximating the edges. The tissue between the two halves of the suture get occluded. Note that the suture

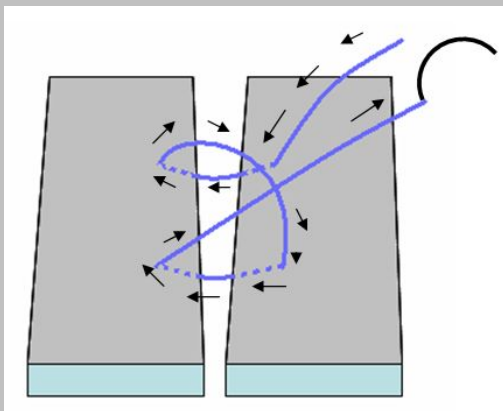


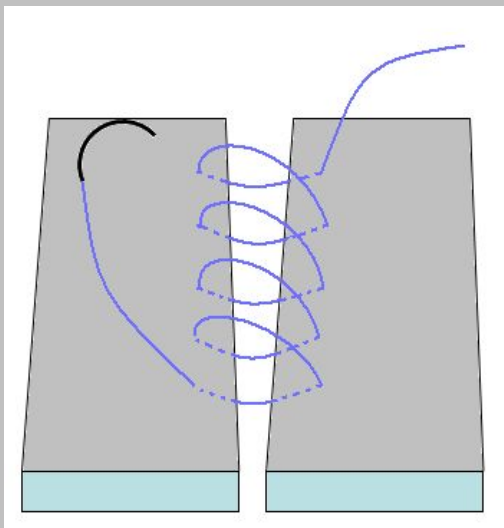
Figure-of-eight suture. The arrows indicate the direction of passage of the needle and the suture.

crosses obliquely outside, not inside the tissues, and the end result is in the form of a cross over the tissues approximated. If the edges of the

tissues have been held with Allis' forceps before placing the suture, release them before tying the reef knot. This suture is a hemostatic suture. Use it only to control bleeding that cannot be controlled with other methods. Do not use it for approximating wound edges, as it may impair their healing.

## **Continuous Sutures**

Place a simple suture at one end of the edges to be approximated. Tie a reef knot. Cut off the short end of the suture beyond the knot. Continue the other end on a needle as a spiral stitch approximating the opposite edges. Tighten each loop of the spiral before placing the next one. Do not drag the thread through the loop as it may



Continuous noninterlocking suture.

weaken the thread. For better control, place the closed blades of the needle holder in the loop and hold it taught as

it is pulled tight, lowering the tip of the needle holder towards the suture line. Once it is tightened, let an assistant hold the thread taut while the next loop is being placed. That prevents loosening the suture. Take the last loop beyond the wound and tie a reef knot. If the patient is thin, the ends of the suture may poke into the overlying skin and hurt even after the wound heals. These ends at the beginning of the suture can be buried by holding them down and passing the initial two loops over them. Then pull on them and cut flush with the tissues. The cut ends at the end of the suture can be buried by inverting the knot, by passing the last loop from inside out and then outside in.

If you do not have thread of adequate length to complete a continuous suture, tie it off and start again with another thread. If there is not enough thread left to tie off the first suture, leave the end untied, held taut by an assistant. Start with another thread, tie its first knot, and tie the untied end of the first suture to this one.

A simple looping in tissues produces a continuous noninterlocking suture. If the thread is passed through each loop, it becomes a continuous interlocking suture. A continuous suture saves time. But if even one of the two knots at the end give way, the entire suture gives way. A continuous suture cuts off blood supply of the sutured tissues more than simple interrupted sutures



do. A continuous interlocking suture cuts off the blood supply more than a continuous noninterlocking suture does.

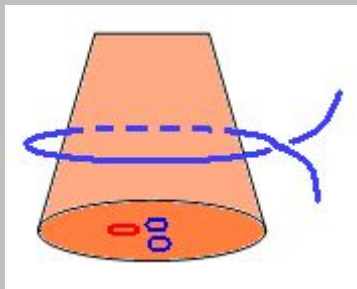
## **Section 4**

### **Ligatures**

Ligatures are put around blood vessels or pedicles with blood vessels in them, so that they do not bleed when cut.

