

## Classical History

There are 101 yantras (blunt instruments). They are sub-divided into 6 types as :-

- a) Swastik yantras e.g. forceps. These are 24 in number. (9+15)
- b) Samdamsha Yantras e.g. Forked instruments.
- c) Taal Yantras (scooped or spooned instruments):
- d) Naadi yantras (Tubular instrument): E.g. 1. Many catheters 2. Drainage tube 3. Feeding tube 4. Miller Abbot's tube 5. Ryle's tube 6. Sungstaken Blackmare tube 7. Tracheostomy tube etc.
- e) Shalaka Yantras
- f) Upa Yantras

**Uses of Yantras: ....**

**Demerits of Yantras (12)**

### Shastras (Sharp instrument)

These are used for astha-vid shastra-karmas. Sushruta (20), Bagbhatta (26)

### Asthavid Shastrakarma:

Chhedan- Excision, Bhedan- Incision, Lekhan- Scrapping, Vedhan- Puncturing, Eshan- Probing, Aaharan- Extraction, Vishravan- Blood-letting, Siwan-Suturing.

There are 14 anu-shastras

Merits of Shastras 6.

Demerits of Shastras 8

Kosha= Instrument box- To preserve, especially, sharp instruments.

**Shastra Dhar:** to make instrument sharp:- Payana (Temper), Nishatani (Black stone), Dhar Sasthan (Stropping)

**Yogya Vidhi** (Learning Operative surgery)- practicing in fruits, animal parts, dead body etc.

**Vishikhanu Pravesh Vidhi-** Medical Professional Practice

A medical practitioner should have some qualities like: Cleanliness, Well trained, Friendly to others, follower of law, good hearted etc.

**Shalya:** is anything that needs to be removed e.g foreign substance, that substance if retained in body cause harm.

**Basics of Shalya:**

**Trivid Shalya Karma**

1. Poorva karma- Preoperative procedures
  - In patients and Surgeons- Full clinical history, examination and investigations, consent, preparedness, review, anesthetic consultation etc.
  - In instruments and operative room:- Preparation and setting of equipments etc.
2. Pradhan Karma – Operative procedures- start with praying the god, with full confidence etc.
3. Paschat karma- Post operative procedures, nursing care, monitoring etc.

**Raksha karma-** Prevention from contamination.

**Branitopasan-** Position of the patient during operation.

**Branagar-** Operation theatre.

**Rakta Skandhan** (Hemostasis, stop bleeding)

- Sandhan – use of kashaya dravyas
- Skandhan – use of cold substance to constrict vessels/capillaries
- Pachan- use of kshar shankha hasmas etc.
- Dahan- cautery etc.

**Sandhan Karma-** is the process of joining, suturing

Founder of modern plastic surgery was Gasparo Tagliacozzi. Principles were given by John Staige Davis & Vilray Papin; Blair; Harold Delf Gillies.

## **General principles**

### 1. Skin incision

- They should be such that scar lies parallel to natural skin lines.
- Natural skin lines lie perpendicular to direction of pull of underlying muscle fibers.

### 2. Wound closure

- Aim-Prompt healing, inconspicuous scar.
- Good surgical technique - gentle handling with non-crushing instruments, avoiding tension by subcutaneous tissue closure, using fine suture on a fine needle, good skin apposition, prevention of dog ear, early suture removal.

### 3. Dog-ear

Dog-ear are produced when long axis: short axis = 4:1: Dog ear excision requires either lengthening of the wound or closure by T shaped scar.

### 4. Skin closure may also be done by using either

- Free graft
- Pedicle flaps to be used when primary closure is not possible because of large defect.

## **Instruments in Daily Use**

### **1. Spatula and Cytobrush**

Ayre's spatula (wooden or plastic) and the endocervical brush are used for collection of cells for cytology screening.

Uses:

- For cervical cells- Projected end of the spatula goes within the external os. The spatula is rotated 360° to collect cells from the entire ectocervix.
- For endocervical cells- the cytobrush goes within the cervical canal and is rotated to collect cells.
- For cytohormonal study the rounded end of the spatula is used.

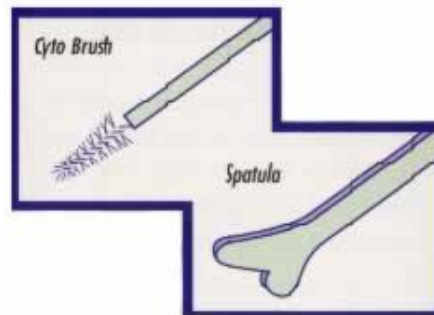


Figure 1 Brush and Spatula

## 2. Sims' double bladed posterior vaginal speculum

The instrument was designed by Marion Sims. The blades are of unequal breadth. The use of one is dependent on the caliber of the vagina. It may be single bladed.



Figure 2 Sims Speculum

### Uses

- It is commonly used in vaginal operations such as D + C, D + E, anterior colporhaphy, vagina hysterectomy, etc. to retract the posterior vaginal wall.
- To visualize the cervix and inspect the abnormalities in the anterior wall like cystocele, VVF or Garter's cyst after placing the patient in Sims' position.
- To collect the materials from the vaginal pool for cytology or Gram stain and culture.

### 3. Cusco's bivalve self-retaining vaginal speculum

The valves are to retract the anterior and posterior vaginal wall so as they have a good look to the cervix. A light source from behind is essential. It is commonly used in the OPD.



