

# Instruments and Procedures in Obstetrics and Gynecology

Kiran Agarwal



Foreword  
**Narendra Malhotra**



# Instruments and Procedures in Obstetrics and Gynecology

**Kiran Agarwal** MD FICOG

Associate Professor, Rohilkhand Medical College and Hospital  
Pilibhit Bypass Road, Bareilly

Vice President, Rohilkhand Medical College and Hospital  
Institute of Dental Sciences  
Rohilkhand College of Nursing  
Bareilly-243001 (UP) INDIA

*Foreword*

**Narendra Malhotra**



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#### **Headquarters**

Jaypee Brothers Medical Publishers (P) Ltd  
483B/24, Ansari Road, Daryaganj  
New Delhi 110 002, India  
Phone: +91-11-43574357  
Fax: +91-11-43574314  
Email: [jaypee@jaypeebrothers.com](mailto:jaypee@jaypeebrothers.com)

#### **Overseas Offices**

J.P. Medical Ltd  
83 Victoria Street, London  
SW1H 0HW (UK)  
Phone: +44-2031708910  
Fax: +02-03-0086180  
Email: [info@jpmedpub.com](mailto:info@jpmedpub.com)

Jaypee Medical Inc  
The Bourse  
111 South Independence Mall East  
Suite 835, Philadelphia, PA 19106, USA  
Phone: +1 267-519-9789  
Email: [joe.rusko@jaypeebrothers.com](mailto:joe.rusko@jaypeebrothers.com)

Jaypee Brothers Medical Publishers (P) Ltd  
Bhotahity, Kathmandu, Nepal  
Phone: +977-9741283608  
Email: [Kathmandu@jaypeebrothers.com](mailto:Kathmandu@jaypeebrothers.com)

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**Dedicated to**

***My father (Late) Dr Rajendra Gupta***  
***DMRE, DMRT, MD (Radiology)***  
***who is a source of inspiration for me.***

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## FOREWORD

Obstetrics and gynecology today has become a fast expanding branch and everyday new procedures and equipments and instruments in this field are added. We are also over flooded with literature, books, online internet articles and guidelines, etc.

There are many books on medical surgical instruments and equipments and procedures, but this lovely manual is different. The approach in this manual/book is very practical. To a medical student, intern, resident fresh out of theory teaching this manual offers a very clear and simple way of describing an instrument and its uses.

This manual has different sections and each section containing photographs, description and their uses which are clearly explained in simple words.

I congratulate Associate Professor Kiran Agarwal for this wonderful manual and recommend this as a standard teaching manual for undergraduates, postgraduates, residents and also for the practicing gynecologist.



**Prof Narendra Malhotra**  
DIU Croatia  
Past President FOGSI  
FOGSI Rep To FIGO  
MD Rainbow Hospitals  
Consultant and Director  
MNMH(P) Ltd

## PREFACE

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I always felt in my practising career, that there is a lack of simple yet concise and handy book for students and residents on instruments and procedures in obstetrics and gynecology. In this endeavor I consulted several textbooks and aimed at presenting a book with clinical experience in a manner that would be understood by all.

This book will be practically useful not only for junior doctors but also for consultants and busy practitioners who are unable to refer to larger textbooks and journals. The book includes general instruments, specialized instruments and diagnostic tools in its different sections. Some instruments are of historical value only but focus has been made on what is basic, practical and important to know and learn in art and science of obstetrics and gynecology.

**Kiran Agarwal**

## ACKNOWLEDGMENTS

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I salute my institution Rohilkhand Medical College and Hospital which has given me opportunity to write this book.

I humbly acknowledge and sincerely thank the affectionate and caring attitude of all the people throughout my work and all praises to Almighty God who enlightened me to carry out this work successfully.

I would take this opportunity to thank my husband, Dr Ashok for his constructive suggestions, encouragement, his companionship, understanding and moral support.

With supreme sincerity and deep sense of appreciation I thankfully acknowledge Dr Abhaya and my children Dr Kanupriya and Dr Mohit, Dr Arjun and Dr Cheena for giving valuable suggestions in various sections.

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I would welcome any valuable suggestions and feedback or queries for further improvement at ashokkiran\_bly@yahoo.com

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## Section

# 1

## Instruments for Examination in Obstetrics and Gynecology

### SIMS SPECULUM

*Designed by Marion Sims*

It is a **nonsel-retaining vaginal speculum** used in vaginal examination and operations to retract posterior vaginal wall (sometimes lateral or anterior wall) and view vagina and cervix.

#### ■ Types

- Metallic speculum: It needs external light source
- Plastic speculum: It may be equipped with a light source.

#### ■ Sizes

- Small for nulliparous, virgins and adolescents
  - Large for parous woman
- Used according to vaginal length and cavity.

#### ■ Parts

##### Blades

At an angle to shaft and point towards same side. Different sizes are used for different sizes of vagina. Each valve (blade) is rounded at the end so the instrument is atraumatic (Fig. 1.1).

Lubricant: Water-based jelly is preferred.

##### Groove

For drainage of secretions by slightly tilting the instrument and collection of specimen from vagina.

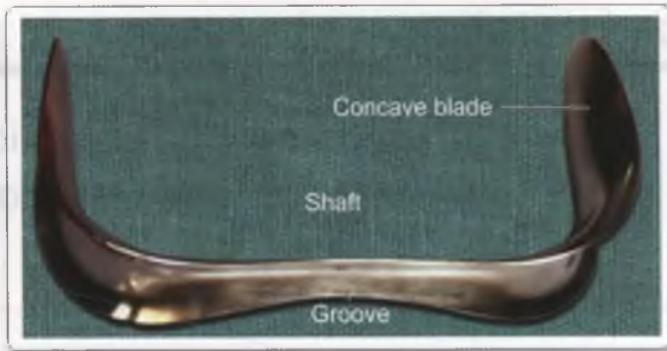


Figure 1.1: Sims bivalved vaginal speculum

## ■ Technique

### Position

Lithotomy by edge of table / Sims position.