### **Simple Ligature**

A simple ligature goes all around the pedicle or blood vessels to be tied. It is easy to place. However it is associated



Simple ligature.

with the risk of slipping if it is not tied tightly. It works with blood vessels if tied tightly. But it may not work with pedicles, because the ischemic tissue of the pedicle at the site of the ligature shrinks and as a result the ligature becomes loose. A simple ligature is not recommended for tying pedicles.

Place a simple ligature by going all around the structure to be tied. Do it by one of the following methods.

1. Hold a segment of thread with thumb and index finger of each hand at each end of the thread. Carry it all around the structure.
2. Catch the bleeding vessels with a hemostat. Place a simple ligature all around the vessels by going around them under

the hemostat. Release the hemostat when the ligature is tied.

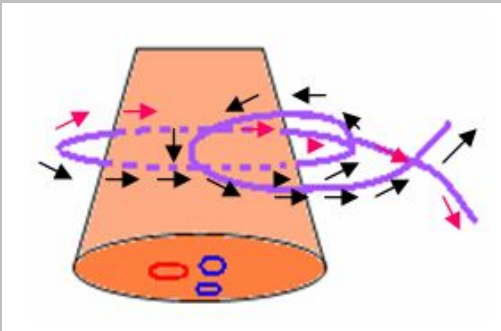
3. In case of a deep seated vessel, catch it with a hemostat. Hold one end of the thread with the thumb and index finger of the left hand, and catch the other end with a hemostat. Take the tip of the hemostat with the thread down to the level of the hemostat on the blood vessel, and guide the thread around the vessel by maneuvering the hemostat with the thread caught in it. The hemostat can reach easily and safely where two fingers holding the thread cannot reach.

4. If a ligature is to be passed around an intact blood vessel deep down in the pelvis, put a mixer around the vessel, and feed the tip of a thread into its blades using a hemostat as described above. When the mixer is withdrawn, the ligature passes around the blood vessel.

### **Transfixion Ligature**

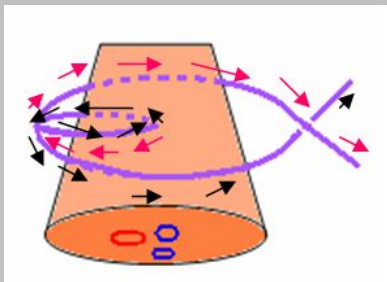
A transfixion ligature passes around a pedicle once. Then its one end on a needle is carried back and passed through a part of the pedicle once again. Then this end is carried round the pedicle for being tied to the other end. This ligature does not slip

because it has passed through the substance of the pedicle. This ligature is useful when one edge of the pedicle is free, while the other edge is in continuity with other tissues.



Transfixion ligature. The black arrows indicate the direction of passage of one segment of the ligature. The pink arrows indicate the direction of passage of the other segment.

Another variety of a transfixion ligature is used when both the edges of the pedicle are free. The suture is passed through the middle of the pedicle in an avascular area. The ends are tied once on one side. Then the two ends are carried around the pedicle one around each edge, and tied on the other side.



Another type of a transfixion ligature.



This ligature does not slip because it has passed through the substance of the pedicle.

## **Section 5**

# **Surgical Knots**

## **Tying Knots**

A knot is an intertwining of threads for the purpose of joining them, as for ends of ligatures and sutures. A secure fastening of the knot results from the friction between the threads. The friction depends on the area of contact, the roughness of the thread surface, the tightness of the knot, and the length of the thread left beyond the knot.