Figure 3 Cusco's Speculum

#### Uses

- To visualize the cervix and vaginal fornices.
- To collect vaginal pool materials and cervical smear for cytologic screening.
- To have cervicovaginal swabs for Gram stain and culture.
- To insert or to remove IUCD or to check the threads.
- To perform minor operations like punch biopsy, surface cauterization or snipping a small polyp.

### 4. Female rubber catheter

It is used to empty the bladder in cases with retention of urine during – (a) pregnancy (Retroverted Gravid Uterus). (b) Labour – (i) When the woman fails to pass urine by herself (ii) before and after any operative interventions. (c) Post-partum – during management of post-partum hemorrhage retained placenta. (d) Continuous bladder drainage with Foley's catheter is required in (i) Eclampsia (ii) Retroverted gravid uterus. (iii) To give rest to the bladder following any destructive operation and/or in a case with suspected bladder injury. It is usually kept for 4-10 days. (e) other uses – (i) as a tourniquet (ii) to administer O<sub>2</sub> when nasal catheter is not available (iii) as mucus sucker – when it is attached to a mechanical or electric sucker.



Figure 4 Female Rubber Catheter

[ In Short: -To empty the bladder in retention of urine. - To administer oxygen. - To use as a tourniquet in myomectomy operation as an alternative to myomectomy clamp.]

## 5. Female metal catheter

### Uses

- To empty the bladder prior to major vaginal operations. Not only it facilitates the operation but minimizes the injury to the bladder.
- To confirm the diagnosis of Gartner's cyst from cystocele
- It is not used in obstetrics to avoid trauma.

### Use in PFR

- To empty the bladder prior to the operation
- To note the lower limit of the bladder before making the incision on the vagina.
- Prior to cutting the vesicocervical ligament.
- At the end of the operation to make sure about absence of any injury.



Figure 5 Female metal Catheter

## 6. Cervical dilators

### Varieties

- Hawkin-Ambler-There are 16 sets starting from 3/6 and ends with 18/21
- Hegar's-There are 12 sets, the smallest one is of 1-2 mm. This is used mainly in gynaecological operations.
- Das's dilator (named after Sir Kedarnath Das)



Figure 6 Cervical Diltor

### Uses

- To dilate the cervix to facilitate intrauterine introduction of instruments (curette) or devices (IUCD) or hysteroscope or radium.
- To dilate the cervix to facilitate drainage of intrauterine collection-pyometra, haematometra or lochiometra
- To confirm patency of cervical canal after amputation cervix.

## 7. Multiple toothed vulsellum

### Uses

- To hold the parous cervical lip in operations like D+C, anterior colporrhaphy or vaginal hysterectomy.

Its function is to make the cervix steady by traction.

- To remove a polyp by twisting as an alternative to Lane's tissue forceps.
- To hold the fundus of the uterus and to give traction while the clamps are placed in operation of total abdominal hysterectomy for benign lesion.

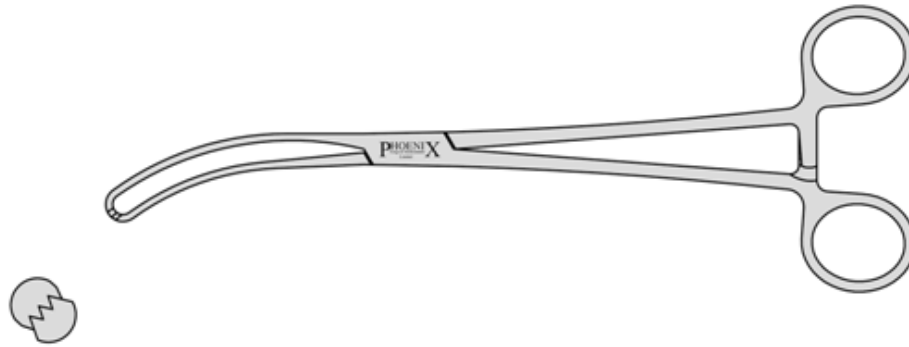


Figure 7 Vulsellum

**To hold cervical lip-** Usually the anterior lip is held but in some conditions, the posterior lip is to be held. Such conditions are:

- In amputation cervix or vaginal hysterectomy when the posterior cervicovaginal mucous membrane is cut.
- Posterior colpotomy for drainage of pus or vaginal ligation.
- Growth in the anterior lip.
- Culdocentesis

## 8. Olive pointed malleable graduated metallic uterine sound

### Uses

- To confirm the position of the uterus.
- To note the length of the uterocervical canal.
- It acts as first dilator.
- To sound the uterine cavity in a case of IUCD with missing threads.
- To differentiate a polyp from inversion.



Figure 8 Uterine Sound



## 9. Uterine curette

### Types

- Sharp at one end, blunt at the other
- Sharp or blunt at both ends.
- Handle with only sharp at one end.
- Flushing curette (blunt)
- Sharman's curette.



Figure 9 Uterine Curette

### Uses

#### Sharp curette

- Infertility.
- DUB
- TB endometritis

#### Blunt curette

- Suspected choriocarcinoma.
- Suspected endometrial carcinoma

#### Flushing curette

- Following D+E

#### Sharman's curette

- Infertility work up, where only a strip of endometrium is enough to study the hormonal reflection. It is done as an outpatient procedure and without anaesthesia.