### Method

Wear gloves. Appropriate size of the speculum is taken. Lubricate speculum (except in Pap smear). Labia minora are gently separated and urethra is identified prior to insertion. Speculum is inserted well below the meatus because of urethral sensitivity. To improve comfort with speculum examination the woman is asked to relax posterior wall muscles. Sims speculum should not be inserted with blades in line with cleft of the vulva and then rotated in vagina because it is designed for “direct” application. In any case vagina is wider from side to side than from front to back, so Sims speculum is introduced directly posteriorly to its full length for inspection of cervix.

## ■ Uses

To retract vaginal wall and speculate vagina and cervix.

### Uses in gynecology

1. P/S (per speculum examination) in gynecology
  - Inspect cervix for growth, erosion, discharge
  - Inspect vagina for vaginitis, cystocele, rectocele, enterocele, VVF
2. Perform minor procedures on the cervix

- Cervical biopsy, conization of cervix
  - Cervical tear stitching
  - Polypectomy
  - Dilatation of cervix.
3. Perform procedures on the uterus
    - Dilatation and curettage (D and C)
    - Endometrial biopsy (EB)
    - Intrauterine contraceptive device (IUCD) insertion.
  4. Major gynecological operations
    - Vaginal hysterectomy
    - Fothergill's repair
    - Anterior colporrhaphy and posterior colpoepineorrhaphy
    - VVF (vesicovaginal fistula) repair.
  5. Diagnostic procedures
    - Hysteroscopy
    - Hysterosalpingography, sonosalpingography
    - Tubal insufflation
  6. Collection from vagina
    - Cytology, staining, culture
    - Three swab test.

### Uses in obstetrics

1. P/S (per speculum examination) in obstetrics
  - Discharge
  - Leaking
  - Bleeding in APH (antepartum hemorrhage), abortions, PPH (postpartum hemorrhage) to diagnose traumatic PPH and repair tears.
2. Performing procedures
  - Medical termination of pregnancy (MTP)
  - Dilatation and evacuation (D and E).
3. McDonald stitch, Shirodkar stitch.

### ■ Advantage

Good view.

### ■ Disadvantages

- Assistant is required to hold the speculum
- Cannot visualize the cervix without anterior vaginal wall retraction.

## CUSCO'S SPECULUM

*Devised by Cusco Edward Gabriel.*

It is a **self-retaining vaginal speculum**.

### Types

- Metallic
- Plastic.

### Sizes

- Small
- Large.

### Parts

#### Blades

- Two blades are shaped like the beak of a duck
- Blades can be opened up and fixed at the required angle by an adjustable arrangement (Fig. 1.2).

#### Handle

- It is at right angle to the blades. When handle is closed blades will open
- Screw mechanism on handle makes it self-retaining.



**Figure 1.2:** Cusco's bivalved self-retaining speculum

## ■ Technique

### Position

Dorsal / Lithotomy.

### Method

It is same as in Sims speculum. Wear gloves. Appropriate size of speculum is taken. Lubricate speculum (except in Pap smear). Prior to insertion, labia minora are gently separated and urethra is identified and it is **inserted with closed blades** in vagina. When speculum is inserted completely it is angled approximately 30° downward to reach the cervix. Uterus lies in anteverted position commonly and ectocervix lies apposed against posterior vaginal wall. As speculum is opened ectocervix is visualized. The fixation screw is tightened depending on the amount of exposure needed, then it is unscrewed and blades closed when speculum is taken out (if the cervix is pointing forwards, the uterus is retroverted and if it pointed backwards it is anteverted).

## ■ Uses in gynecology and obstetrics

1. P/S examination: An important examination in obstetrics and gynecology
  - To visualize the cervix for erosion, discharge and growth
  - To visualize vaginal fornices.
2. Perform minor operations on the cervix
  - Biopsy
  - Cautery
  - Polypectomy.
3. Collect vaginal pool material and scraping for cytological study
4. IUCD follow-up and removal
5. Colposcopy.

## ■ Advantages

- Ideal for visualization and operations on cervix
- Self-retaining, so no assistant is required
- It can be used in patients who cannot be put in lithotomy position.

## ■ Disadvantage

- Limited view of vagina as anterior and posterior walls cannot be visualized.

## AUVARD SPECULUM

It is **self-retaining vaginal speculum**.

It is a heavy instrument with a heavy metal ball.

### ■ Parts

- Blade
- Groove: A channel is provided on the handle to collect the blood and drain (Fig. 1.3).
- Heavy metal ball: Which makes it self-retaining.



Figure 1.3: Auvard vaginal speculum

### ■ Technique

- Position: Lithotomy
- Method: Same as in Sims speculum.

### ■ Uses

It is used to retract posterior vaginal wall in

1. Operations on vagina, cervix and uterus, e.g. vaginal hysterectomy.
2. Anterior colporrhaphy, VVF repair.

### ■ Advantages

Advantages of Sims and Cusco's speculum combined.

- Good view of vagina
- Self-retaining.

### ■ Disadvantages

- Prolonged use causes postoperative perineal pain.
- Used when operation is done under anesthesia.

## SIMS ANTERIOR VAGINAL WALL RETRACTOR

This instrument is used along with Sims speculum to retract the anterior vaginal wall.

### ■ Parts

- A long instrument with shaft and oval fenestrated ends.
- Two loops are set at an angle of  $15^\circ$  with the shaft which face in opposite directions (Fig. 1.4).

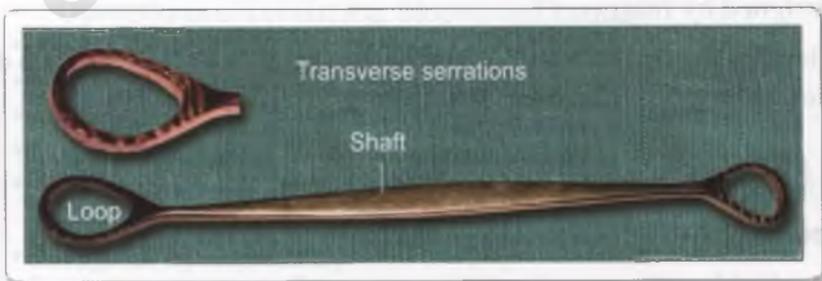


Figure 1.4: Sims anterior vaginal wall retractor

- Transverse serrations on loop prevent slipping of instrument and fits into rugosities of vagina.

It is differentiated from uterine curette by following points:

- It is larger in size.
- Oval loops have transverse serrations.