When tightening a knot, place the ends of the two segments of the thread looped over the distal phalanges of the two index fingers, equidistant from the tissue. If the distance is not equal, the longer segment tends to break. Do not tie two threads of unequal gauge to each other. If you do, the thinner

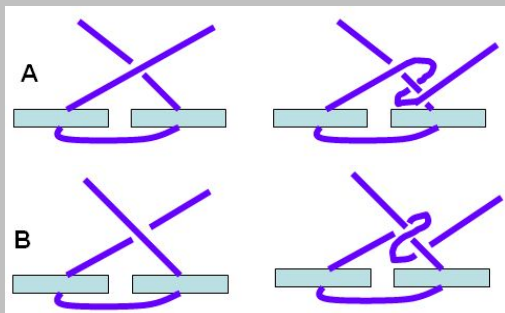
thread tends to break. Do not tie two threads of different tensile strengths (even if of the same gauge) to each other. If you do, the thread of less tensile strength tends to break.

The knots have to be tight so that the patient does not bleed from loosely tied pedicles. When tying knots, keep the passive thread tight between successive throws, so that the knot does not become loose. Get an assistant to step on the first knot while placing the second hitch, in case the first knot becomes loose despite keeping the passive thread taut. But it may damage the suture material, making the knot weaker. If at all it has to be done, do not tighten the ratchet of the hemostat more than once. The

second hitch tightens the first one, in case the first one becomes loose while placing the second one. This cannot happen if the first hitch has two loops instead of one. So never put two loops for a single hitch.

## **Half Hitch**

A half hitch is the basis of most of the surgical knots. Cross two threads to form a closed loop. Pass one end through the loop. Pull on the ends to tighten the knot. There are two types of half hitches, depending on whether one thread is crossed over or under the other.



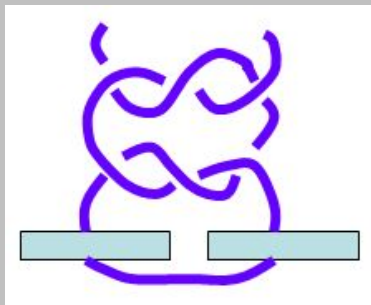
Two types of half hitch. Figures on left side indicate the beginning, and those on the right side indicate the completed hitches.

## Reef Knot

If the second half hitch is of different type than the first one, it becomes a reef knot. The threads of the two half hitches run parallel and hence the area of contact is increased. After tying it,

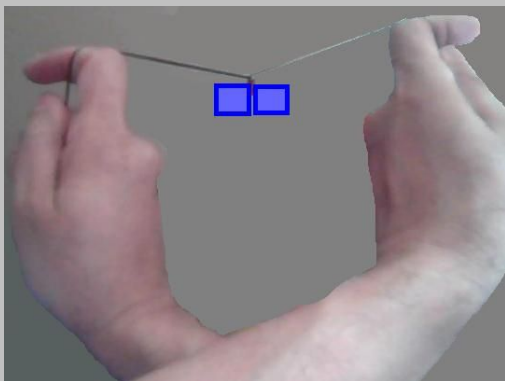
the ends lie parallel to the standing parts. A reef knot is secure.

In order to place the knot correctly, either the hands have to cross each other, or the grip on the threads must be exchanged. If the hands are crossed in the horizontal plane, they obscure the field. That must not happen.



Reef knot.

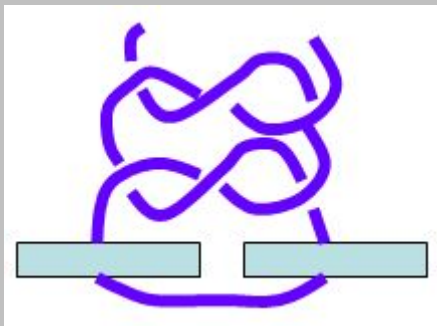
Do not cross them this way at any time. Either change hands or cross them in the sagittal plane. It is preferable to change hands, as the force available is reduced when the hands are crossed.



Hands crossing and obstructing the operative field.



## Granny Knot

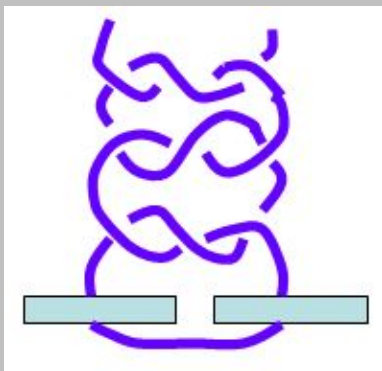


Granny knot.