## 10. Haemostatic Forceps (Artery Forceps)

### Types:

- Medium sized straight hemostatic forceps
- Medium sized curved hemostatic forceps
- Mosquito hemostatic forceps

Identification:



Figure 10 Artery Forceps

- Has a ratchet, two blades with uniform serrations
- Also called as Spencer Well's artery forceps

Uses:

i, Hemostatic- to hold bleeding vessels (arteries, veins, and capillaries) during diathermy coagulation, ligation or crushing (usually Curved type)

ii, Holding

- to hold cut edges of fascia, aponeurosis or peritoneum
- to hold stay sutures
- to hold hard swab (Laheys swab)
- to hold free end of sutures during continuous suturing

iii, Clamping

- as a pedicular clamp (curved type) for gallbladder, thyroid, testis etc
- to crush the base of appendix during Appendicectomy

iv, Dressing- for wound dressing in ward

v, Drainage- for abscess drainage

**Use of Mosquito Forceps:**

- to hold bleeding vessels
- to hold peritoneum during opening
- to perforate mesoappendix during appendicectomy
- to hold ends of sutures
- useful in repair of harelip, cleft palate and other plastic surgeries

## 11. Uterine dressing forceps

The instrument is often confused with laminaria tent introducing forceps. The blades are transversely serrated while in the latter, there is a groove on either blade.

### Uses

- To swab the uterine cavity following D+E operation with a small gauze piece.
- To dilate the cervix in lochiometra or pyometra.
- To plug the uterine cavity with gauze twigs in continued bleeding after removal of polyp.

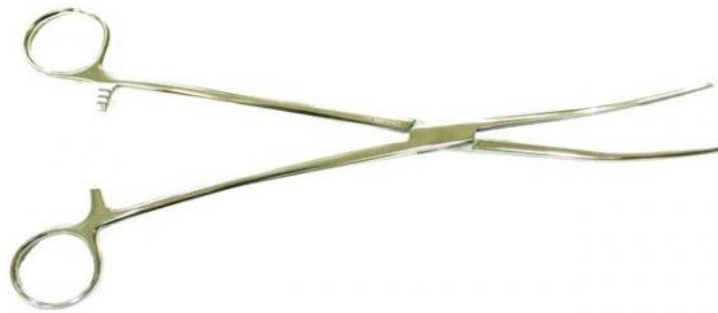


Figure 11 Uterine Dressing Forceps

## 12. Laminaria Tent Introducing Forceps

The instrument is almost similar to uterine dressing forceps. There is a groove on either blade to catch the laminaria tent.

Laminaria tent: It is dehydrated, compressed, Chinese sea-weeds. It is sterilized by keeping it in absolute alcohol at least for 24 hours. Usually more than one tent is to be introduced to prevent dumbing of the ends. It produces slow dilatation of the cervical canal, as it swells up due to hygroscopic action.

## 13. Swab Holding Forceps



Figure 12 Swab Holding Forceps

Uses:

- to hold the tongue to prevent fall back in an unconscious patient
- to hold the body or fundus of gall bladder during cholecystectomy for fixation or traction
- taking out vesicle calculus during cystolithotomy
- to hold caecum during appendicectomy
- to take out enucleated prostate during transvesical prostatectomy

#### **14. Ovum forceps -**

It is often confused with sponge holding forceps but it has no catch. As such, it minimizes trauma to the uterine wall if accidentally caught and also it has got no crushing effect on the conceptus.

**Uses**

- To remove the products of conception in D and E after its separation partially or completely.
- To remove molar tissue in hydatidiform mole.
- To remove uterine polyp (small).

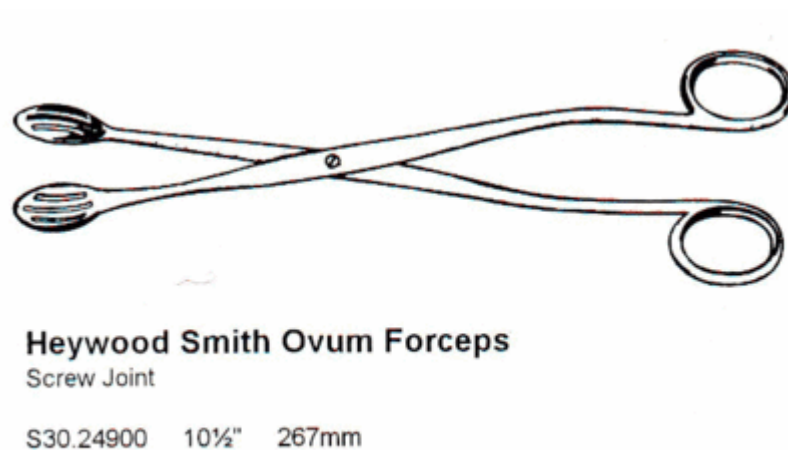


Figure 13 Ovum Forceps

## Methods

The cervical canal is dilated first. The instrument is introduced with the blades closed and opened inside the cavity. The products are caught and then with twisting movements and simultaneous traction, the products are removed.

Dangers - It may produce injury to the uterine wall to the extent of even perforation. Not infrequently, a segment of intestine or omentum may even be pulled out through the rent.

## 15. Allis tissue forceps

### Uses

- To hold the margins of the vaginal flaps in colporrhaphy operation.
- To hold the peritoneum or rectus sheath during repair of the abdominal wall.
- To hold the margins of the vaginal in abdominal hysterectomy.
- To hold the anterior lip of the cervix in D and C operation.
- To catch the torn ends of the sphincter and externus in CPT repair.
- To remove a small polyp.
- To take out the tissue in wedge biopsy.