### ■ **Technique**

- Used along with Sims speculum.
- Instrument is used to retract anterior vaginal wall with the angle at oval end facing upwards.
- Can be used to retract sagging vaginal wall for good exposure of the cervix.

### ■ **Uses**

- To visualize the cervix in obstetrical and gynecological operations.
- In postpartum hemorrhage just after delivery as blunt curette to remove products of conception and membranes.

## VULSELLUM

---

*Designed by Teals*

It is a long instrument which can be applied to the anterior lip or the posterior lip of cervix. Usually it is 20 cm in length.

### ■ **Parts**

#### **Teeth**

Interlocking sharp teeth which ensure a firm grip on cervix when it is locked (Fig. 1.5).

## Blades

Blades have a curve so that field of vision is not blocked during the procedure. Distance in between blades prevent crushing of tissues held in between them. The instrument gives a firm grip on the cervix and pulling cervix **straightens uterocervical canal** so that chances of perforation are reduced.



Figure 1.5: Teal's vulsellum

## ■ Technique

Vaginal exposure is done by retracting vaginal walls using Sims speculum and Sims anterior vaginal wall retractor.

Anterior lip of the cervix is grasped with the teeth of vulsellum and the instrument is locked. The curve should face upwards.

## ■ Uses

### Uses in gynecology

1. To catch the anterior lip of cervix for surgical procedures
  - Operations of cervix, e.g. biopsy and cautery
  - Cryosurgery
  - D and C (dilatation and curettage)
  - IUCD insertion
  - Drainage of hematometra and pyometra
  - Fothergill's operation to hold the new cervical stump after amputation
  - Vaginal hysterectomy
  - To test degree of descent of uterus by giving traction with vulsellum in case of prolapse.

2. To catch the posterior lip of cervix
  - Aspirating pus in pelvic abscess, i.e. posterior colpotomy
  - Aspirating blood in ectopic pregnancy, i.e. culdocentesis
  - Fothergill's operation
  - Vaginal hysterectomy
  - If growth on the anterior lip of the cervix then catch the posterior lip of cervix.
3. To hold uterine fundus during abdominal hysterectomy.
4. To give gentle traction on fetal head after craniotomy or the collapsed head in IUD baby.
5. To remove polyps by twisting.

### **Use in obstetrics**

- To catch the cervix in pregnant patient, e.g. MTP, S and E, D and E.

### **Disadvantages**

Cervical trauma and bleeding. The cervix is soft in pregnancy so sponge holding forceps is used to hold cervix instead of vulsellum.

---

## **TENACULUM**

It is used in the nulliparous cervix in place of vulsellum.

### **Parts**

It can be differentiated from vulsellum by following points:

- Straight instrument and not curved as vulsellum
- Single tooth is present

- Grip is more secure than vulsellum because its bite is deeper. Two blades have gap in between to prevent crushing of structure.

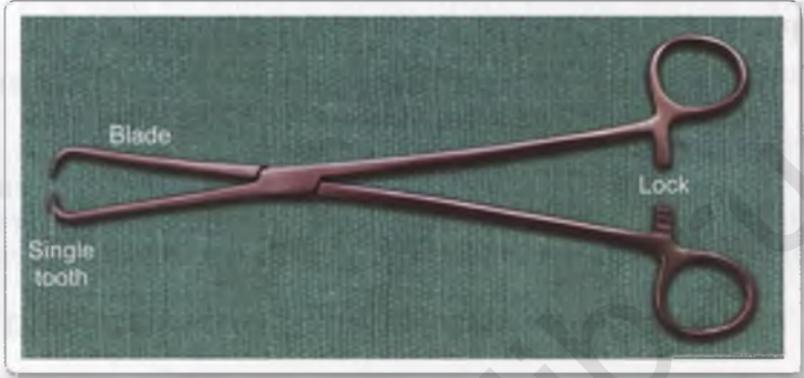


Figure 1.6: Jarcho's tenaculum

### ■ Technique

- Retract anterior and posterior vaginal walls for exposure of the cervix
- Anterior lip of the cervix is held with a tenaculum (Fig. 1.6).

### ■ Uses

- To hold the anterior lip of the cervix / posterior lip of cervix in place of vulsellum
- In **nulliparous**, to hold the cervix in sonosalpingography (SSG), hysterosalpingography (HSG) and chromopertubation during laparoscopy.
- To hold cervix in cryosurgery or cautery of cervix.

### ■ Advantage

Better for nulliparous cervix because it occupies less space.

### ■ Disadvantages

- Cervical tears are greater than in vulsellum as the bite is deeper
- Discomfort or pain.

## UTERINE SOUND

*Designed by Simpson.*

### Parts

- It is 30cm long angulated instrument with handle at one end and a rounded blunt tip at the other end.
- It has graduations in inches or centimeters (Fig. 1.7).
- The angle accommodates for flexion of uterus and prevents perforation as it fits into the anteverted or retroverted uterus.
- Angulated at 7cm from the tip (which is the normal uterocervical length).
- Blunt tip does not cause injury when introduced.



Figure 1.7: Simpson uterine sound

### Technique

#### Uterine sounding

- Bimanual examination.
- Retract anterior and posterior vaginal walls for exposure of the cervix.
- Anterior lip of the cervix is grasped with vulsellum.
- Uterine sound is held as a "Pencil" with thumb and two fingers.
- Sound is guided slowly through cervical os into the uterine cavity and to fundus.
- The distance from the fundus to external os is measured by score marks (graduations) along the length of sound.

### Uses

- It confirms the direction of uterus, i.e. anteverted or retroverted.
- It measures uterine cavity and cervical length, i.e. uterocervical length.

- It is used to diagnose cervical stenosis and congenital malformations, e.g. bicornuate uterus.
- Used as first dilator prior to operations on uterus and cervix, i.e. D and C, S and E.
- It is used to sound a polyp, IUCD, uterine septum called sounding of the uterus.
- It helps to break the adhesions in Asherman's syndrome (therapeutic use).
- It differentiates between chronic inversion and fibroid polyp.
- In a misplaced IUCD, uterine sound can be inserted and X-ray of pelvis is taken in AP and lateral view. Position of IUCD in relation to sound shows that IUCD has perforated uterus.

### ■ Disadvantage

Perforation: If direction or size of the uterus is misjudged, perforation is suspected when instrument travels deeper than the measured uterine length.