If the second half hitch is of the same type as the first one, it becomes a granny knot. The threads of the two half hitches cross rather than run parallel as in the reef knot. The length of contact is reduced. After it is tied,

the ends tend to lie at right angles to the standing part. A granny knot is not very secure as it may become loose under tension.

### **Triple Throw Knot**



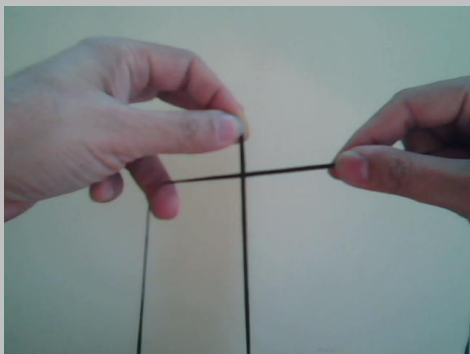
Triple throw knot.

Alter tying a reef knot, place a third half-hitch. It is even more secure.

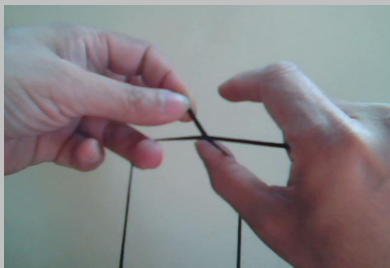
## **Two Handed Knot**

If the longer end of the thread is away from you, grasp it with fully flexed ring and little fingers of the right hand, the extra length of thread hanging beyond the little finger. Grasp the shorter end with the thumb and index finger of the pronated left hand. Draw the right thread to the left with the left ring finger. Pronate the right hand. Put its thumb forward under the crossing of the threads. Place the short thread between the tip of the right thumb and index finger. Holding the thread between the two fingers, supinate the right hand fully so that the thread gets

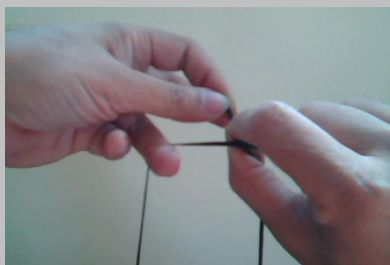
drawn backward through the loop. Grasp it with the left thumb and index finger. Pull on both the ends to tighten the hitch.



Short end is held with left thumb and index finger, long one with right hand. The long thread is drawn to the left with the left index finger.



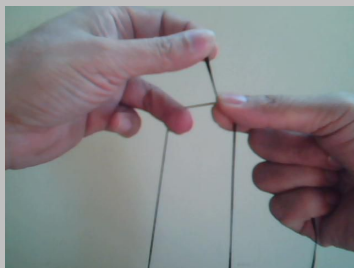
Right thumb is being passed forward under the crossing of the threads.



The short thread is placed between the tip of the right thumb and index finger.



Holding the thread between the two fingers, the right hand is supinated fully so that the thread gets drawn backward through the loop.



It is grasped with left thumb and index finger.



Both the ends are pulled to tighten the hitch.

If the long end of the thread is towards you, grip it with fully flexed right ring and little fingers, the rest of it hanging loose beyond the little finger. Grasp the shorter end with the thumb and index finger of the pronated left hand. Draw the long thread to the left in front of the short thread with the left ring finger. Pass the right index finger

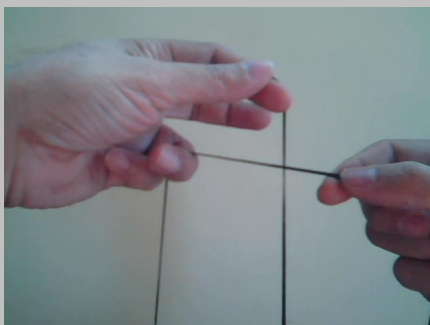


The long end of the thread is grasped with right ring and little fingers, the shorter end with the thumb and index finger of the pronated left hand.