Figure 14 Lanes Tissue Forceps

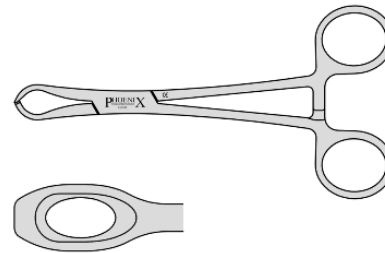


Figure 15 Allies Tissues Forceps

## 16. Lanes tissue forceps -

### Uses

- To hold parietal wall (bulk of tough tissues) for retraction during abdominal operations with transverse incision.
- To hold the polyp or fibroid in polypectomy or myomectomy operation.
- To hold the towel during draping.

## 17. Uterus holding forceps -

The blades are protected with rubber tubes to minimize trauma to the uterus.

### Uses

- To fix and steady the uterus when conservative surgery is done on the adnexae (tuboplasty)
- What are the different surgical procedures for proximal and distal tubal disease?



Figure 16 Uterine Holding Forceps

## 18. Long straight haemostatic forceps (Spencer Well's)

Use: This is not commonly used in obstetrics. It can be used to clamp the pedicle while removing the uterus as in rupture uterus. The umbilical cord may be clamped as an alternative to Kocher's.

- It is used as a clamp in hysterectomy, salpingectomy or salpingo-oophorectomy operation.

## 19. Green Armytage Haemostatic Forceps

The forceps are used in lower segment Caesarean section. Four pairs of forceps are ordinarily required-one for each angle and one for each flap. Its functions are haemostasis and to catch hold of the margins so that they are not missed during suture. It can not be used in classical Caesarean section. Alternative to this Allis tissue forceps may be used.

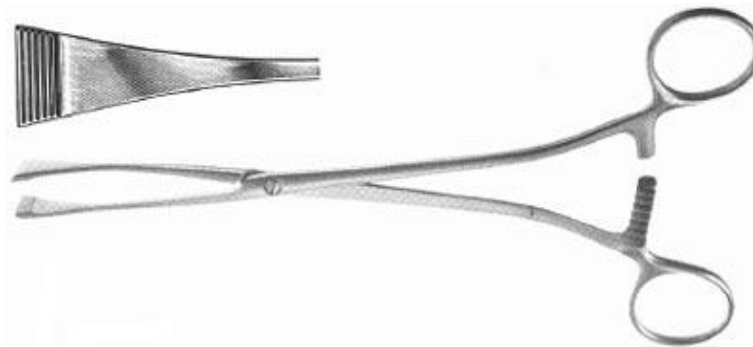


Figure 17 Green Armytage Haemostatic Forceps

## 20. Kocher's Forceps

Identification:

- Similar to artery forceps with serrations
- sharp tooth at the tip for better grip

Uses

- to hold tough structures like aponeurosis, fascia etc.
- to catch hold of perforating vessels in radical mastectomy
- to hold the strap muscles during thyroidectomy
- used in ARM (obstetric use)

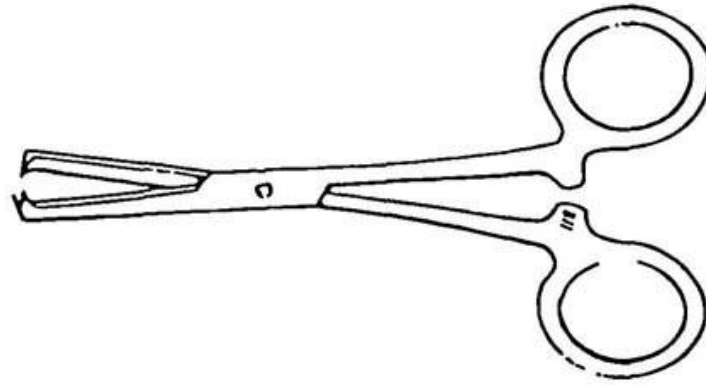


Figure 18 Kocher's Forceps

## 21. Sinus Forceps -

### Identification

- similar to artery forceps but with no ratchet
- serrations are confined to the tip

### Uses:

- for drainage of abscess by Hilton's method
- sometimes used as dressing forceps
- may be used to introduce Ryle's tube, catheter etc.



Figure 19 Sinus Forceps

## 22. Babcock's forceps -

### Identification

- with ratchet and a triangular expansion with fenestration at the operating end



- no teeth

#### Uses

- to hold intestine during anastomosis or resection
- to hold fallopine tube in tubal surgeries
- to hold appendix during appendicectomy
- to hold lymph gland during dissection in radical hysterectomy



Figure 20 Babcock's forceps

### 23. Punch biopsy forceps -

#### Uses

- To take biopsy from the cervix.
- The biopsy is taken as an outdoor procedure without anaesthesia. The site of biopsy is either from the suspected area of Schiller's iodine or colposcopic derected.



Figure 21 Punch biopsy forceps

### 24. Dissecting forceps -

#### Types

- toothed
- non-toothed

#### Uses

##### I, Toothed

- to hold tough structure like tendon, aponeurosis etc for fixation during fixation and cutting



Figure 22 Toothed Dissecting forceps

## II, Non-toothed

- to hold soft structures like Gastro-intestinal tract, gall bladder etc for fixation during stitching and cutting
- as a contact media for diathermy coagulation of bleeders
- for blunt dissection

## 25. Cervical occlusion clamp

The blades are guarded with rubber tubes to avoid trauma to tissues.