### ■ Contraindications

- Pregnancy
- Infection.

## BLADDER SOUND

It is a long instrument similar to uterine sound.

### ■ Parts

It is differentiated from uterine sound by following points:

- Shorter in length

- No graduations are present (Fig. 1.8)
- The tip is more blunt and so it is atraumatic.
- The angle is at a lesser distance from the blunt tip.

It is an obsolete instrument used for exploring the interior of a bladder to detect stones by sounding because now noninvasive procedures are available like radiography and ultrasonography.



Figure 1.8: Bladder sound

### Uses

- To define the limits of bladder in vaginal surgeries
- Used as a urethral dilator in urethral stenosis
- To diagnose bladder injury in gynecological operations.

## PINARD'S STETHOSCOPE

(Fetoscope)

- Invented by Adolphe Pinard.
- Instrument to hear fetal heart sound.

### Parts

- Simple hollow tube with one broad end and another narrow end (Fig. 1.9).



Figure 1.9: Pinard's stethoscope

- Narrow end has a wide rim which is used as an earpiece.
- Broad end is placed over the patient's abdomen.

#### ■ Technique

- The instrument is kept at right angle on patient's abdomen.
- The instrument should not be touched with hand while listening to FHS.

It is rarely used now since use of stethoscope and digital fetal Doppler.

## **STETHOSCOPE AND DIGITAL FETAL DOPPLER**

These instruments are to hear FHS with high acoustic sensitivity.

Stethoscope has ear tips with ear tubes set to accommodate the anatomy of the ear (Fig. 1.10).

Digital fetal Doppler has display to give read out of fetal heart rate (FHR) in beats per minute (bpm) (Fig. 1.11).

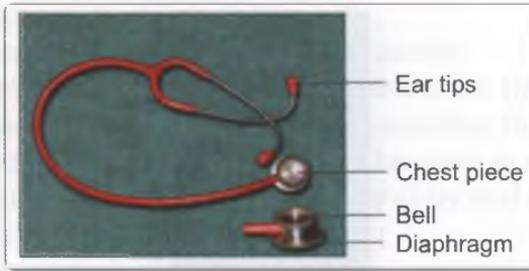


Figure 1.10: Stethoscope

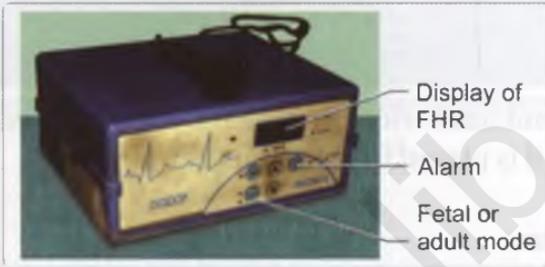


Figure 1.11: Digital fetal Doppler

### Auscultation

The fetal heart is auscultated for **one minute** (normal 110–160 bpm) NICE guidelines. During labor fetal heart rate should be auscultated during and immediately after uterine contraction to detect late deceleration.

- Low-risk pregnancy
  - Auscultation in—1st stage labor: 30 minutes interval
  - 2nd stage labor: 15 minutes interval.
- High-risk pregnancy
  - Auscultation in—1st stage labor: 15 minutes interval
  - 2nd stage labor: 5 minutes interval.

## Section

# 2

## Instruments for Dilatation, Curettage and Evacuation

### HEGAR'S DILATORS

These are curved double ended dilators with conical tips used to dilate endocervical canal and internal os rapidly.

#### Types

- Metallic
- Plastic.

#### Sizes

- Size increases gradually ranging from diameter of few millimeters to more than 2 cm. Number of dilators are according to diameter of the shaft. Each double ended dilator has two sizes with a difference of 0.5 mm (Fig. 2.1).

#### Parts

- Solid rod which is curved near the tip.



Figure 2.1: Hegar's dilators

- Tip is tapered. The dilating portion is within terminal 1.5 cm of dilator.

### ■ Technique

- Consent
- Patient preparation. Empty bladder.

### ■ Steps

1. Anesthesia and patient positioning
  - GA or paracervical block
  - Dorsal lithotomy positionBimanual examination.
2. Uterine sounding is done after retraction with speculum and holding cervix with vulsellum. Sounding confirms size and direction of the uterus.
3. **Uterine dilatation:** Hegar's dilator is held as in pen holding manner in right hand by thumb and first two fingers, while fourth and fifth fingers and heel of hand (ulnar border) rests on perineum and buttock. This prevents injury from sudden and excessive dilatation (Fig. 2.2).

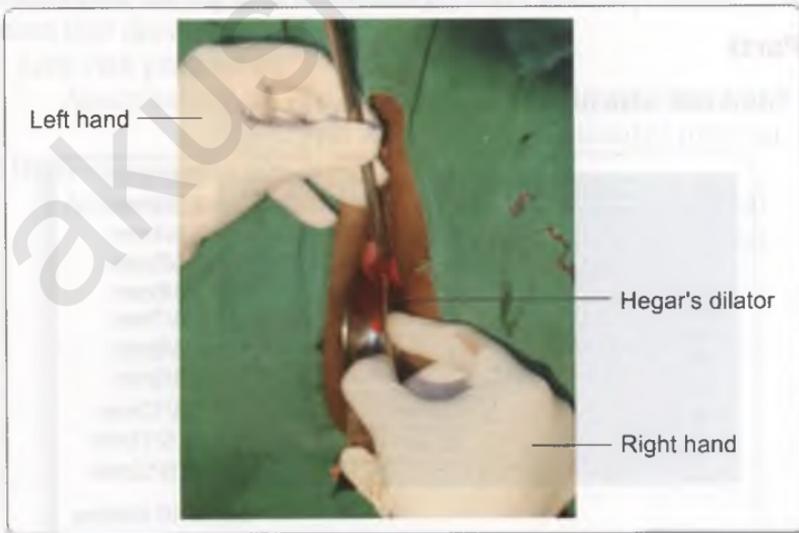


Figure 2.2: Method of cervical dilatation

- The right and left hand provide traction and counter traction so that the amount of pressure is controlled while dilating the cervical os.
- Each dilator is gently and gradually advanced through the internal os.
- Serial dilatation continues until cervix admits the selected curette.
- Tip is directed anteriorly or posteriorly according to direction of the uterus whether it is anteverted or retroverted.
- For MTP the dilatation required depends on size of pregnancy in weeks, i.e. for 6 weeks pregnancy the size of dilator required is no. 6.