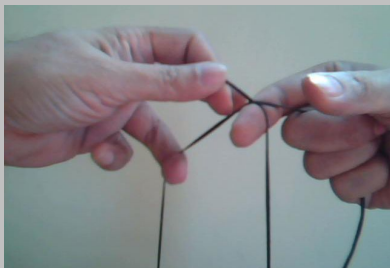
backward through the loop by supinating the right hand. Place the short thread between the tips of the right thumb and index fingers. Release it as it is held with the right thumb and index fingers. Pronate the right hand fully, pushing the short thread forward



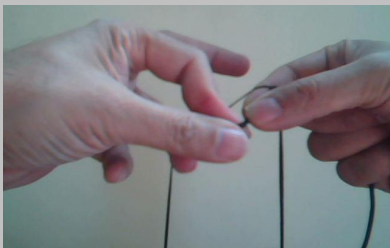
through the loop. Release it as it is held with the left thumb and index finger. Pull on the two ends of the thread to tighten the hitch.



The long thread is drawn to the left in front of the short thread with the left ring finger.



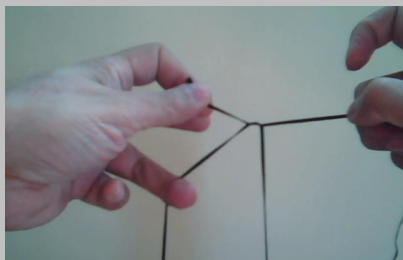
The right index finger is passed backward through the loop by supinating the right hand.



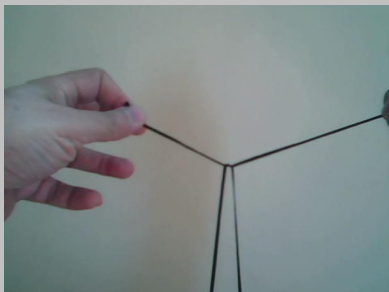
The short thread is placed between the tips of the right thumb and index fingers.



The right hand is pronated fully, pushing the short thread forward through the loop.



It is released as it is held with the left thumb and index finger.



The two ends are pulled on to tighten the hitch.

### **One Handed Knot with Left Hand: Index-Finger Hitch**

Use the index-finger hitch when the short end is away from you. Hold it vertically with the left thumb and middle finger. Draw a loop of the thread over the left index finger by extending it. Draw the long segment

over the short thread between the left index finger on one side and the left thumb and middle finger on the other. Flex the terminal phalanx of the left index finger around the long thread and reach behind the short thread. Extend that phalanx and draw the short thread under the loop of the long thread. Release the grip of the left thumb and middle finger over the short thread as it is drawn forward by the left index finger, trapping the thread between the left index and middle fingers. Take the long end away from you and bring the short end toward you to tighten the hitch.



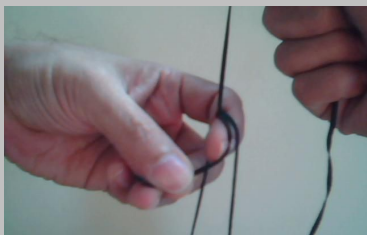
The short end is held vertically with the left thumb and middle finger.



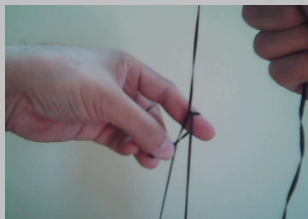
A loop of the thread is drawn over the left index finger by extending it.



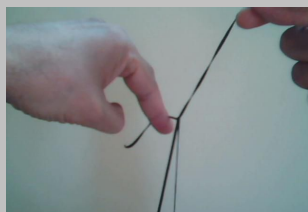
The long segment is drawn over the short thread between the left index finger on one side and the left thumb and middle finger on the other.



The terminal phalanx of the left index finger is flexed around the long thread to reach behind the short thread.