### Used

Evaluation of tubal patency during laprotomy (following tuboplasty). Cervix is occluded with the instrument and methylene blue dye is injected into the uterine cavity through the fundus using a syringe and a needle.



Figure 23 Cervical occlusion clamp

## 26. Barkelay Bonney vaginal clamp

### Use

- To occlude the vaginal canal prior to cutting the vagina in Werthim's hysterectomy.

## 27. Plastic Suction Cannula (Karmen's Type)

It is of different sizes and the approximate size required for a particular case equals to the weeks pregnancy to be terminated. The plastic cannula has got advantages over the metallic one-as it causes less damage to the uterine wall and the products sucked out is visible. The vacuum must be broken before its withdrawal. It is of different sizes. It is used for s+E.



Figure 24 Plastic Suction Cannula (Karmen's Type)

## 28. Hysterosalpingography cannula

In HSG, a syringe is required to push the dye. Iodine containing radio-opaque dye (urograffin) is used. It is done in the radiology department without anaesthesia.

### Uses:

- Hysterosalpingography (HSG)
- Also used for hydrotubation

**Hydrotubation-** Medicated solution is pushed transcervically in conditions such as following tuboplasty operation or suspected flimsy fimbrial adhesions. The drugs instilled are dexamethasone 4 mg with gentamicin 80 mg in 10 ml normal saline. It should be instilled in the proliferative phase for at least 3 cycles.



Figure 25 Hysterosalpingography cannula

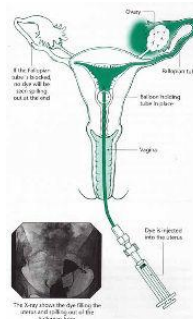


Figure 26 Diagram Showing HSG procedure

## 29. Needle holder

### Uses

- It may be straight or curved.
- To catch-hold the needle. The needle should be caught at the junction of anterior 2/3<sup>rd</sup> and posterior 1/3<sup>rd</sup>.



Figure 27 Needle holder

## 30. Scalpel (B-P/Bard Parker Knife holder)

The instrument is detachable- handle and blade. Different sizes of knife holders are available to hold different blades



Figure 28 Scalpel (BP handle and Blade)

### Uses

- To cut the abdominal wall-skin, subcutaneous tissue rectus sheath and opening the peritoneum.
- To cut the mucous coat in vaginal plastic operation and to cut tissue during surgery.
- it is used to give incision during surgery
- it can also be used to take cervical biopsy and also for debridement of the wound

## 31. Needles -

### Types and Uses

#### I, Fine curved round bodied needle

- for stitching gut and soft structures



Figure 29 Needle

#### II, Curved cutting bodied needle

- for stitching tough tissues like aponeurosis, fascia, skin

#### III, Straight cutting bodied needle

- for skin sutures

### Round bodied (Curved)

It is used while suturing soft structures like:

- Peritonisation, suturing muscles.
- Suturing the pedicles in hysterectomy.
- Suturing the pubocervical fascia.
- Tubectomy of salpingectomy.

### Cutting (Curved)

It is used while suturing tough structures like:

- Suturing the vaginal margins in PER.
- Closure of the vaginal vault in abdominal hysterectomy.
- Repair of the rectus sheath.
- Suturing the skin.

#### A. Curvature

- Straight needle
- curved 2/8 of circle
- curved 3/8 of circle (preferred needle in most cases)

- curved 4/8 of circle
- curved 5/8 of circle

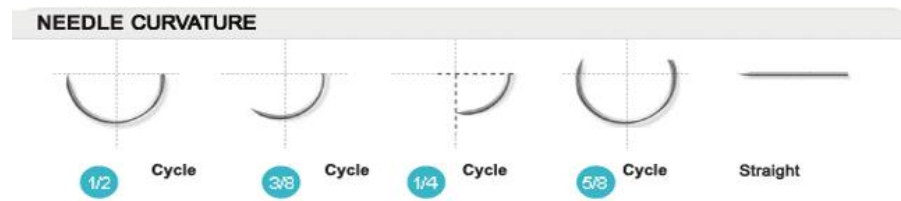


Figure 30 Curvature of Needles

## B. Needle Tip

- Tapered (used in vascular sutures)
- conventional cutting needle
- reverse cutting needle (preferred in most cases)

## 32. Scissors -

### Mayo's type

This is used in almost every operation requiring tissue dissection and excision.

### Bent on flat (Bonney) type

This is used conveniently in anterior colporrhaphy to dissect the vesicovaginal space and also for tissue dissection.

### Metzenbaum

This used for tissue dissection.

### Perineorrhaphy

It is comfortably used in perineorrhaphy operation; also used in episiotomy.



Figure 31 Scissors

### Long Straight Scissors

Use: It is commonly used to cut the umbilical cord, in episiotomy, to cut suture materials also in Caesarean section.

### 33. Towel clips -

#### Uses

- These are used in draping the operative area abdominal or virginal. The towels or sheets are fixed to the skin and each other with these clips.