## ■ Uses

### Uses in gynecology

- Prior to curettage (commonest), D and C and polypectomy.
- Prior to hysteroscopy.
- Acquired or congenital cervical stenosis. To prevent cervical stenosis following Manchester operation for prolapse of uterus and following conization.
- To drain hematometra, pyometra.
- Smaller sizes can be used as urethral dilator in stricture.
- Prior to removal of embedded intrauterine contraceptive device dilator no. 4 / no. 5 is used.
- Prior to breaking uterine adhesions in Asherman's syndrome.
- To diagnose incompetent os, if no. 8 dilator goes easily in the internal os of the cervix in nonpregnant patient.
- Prior to insertion of radium into the uterine cavity in cancer cervix and endometrial cancer.
- Dysmenorrhea.

### Uses in obstetrics

- D and E, MTP, incomplete abortion, missed abortion, vesicular mole.
- Drain lochiometra.
- Retrograde dilatation in elective cesarean section.

### ■ Advantages

- The angle makes the instrument less traumatic.
- The increasing sizes of dilators make cervical canal patulous by gradually stretching the muscle and fibrous tissue of the cervix.

### ■ Disadvantages

Complications are few and rare

- Vasovagal shock due to forceful dilatation.
- Injury: Cervical tear and laceration, false passage.
- Uterine perforation occurs mainly in soft uterus, i.e. pregnant uterus, in atrophic postmenopausal or scarred uterus and can also occur in malignant uterus. In acute anteflexion the dilator can perforate posteriorly and when retrodisplacement exists, the perforation usually occurs anteriorly. When dilator goes further in **without resistance** beyond measured length of uterine cavity then perforation is suspected.
- Hemorrhage.
- Infection.
- Injury to bladder and intestine.
- Late: Cervical incompetence (due to excessive dilatation) and cervical stenosis.

---

## UTERINE CURETTE

---

It is a long double ended instrument.

### ■ Sizes

Different sizes of loops from a few millimeters to few centimeters are available.

## ■ Parts

The terminal ends are oval loops. They are angled to the shaft.

It is differentiated from anterior vaginal wall retractor by following points:

- It is smaller
- Oval loops are sharp and blunt without transverse serrations.
- **Sharp** end has smaller loop and is used in gynecological conditions.
- **Blunt** end has larger loop and is used in obstetrics (Fig. 2.3).



Figure 2.3: Blakes blunt and sharp uterine curette

## ■ Technique

- Consent
- Patient preparation. Empty bladder
- Injection atropine is given to prevent vasovagal attack.

## ■ Steps

1. Anesthesia and patient positioning
  - GA or sedation with a paracervical block with 1% lignocaine, 5 to 10ml at 3 and 9 O' clock position.
  - Lithotomy position
  - Bimanual examination.
2. Uterine sounding
  - After retracting vagina with speculum and holding cervix with vulsellum confirm the size and direction of the uterus.
3. Uterine dilatation
  - Done with dilators depending on size of curette to be inserted and indication of operation starting from no. 3 to no. 10.

#### 4. Uterine curettage

- Uterine curette is introduced with tip facing anteriorly if uterus is anteverted and posteriorly if uterus is retroverted to avoid perforation. Curette is advanced to fundus following the long axis of corpus. Pressure is exerted gently but firmly against endometrium as curette is pulled towards internal cervical os lengthwise. Posterior surface is curetted followed by anterior and then left and right lateral surface and finally fundus. Action of curette is gentle one with curette lightly held in first three fingers and thumb of right hand.
- Curetted endometrial sample is collected on swab placed just under posterior lip of cervix in posterior fornix. Tissue is sent for HPE in 10% formalin and AFB culture in saline as required. The angulation between loop and shaft helps in easy removal of uterine contents without causing injury to uterus.  
Normal endometrium is pink and healthy.  
Profuse, pale looking friable tissue suggests malignancy.

**Hysteroscopy directed biopsy and curettage is a more accurate procedure.**

#### Uses in gynecology

Sharp end of curette is used.

1. Dysfunctional uterine bleeding (DUB) for hormonal pattern.
2. Secondary amenorrhea: To detect tubercular endometritis. Optimum results are obtained from endometrial samples curetted from cornua of the uterus as tuberculosis is a descending infection and cornual end is the first part of the uterine cavity to be affected.
3. Postmenopausal bleeding: To rule out endometrial cancer.
4. Endometrial cancer: To study the endocervical tissue and the extent of spread. This helps in staging and deciding treatment.

For **fractional curettage** three specimens are taken and sent in labelled vials.

- Undiluted cervical canal: Endocervical curettage(ECC).
- Dilated cervix just above the internal os from isthmic region.

- From uterine cavity (4 walls, i.e. anterior, lateral, posterior and fundus).

Involvement of endocervical lining places malignancy in stage II of the disease.

5. Infertility: Till now D and C was performed premenstrually to detect if ovulation has occurred or not. Proliferative endometrium indicates nonovulation and secretory endometrium indicates ovulation. Now D and C is replaced by ultrasound for monitoring ovulation except in tubercular endometritis where endometrial tissue is sent in saline for AFB culture and PCR.  
The corpus luteal phase defect is diagnosed if endometrial histology lags behind by 2 days of menstrual date.
6. A menopausal woman on hormonal replacement therapy for endometrial hyperplasia and cancer.
7. A woman on tamoxifen therapy for breast cancer must have curettage 6-monthly for the diagnosis of endometrial hyperplasia and cancer.
8. Diagnosis of choriocarcinoma.
9. Treatment of Asherman's syndrome to break adhesions.
10. After removal of polyp and prior to myomectomy.

### Uses in obstetrics

**Blunt end** of the instrument is used for (check curettage)

1. Incomplete abortion, missed abortion
2. Evacuation of hydatidiform mole
3. MTP (medical termination of pregnancy)
4. PPH for retained products of conception

### ■ Disadvantages

Complications are less than 1%

- Infection
- Perforation
- Cervical injuries
- Hemorrhage
- Asherman's syndrome leading to amenorrhea and placenta praevia with over enthusiastic curettage as it damages the decidua basalis layer

- Infertility
- Ectopic pregnancy due to PID
- Rupture uterus during subsequent pregnancy or labor.