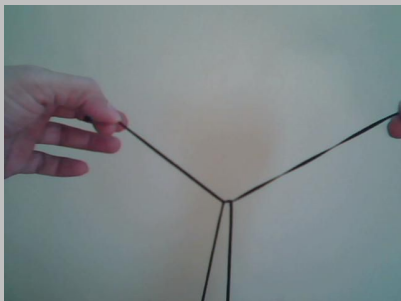


The distal phalanx of the left index finger is extended to draw the short thread under the loop of the long thread.



The grip of the left hand over the short thread is released as it is drawn forward by the left index finger, trapping the thread between the left index and middle fingers.





The two ends are pulled to tighten the hitch.

As a variation of this knot, instead of drawing the short end of the thread forward with the left index finger, it may be held between the distal phalanges of the left thumb and index finger and pushed forward through the loop, reversing the path of the left index finger.

Follow the index-finger hitch by the middle-finger hitch, so that the knot becomes a square knot.

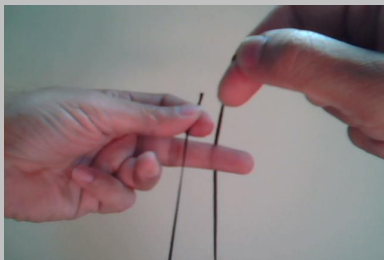
### **One Handed Knot with Left hand: Middle-Finger Hitch**

Use the middle-finger hitch when the short end is near you. Pick it up with the thumb and index finger of the pronated right hand and hold it vertically. Hold the long thread vertically with the right hand. Supinate the left hand and extend its middle finger between the two threads. Pull the long thread forward over the left middle finger crossing the short thread. Flex the distal phalanx of the left middle finger passing over the long thread and behind the short

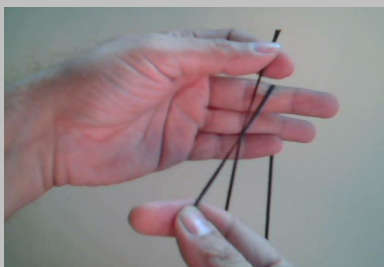
thread above the crossing of the two threads, its nail in contact with the short thread. Extend it and pronate the left hand to draw away a loop of the short thread under the long thread. Pull on the ends to tighten the knot.



The shot end is held with left index and middle fingers, the long end with right thumb and index finger.



The left middle finger is extended in front of the long thread.



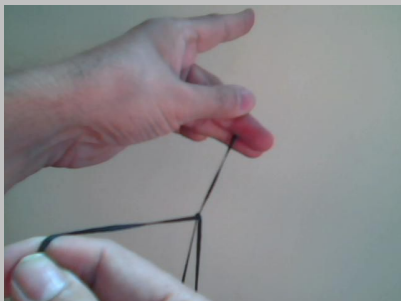
The long thread is pulled forward over the left middle finger crossing the short thread.



The distal phalanx of the left middle finger is flexed, passing over the long thread and behind the short thread.



The distal phalanx of the left middle finger is extended, drawing a loop of the short thread under the long thread.



The two ends are pulled to tighten the hitch.

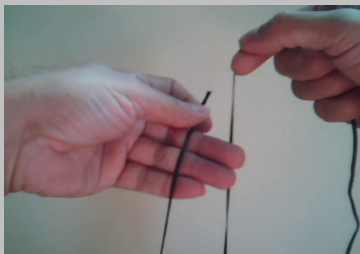
### **Three-Finger Hitch**

It is an alternative to the middle-finger hitch. Hold the short end vertically with the thumb and index finger of the pronated left hand. Hold the other thread with the right index finger and thumb vertically. Extend the other three fingers of the left hand so that the

short thread lies over them. Draw the thread held by the right hand forward over the upper border of the left middle finger. Flex the distal phalanx of the left middle finger over the long thread, passing under the short thread. Draw the short thread backward by extending it and let go of the hold of the left hand over it. Pull on the two ends to tighten the knot.