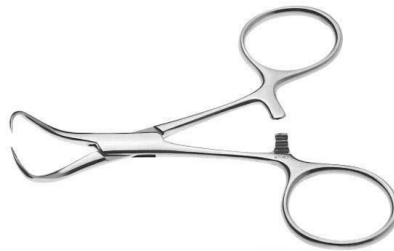


Figure 32 Towel clips

### 34. Ryle's Tube

#### Indication

#### I, Diagnostic

- aspiration of gastric content - analgesic
- to diagnose gastric outlet obstruction (gastric aspirate, 200 cc after 12 hrs of fasting)

#### II, Therapeutic

- Gastric decompression (in obstruction or prolonged ileus)
- gastric lavage
- feeding
- post-operative after bowel operation

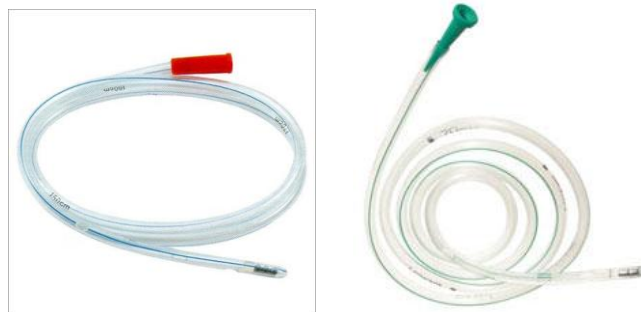


Figure 33 Ryle's Tube

N.B. Distance of structures from upper central incisors: -

- 15 cm - cricopharyngeal junction

- 25 cm - aortic and bronchial constriction
- 40 cm - cardioesophageal junction
- 45 cm - Pylorus
- 60 cm - ampulla of Vater

(Procedures, Contraindication, care of NG - not mentioned)

### **Types of Naso-gastric tube**

A. Short tubes:

- Ewald tube
- Levin tube
- Sunp tube

B. Long Tube

- cantor tube

## **35. Mucus Sucker**

(a) Disposable (b) Metal – It is used to suck out the mucus from the naso-oropharynx following delivery of the head of the baby. To be of value, the mucus is to be sucked prior to the attempt of respiration, otherwise the tracheo-bronchial tree may be occluded leading to inadequate pulmonary aeration and development of asphyxia neonatorum. The metal sucker requires a sterile simple rubber catheter to be fitted at one end and a sterile piece of gauze to the other end. Currently electric or the disposable sucker is being used.



Figure 34 Mucus Sucker

## **36. Loop hook**

**Use:** To remove (IUCD form the uterine cavity when the threads are missing.



Method of use: The cervical canal is dilated if needed. The hook is introduced within the uterine cavity. The IUCD is felt and is grasped within the hook. It is then pulled out.

Precautions: Location of the IUCD within the uterine cavity must be confirmed. Trauma (perforation) to the uterus is to be avoided. Hysteroscopy removal can also be done.

### 37. Pinnard's Stethoscope -Fetoscope

It should be held firmly at right angle to the point on the abdominal wall. The ear must be firmly closed to the aural end. It should not be touched by hand while listening.

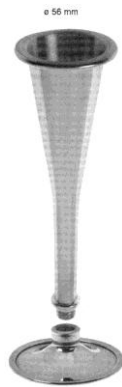


Figure 35 Fetoscope

### 38. Ultrasonic Doppler

To detect and monitor fetal heart sound.



Figure 36 Ultrasonic Doppler

### 39. Kidney Tray

This instrument is shaped like a kidney and is usually used for: -

- collecting urine during catheterization
- painting and draping
- keeping catgut, scalpel and other instruments during surgery

- putting saline and antiseptic solutions for washing abdominal cavity during laparotomy
- collecting blood and blood clots
- keeping operated specimens



Figure 37 Kidney Tray

#### **40. Hodge-Smith pessary**

It is made up of vulcanite or ebonite. It is sterilized by keeping it in Lysol for 24-48 hours.

##### **Indication of use:**

##### **Contraindications**

- Fixed R.V. uterus
- Presence of infection

Method of insertion: The patient lies in dorsal position with an empty bladder. The pessary is held collapsed or folded to make the insertion easy. A lubricant may be used. It is introduced inside the vagina and is pushed high. The broad end lies in the posterior fornix, the narrow end behind the symphysis pubis and the concavity is directed upwards.

##### **Instructions to the patient**

- To have vaginal douche at least twice a week
- To check after 1 month.
- To be removed or reintroduced after 3 months.

#### **41. Ring pessary**

It is made up of watch-spring with rubber. It is sterilized by boiling for half an hour.

##### **Uses: uterine organ prolapse**

##### **Contraindications of use**

- Presence of sepsis.
- Cross relaxation of pelvic floor muscles.

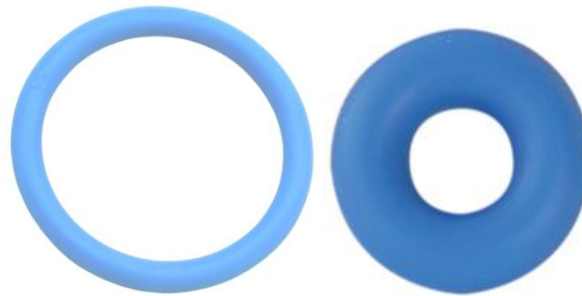


Figure 38 Ring pessary

## 42. Syringe and Needle

- to give IV/IM/SC injections. - Syringes available in different volumes e.g. 3ml, 5 ml, 10ml, 20 ml, 50 ml.