### ■ Contraindications

- Suspected pregnancy
- Genital tract infection
- In acute endometritis and salpingitis curettage should be avoided
- Removal of the infected placental tissue is preceded by parenteral antibiotics
- Pyometra.

## ENDOMETRIAL BIOPSY CURETTE

It is a long tubular instrument used for endometrial biopsy.

### ■ Parts

- Hollow and blunt tipped instrument
- The tip has a whistle subterminally which is notched and has cutting edge
- The instrument is angulated about 5cm from tip for easier introduction in the uterine cavity (Fig. 2.4)
- Stilette is for removing biopsy tissue.

### ■ Technique

1. OPD procedure
  - Consent
  - Patient preparation. Empty bladder.



Figure 2.4: Randall's endometrial biopsy curette

### Steps

1. Anesthesia is not required.
  - Bimanual examination
  - Sedation is given.
2. Uterine sounding:
  - After retracting vagina with speculum and holding the cervix with vulsellum, confirm the size and direction of the uterus.
  - The cervix is not dilated.
3. Uterine curettage
  - Endometrial biopsy curette is inserted according to position of the uterus whether anteverted or retroverted.
  - Uterine wall is curetted and 10ml syringe is attached to create negative pressure to suck out endometrial tissue. During withdrawal of instrument pressing against the uterine wall a strip of endometrium is removed.
  - The tissue is sent for HPE and AFB culture.

### Uses

- Diagnosis of DUB
- Diagnosis of corpus luteum insufficiency: Biopsy is taken on  $D_{21-24}$
- Diagnosis of anovulation: Biopsy is taken on  $D_{21-28}$  and if cycles are irregular biopsy on  $D_1$ .

Endometrial biopsy for diagnosis of tuberculosis is done in late premenstrual phase as tubercles are present in superficial layers and are shed during menstruation.

### Disadvantages

- Perforation

- Infection.

Endometrial biopsy is not adequate for diagnosis of endometrial cancer or endometrial tuberculosis because the strip of endometrium taken does not reveal entire endometrium.

## PIPELLE

It is a flexible plastic endometrial sampling device.

### ■ Parts

- Outer tube measures 3.1 mm in diameter.
- Inside tube is closely fitted rod which when withdrawn creates a vacuum which sucks endometrium sufficient enough to give a histological report (Fig. 2.5).



Figure 2.5: Pipelle

### ■ Technique

- OPD procedure.
- Anesthesia is not required.
- Office endometrial biopsy can be taken.
- There is no need of syringe to develop a negative pressure.
- There are markings on the device to allow measurement of uterine depth.

- Pipelle stilette is retracted so that suction pressure is created and now the hollow tube is withdrawn to internal cervical os and then advanced back to fundus several times.
- Slow withdrawal from the uterine cavity causes sufficient suction to obtain an adequate endometrial specimen.

### ■ Use

Used for pipelle sampling of endometrium.

### ■ Advantages

- Easy
- No admission / no anesthesia required.

### ■ Disadvantages

- Difficulty in introducing in the postmenopausal female
- Inadequate specimen as endometrial surface area sampled is small and can miss polyps and endometrial carcinoma.

## OVUM FORCEPS

*Designed by Haywood Smiths.*

### ■ Parts

#### Blades (Fig. 2.6)

- Blades are spoon-shaped, fenestrated and have blunt ends
- Longitudinal fenestrations can hold good amount of tissue.

## Lock

1. It is **absent**.
2. Anything held in blades is firmly caught but not nipped and so no crushing.

Ovum forceps is differentiated from sponge holding forceps by following points:

- It has no lock
- It has no serrations

Catch lock is absent so less chances of injury to intra-abdominal structures.

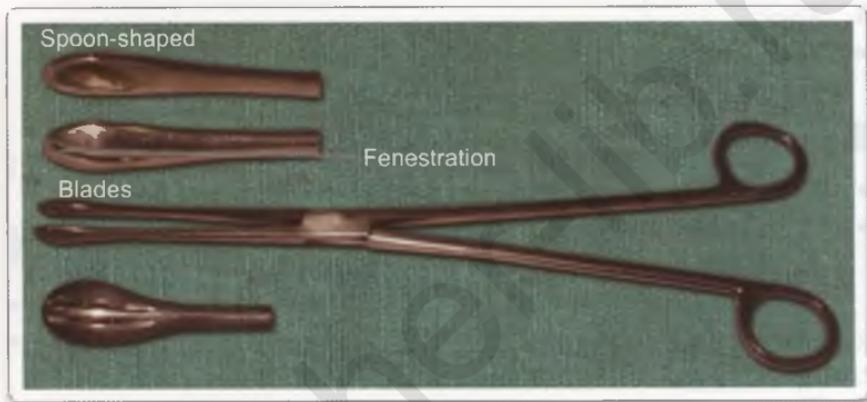


Figure 2.6: Haywood Smith's ovum forceps

## Technique

- Consent
- Patient preparation. Empty bladder
- Anesthesia LA / GA.

## Method

- Retract posterior and anterior vaginal wall and catch cervix by vulsellum.
- Os is dilated with Hegar's dilators.
- Ovum forceps is introduced with closed blades.
- Once in uterine cavity blades are opened and products of conception are grasped and removed by rotatory movements.

### ■ Uses

- Evacuation of products of conception in abortion and vesicular mole.
- Evacuation of products of conception in secondary PPH.

### ■ Advantage

- No catch ratchet so no crushing action.

### ■ Disadvantages

- Perforation
- Infection
- Injury to intra-abdominal structure.

## **KARMAN DOUBLE WHISTLE CANNULA, KARMAN MENSTRUAL REGULATION SYRINGE AND MANUAL VACUUM ASPIRATION SYRINGE**

### ■ Karman cannula

A long tubular structure made of plastic or metal.

#### ■ Types:

Rigid or flexible

#### ■ Sizes:

4–12mm

#### ■ Parts

- Distal end: Double whistle at the terminal end.
- Proximal end: Fixes into syringe.
- Superior overhanging edge acts as a curette (Fig. 2.7).