The two threads are held vertically with the thumbs and index fingers of the two hands.

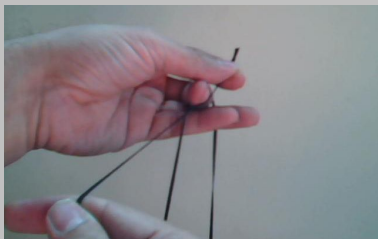


The other three fingers of the left hand are extended so that the short thread lies over them.



The thread held by the right hand is drawn forward over the upper border of the left middle finger.





The distal phalanx of the left middle finger is flexed over the long thread, passing under the short thread.



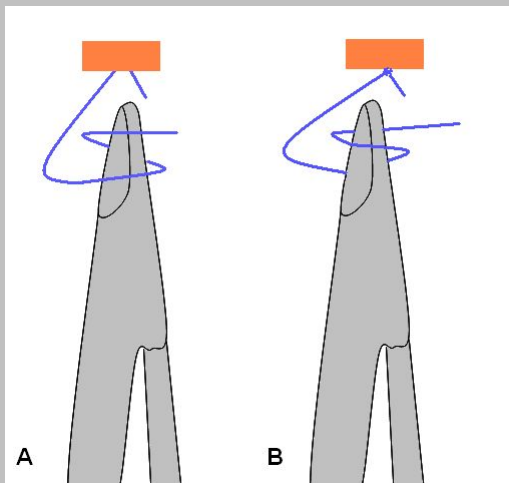
The short thread is drawn backward by extending the left middle finger. The hold of the left hand over the thread is released.



The two ends are pulled to tighten the hitch.

### **Tying a Knot With a Needle Holder**

Use of an instrument to tie a knot has two advantages. It saves suture material and does away with the need to put down the needle holder to tie the knot with fingers.



Tying a knot with a needle holder. A. First hitch; B. Second hitch.

Hold the long end with the left hand. Loop it around the closed blades of the needle holder clockwise once. Catch

the short end with the needle holder. Slide the loop off the closed blades of the needle holder and pull the ends in opposite direction to tighten the knot. Pull in a plane at right angles to the plane of insertion of the suture. After the first hitch is tightened, place the second one, looping the long segment of the thread counterclockwise around the closed blades of the needle holder. Once it is tightened, place a third hitch, in the same way as the first one.

If the long segment of the thread is short, tying a knot may become difficult, because the short end cannot be accessed easily, it tending to move with distortion of the operative field immediately around the knot. Get an assistant to hold the short segment

with a hemostat and feed it between the open blades of the needle holder after the long segment is looped around the blades. This technique is also useful when working with very fine suture material, like 5-0 to 9-0.

### **Tying a Knot With Two Hemostats**

When the two ends of a suture are short, it is not possible to tie a knot with the hands or a needle holder. In such a case, the knot is tied with two hemostats or two needle holders.

Hold the ends of the two segments with two hemostats. That increases the effective lengths of the two segments. Hold the hemostat on the left segment in the palm of the left hand. Hold the

other one with the right thumb and ring finger grip. Extend the left index finger to loop the left segment over it partially. Pass the right segment over the front of the left index finger, thus forming a loop around the left index finger with the two segments. Take the tip of the right segment to the back of the loop, and place the left thumb over the crossing of the threads to maintain their relative positions. Release the grip of the hemostat held by the right hand over the right segment. Pass the hemostat with its blades closed through the loop, catch the end of the right segment and draw it back through the loop. Pull on the two ends to tighten the knot.



The ends of the two segments are held with two hemostats.



The left index finger is extended to loop the left segment over it partially. The right segment is passed over the front of the left

index finger. Thus a loop is formed around the left index finger with the two segments.



The tip of the right segment is taken to the back of the loop, and the left thumb is placed over the crossing of the threads to maintain their relative positions.





The grip of the hemostat held by the right hand over the right segment is released. The hemostat with its blades closed is passed through the loop, the end of the right segment is caught with it and drawn back through the loop.



The two ends pulled on to tighten the knot.

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