Figure 39 Syringe and Use of Syringe for blood sample collection

## 43. Drip Set and IV Canula

- to give IV fluids, continuous bladder washing? etc.  
- size: Kha Ha Ra Ni (Brown 16, Green 18, Red 20, Blue 22)

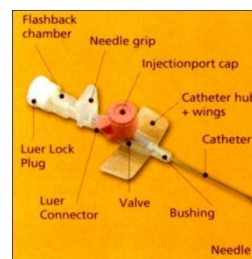


Figure 40 Drip Set and IV Canula

## 44. Ultrasonography/USG/Video X-ray

- to visualize soft organs in pelvis and abdomen of mother
- to visualize fetus
- to monitor fetal status, activity and development

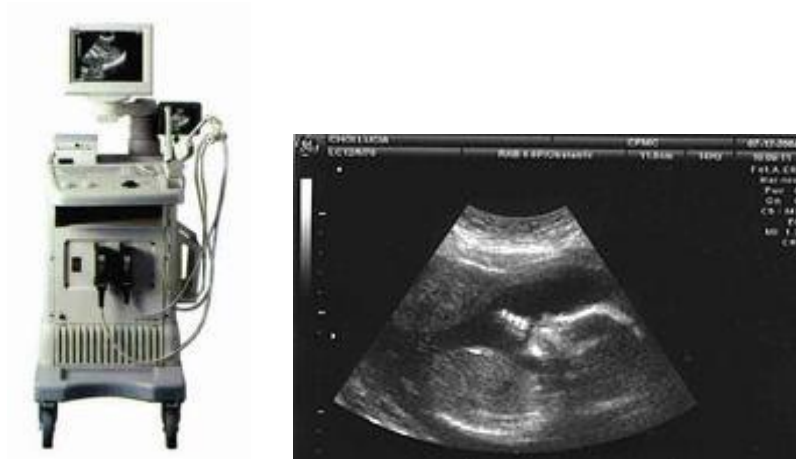


Figure 41 Ultrasonography

#### 45. Miscellaneous

- other instruments that a physician needs are stethoscope, sphygmomanometer, thermometer, weighing machine, tape, etc.



Figure 42 Stethoscope and Sphygmomanometer

## 4. Suturing

The suture materials used in a particular surgical step depend on the strength of the tissues to be sutured and the time required for the wound to regain its strength. Depending on diameter, sutures are categorized into no. 0, 1, 2, etc. Sutures when smaller than no. 0, are indicated as 1-0, 2-0 and so forth. Due considerations also to be given on tensile strength of the suture, the rate at which the suture material loses its strength in vivo and the interaction expected between suture and tissues.

### Classification of Suture Materials:

The suture materials may be classified either as absorbable or non-absorbable. Their biological origin or synthetic preparations are mentioned briefly.

- Absorbable
- Non-absorbable



Figure 43 Suture material/threads

### Absorbable

- Biological
- Synthetic

### Biological

- Catgut and Collagen

The catgut (derived from the word kitgut-strings of a musical instrument known as kit) is obtained from the submucosa of sheep or ox intestines. Collagen is derived from ox Achilles tendon. Both are available in plain and chromic form. Treatment with chromic sulphate produces chromic catgut is degraded by photolytic enzymes of white blood cells (inflammatory cells) slowly. Chromic catgut loses half of its tensile strength by 10 days and maintains some strength up to 21 days. Plain catgut loses 70 per cent of its tensile strength by 7 days.

### Synthetic

- Dexon

Dexon (polyglycolic acid) a copolymer of glycolic acid and is degraded by hydrolysis with minimal inflammation. It loses half of its tensile strength in 15 days and is absorbed in 4 months.

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Dexon (polyglycolic acid) is a copolymer of glycolic acid and is degraded by hydrolysis with minimal inflammation. It loses half of its tensile strength in 15 days and is absorbed in 4 months.

- Vicryl rapide (coated)

Vicryl (polyglactin): is a copolymer of lactide and glycolide. It loses its tensile strength in 30 days. It is absorbed in 70 days. It produces less tissue reaction than catgut.

Vicryl rapide (coated): It is also a polyglactin suture. It is similar to plain catgut. Absorption is rapid with minimal tissue inflammation. 70 per cent of its tensile strength is lost by 7 days. It is used for soft tissues, episiotomy repair and skin.

The tensile strength of the above sutures is much greater than that of catgut. But these sutures need more throws to secure knots compared to catgut.

- Polydioxanone suture (PDS) is a pliable monofilament made of polydioxanone. It loses half of its tensile strength in 28 days. Tissue inflammation is minimal. Monofilament sutures have no interstices to lodge any bacteria. So infections are rare. Polyglyconate sutures have got similar properties. These are used for fascial closure.

<b>Sutures</b>		
<b>Nature</b>	<b>Type</b>	<b>Tissue where used</b>
Absorbable	Plain catgut Chromic catgut	Subcutaneous tissue Pedicle, vaginal wall, rectus sheath, etc
Delayed absorbable	<ul style="list-style-type: none"> <li>• Dexon</li> <li>• Vicryl</li> <li>• PDS</li> </ul>	<ul style="list-style-type: none"> <li>• Subcuticular</li> <li>• Fascial structure</li> <li>• Skin</li> <li>• Microsurgery</li> <li>• Vaginal vault</li> </ul>

		<ul style="list-style-type: none"> <li>• Ractus sheath</li> </ul>
Non-absorbable	<ul style="list-style-type: none"> <li>• Nylon</li> <li>• Prolene</li> <li>• Silk</li> <li>• Dacron</li> </ul>	<ul style="list-style-type: none"> <li>• Skin</li> <li>• Rectus sheath</li> <li>• Skin of the abdomen</li> </ul>

All the synthetic absorbable materials are sterilized by ethylene oxide.