The number of cannula corresponds to diameter of cannula

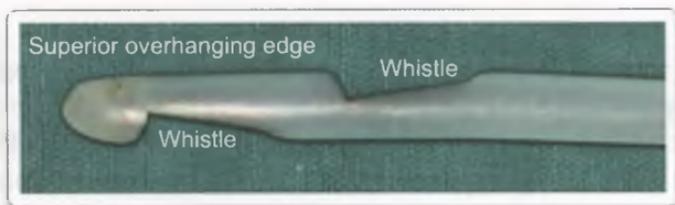


Figure 2.7: Cannula

in millimeters. A plastic cannula is preferred because it is less traumatic, transparent and disposable.

■ **Karman menstrual regulation syringe (MR syringe) (Fig. 2.8)**

Used for aspiration of uterine contents within 42 days of missed period.

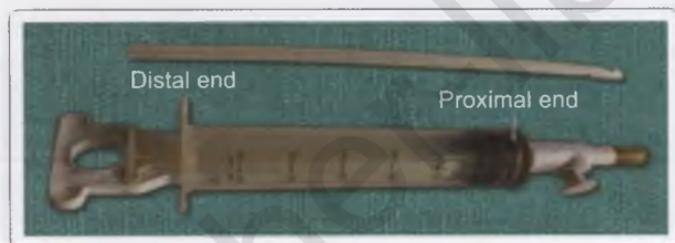


Figure 2.8: MR syringe

■ **Manual vacuum aspiration syringe (MVA syringe) (Fig. 2.9)**

For aspiration of uterine contents till 12 weeks. Superior version of MR is MVA.



Figure 2.9: MVA instruments

## WHO recommends MVA a procedure of choice before 10 weeks and safely upto 12 weeks

### Syringe

60 ml syringe capable of creating vacuum of 650 mm (65 cm) of Hg. It has a barrel and a piston. There is a pressure controlled valve system. When the lock is pressed and piston pulled out a negative pressure is created in syringe (Figs 2.10 and 2.11).



Figure 2.10: Syringe locked



Figure 2.11: Vacuum created

### Method

1. Bimanual examination (Fig. 2.12A)
2. Retract vagina and hold anterior lip of cervix (Fig. 2.12B)
3. Paracervical block (Fig. 2.12C)
4. Bubbles appear: End point (Fig. 2.12D)
5. Inspection of products of conception (Fig. 2.12E).

### Preoperative medical evaluation, tests and examination

- History and physical examination
- Ultrasound is not necessary
- Laboratory tests
  - Hb%, urine R/M, blood group Rh typing is done
  - HIV and chlamydial testing is not mandatory
- Inj Atropine 0.6 mg IM half an hour before procedure
- Inj Tetanus toxoid 0.5 ml IM
- Prophylactic antibiotic
- Counseling for contraception.



**Figure 2.12A:** Bimanual examination



**Figure 2.12B:** Retract vagina and hold anterior lip of cervix



**Figure 2.12C:** Paracervical block



**Figure 2.12D:** Bubbles appear: End point



**Figure 2.12E:** Inspection of products of conception

## Technique

- Informed consent and patient preparation. Empty bladder.
- Bimanual examination for size and position of uterus.

## Steps

1. Anesthesia and patient positioning
  - Sedation with paracervical block with 1% lignocaine 5 to 10 ml at 3 and 9 O' clock.

- General anesthesia can be given.
- Lithotomy position.

## 2. Cervical dilatation

- Anterior and posterior vaginal walls are retracted. Anterior lip of cervix is steadied with vulsellum and traction on the cervix is important to straighten uterocervical canal. Cervical os is dilated with increasing number of Hegar's dilators.
- Cannula is inserted and diameter of cannula in millimeters must be about 1 less than the weeks of gestation from last menses, i.e. 6 mm cannula is adequate for evacuating a pregnancy of 7 weeks gestation. **No touch** technique is used.

## 3. Suction and evacuation

- Vacuum is created into syringe.
- Cannula is inserted upto the lower segment of the uterus and charged syringe is attached to it.
- Pinch valve is released and contents of the uterus are sucked by vacuum aspiration with rotatory and to and fro movements of cannula. A standard negative suction of 650 mm (65 cm) of Hg is adequate.
- Syringe and cannula are disconnected. Only thereafter the cannula is removed as to avoid endocervical canal aspiration.
  - Inj. Methergin is given 0.2 mg IV. Inj Anti D is given if required.
  - Check curettage is done. Sharp curettage is an obsolete method.
- End points: (that the procedure is complete)
  - Uterus grips the cannula
  - Bubbles appear
  - Bleeding stops and products of conception stop coming out
  - Gritty feel on check curettage.
- Failure to evacuate
  - Too early pregnancy
  - Ectopic pregnancy
  - Uterus bicornuate
- Preoperative cervical dilatation
  - In case of large uterus 10–12 weeks misoprostol tablet 200–400 mcg per vagina is given 3–4 hours before the procedure. Laminaria tent can also be used.
- Aspirated contents are examined for

- Products of conception and hydatidiform mole
- At 9 weeks recognizable fetal parts can be seen. Chorionic villi are fluffy, finger-like feathery and decidua is coarse, shaggy and translucent. Amnion and chorion are filmy and transparent.

### Uses of cannula

- Medical termination of pregnancy (MTP)
- S and E in incomplete abortion, missed abortion
- S and E in molar pregnancy
- Cannula is used in draining CSF after craniotomy in hydrocephalus/dead baby
- Endometrial aspiration for endometrial pathology.

### Complications

#### *Immediate*

- Incomplete evacuation
- Continuation of pregnancy
- Uterine perforation
- Excessive bleeding
- Anesthetic complications, i.e. laryngospasm, vasovagal attack
- Infection.

#### *Late*

- PID and chronic pelvic pain
- Infertility caused by tubal infection and blockage
- Incompetent os following trauma to the cervix as this may lead to preterm births and habitual midtrimester abortions
- Adherent placenta in the subsequent pregnancy
- Asherman's syndrome
- Ectopic pregnancy following PID
- Rh isoimmunization if Anti D has not been administered after the MTP to nonimmunized Rh negative mother
- Psychiatric disorders if MTP was done without proper counseling and feeling of regret, especially if infertility follow-up procedure

Low failure rate < 1%

Mortality < 2/100,000 procedure.