Non-absorbable:

- Biological
- Synthetic

### **Biological**

- Silk suture can be handled and tied easily. It has excellent knot security. It is sterilized by gamma radiation. It is a foreign protein and initiates strong inflammatory response and loses half of its tensile strength by one year. It should not be used in contaminated or infected tissue.
- Cotton is the weakest non-absorbable suture. It loses 50 per cent of the tensile strength by 6 months. Wet cotton is stronger (10%) than dry cotton. It is rarely used now.

### **Synthetic**

- Terelene or Dacron - These are extruded from a homopolymer.
- Polyamide (Nylon) - is a man made monofilament or multifilament. It is very much non-reactive in tissues. Monofilament nylon has greater tensile strength, incites less tissue reaction and is less prone to infection than braided nylon.
- Polypropylene (Prolene) is a hydrocarbon polymer and is monofilament. It has least tissue reaction. Knot security is greater. It is sterilized by ethylene oxide.
- Steel suture is non-reactive and has highest tensile strength. It is not commonly used now.

Non-absorbable sutures maintain their tensile strength for a long time. However, there may be suture related pain or rarely sinus formation.

TABLE 2. – Comparison of different materials.

Outcome	Poly-L-Lactide/ Glycolide (PDS®) (n = 13)	Coated Polyester Polyester (Ethibond®) (n = 210)	Polypropylene (Prolene®) (n = 132)	Polydioxanone (PDS®) (n = 46)	Significance
Recurrent prolapse	2 (15.4%)	70 (33.3%)	50 (37.9%)	17 (37.0%)	NS
Recurrent urinary incontinence	3 (23.1%)	55 (26.2%)	29 (22.0%)	8 (17.4%)	NS
Further surgery for prolapse	0	19 (9.0%)	7 (5.3%)	4 (8.7%)	NS
<i>Post-operative complications</i>					
Granulation/ suture erosion	6 (46.2%)	56 (26.7%)	20 (15.2%)	2 (4.3%)	<0.001
Infection	1 (7.7%)	22 (10.5%)	6 (4.5%)	0	<0.5
Interval from surgery (months)	3.5	5.0	6.0	7.0	NS
<i>Management of complications (n=78)</i>					
Cautery	2 (100%)	29 (50.9%)	9 (45.0%)	1 (50.0%)	NS
Cut suture	0	16 (28.1%)	7 (35.0%)	1 (50.0%)	NS
Surgery	0	11 (19.6%)	2 (10.0%)	0	NS

NS = not statistically significant.

## Suture Characteristics

### A. Tensile Strength

- related to suture size
- related to weight required to break a suture

### B. Knot strength- force required for a knot to slip

### C. Configuration

- Monofilament: less risk of infection
- Braided multifilament (easier to handle and tie)

### D. Elasticity

- Degree to which suture stretches and returns to original length

### E. Memory or suture stiffness

- High memory: suture stiff, difficult handling, unties

### F. Tissue reactivity: (inflammatory response to suture)

- reaction peaks in first 2 to 7 days

## Suture Types recommended for skin closure

### A. Deep (Dermal or Buried) Absorbable sutures

- polyglecaprone 25 (monocryl)
- polydioxanone (PDS)
- polyglactin 910 (vicryl)



- polyglycolic acid (dexon)

#### B. Superficial Monofilament Nonabsorbable sutures

- Nylon (Ethilon)
- Polypropylene (Prolene)

#### **Suture Size**

##### A. General

- Superficial facial lesions: 6-0 Nylon
- Other superficial skin lesions
  - low skin tension areas: 5-0 Nylon
  - Higher skin tension areas: 4-0 Nylon

##### B. Annotation for suture size indications:

- Skin: superficial monofilament nonabsorbable suture
- Deep: Dermal absorbable sutures

##### C. Size 0: large suture

##### D. Size 2-0

##### E. Size 3-0

- Skin: foot
- Deep: chest, abdomen, back

##### F. Size 4-0

- Skin: scalp, chest, abdomen, foot, extremity
- Deep: scalp, extremity, foot

##### G. Size 5-0

- Skin: scalp, brow, oral, chest, abdomen, hand, penis
- Deep: brow, nose, lip, face, hand

##### H. Size 6-0

- Skin: ear, lid, brow, nose, lip, face, penis

##### I. Size 7-0 : smallest suture

- Skin: eyelid, lip, face

**Absorbable sutures:** suture loses tensile strength by 60 days under skin

Indication: buried suture to reduce wound edge tension

#### **Various absorbable sutures:**

- Catgut suture
- treated catgut suture (mild chromic gut)

- polyglycolic acid suture (dexon)
- polygalactic acid suture (vicryl)
- polydioxanone (pds)
- polyglyconate (maxon)

### **Non-absorbable suture**

- Silk suture
- Nylon suture (ethilon, dermalon)
- Polypropylene suture (prolene, surgilene)
- Braided polyester suture (ethiobond, ethiflex, dacron)
- Polybuster (novafil)

### **Suture types:**

Continuous, Interrupted, Subcuticular, Mattress, etc.

## **5. Sterilization of the Instrument**

All blunt instruments are sterilized either by boiling for half an hour or in an autoclave for 20 minutes with 20 lbs/in<sup>2</sup> pressure at 120°C (Autoclaving).

Sharp instruments like knife, needle, etc. are sterilized by keeping in Lysol, 2% Gluteraldehyde (cidex) for 24 hours.

Soft and delicate medical or surgical instruments (e.g. gloves, catheters, glassware, suture materials, cotton, etc.) are sterilized  $\gamma$ -rays (gamma rays).

## **6. References**

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