Instrument tray for MTP (Fig. 2.13)



Figure 2.13: MTP set

- |   |                    |
|---|--------------------|
| 1. Sponge holder for cleaning             | 2. Speculum        |
| 3. Anterior vaginal wall retractor        | 4. Vulsellum       |
| 5. Manual vacuum aspiration (MVA) syringe | 6. Cannula         |
| 7. Hegar's dilators                       | 8. Uterine curette |
| 9. Sponge holder                          |                    |

Instrument tray for D and C (Fig. 2.14)

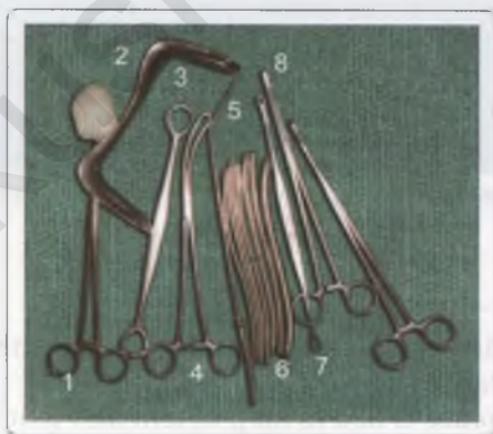


Figure 2.14: D and C set

- |                                    |                    |                  |
|------------------------------------|--------------------|------------------|
| 1. Sponge holder for cleaning      | 2. Speculum        |                  |
| 3. Anterior vaginal wall retractor | 4. Vulsellum       | 5. Uterine sound |
| 6. Hegar's dilators                | 7. Uterine curette | 8. Sponge holder |

## LAMINARIA TENT

Made up of hygroscopic material derived from the stems of seaweed called *Laminaria japonica*. It swells up by absorbing fluid (hygroscopic) and is a slow dilator of cervix.

### ■ Parts

- Stem is 5.5–6 cm
- Small, medium, large sizes are available according to the diameter
- A string is looped through one end and tied to gauze for easy removal (Fig. 2.15).

Two or three tents can be introduced side by side if required into the cervical canal.

Tents swell up 3–5 times of their size after absorbing secretions of cervical canal in 12–24 hours and dilate cervix.

Sterilized by dipping in absolute alcohol.



Figure 2.15: Laminaria tent

### ■ Technique

- Anterior and posterior vaginal walls are retracted
- Cervix is grasped by vulsellum
- Sterilized gauze is tied to loop of tent and tent is introduced in the cervical canal
- Tent is passed to lie just beyond the internal os
- 0.5 cm should be inside the uterus and 0.5 cm should be in the vagina
- The vagina is packed with sterile gauze.

### ■ Uses

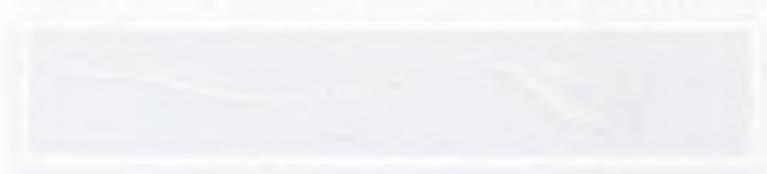
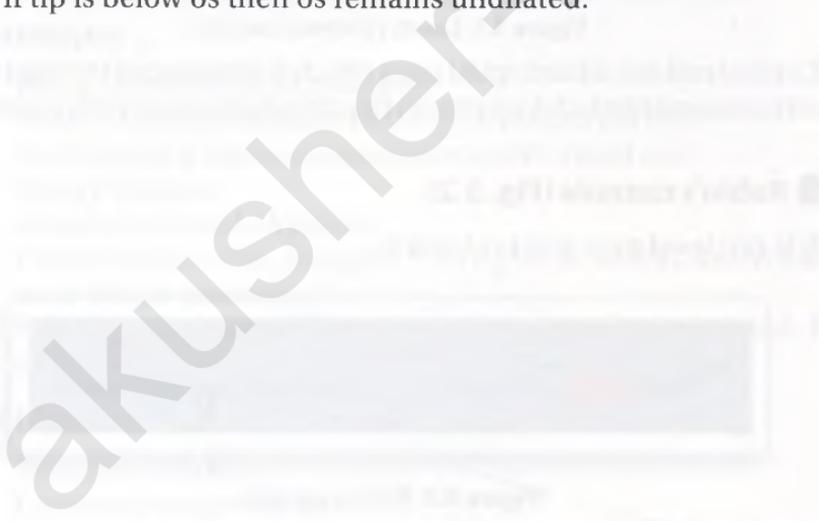
- First and second trimester pregnancy termination
- Expulsion of POC in missed abortion, incomplete abortion
- Induction of labor.

### ■ Advantage

Gradual os dilatation, so minimal chances of injury and incompetent os.

### ■ Disadvantages

- False passage during insertion
- May go up in the uterine cavity
- Dumb bell formation as it swells up unequally when placed too high
- If tip is below os then os remains undilated.



## Section

# 3

## Instruments for Tubal Patency Test

### INSTRUMENTS FOR TUBAL PATENCY TESTS

#### ■ Leech Wilkinson cannula (Fig. 3.1)



Figure 3.1: Leech Wilkinson cannula

Conical end has a fixed spiral cone which is introduced through external os and rotated clockwise so that tip advances in cervical canal.

#### ■ Rubin's cannula (Fig. 3.2)

It is not used now and is obsolete.

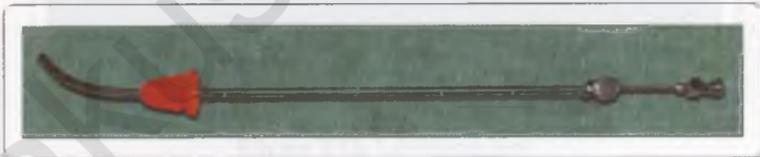


Figure 3.2: Rubin's cannula

#### ■ Foley catheter (Fig. 3.3)



Figure 3.3: Foley catheter

## Tubal patency tests

1. Hysterosalpingography (screening test)
2. Sonosalpingography (Sion test)
3. Laparoscopic chromopertubation (**best**)
4. Tubal insufflation test (outdated).

## Uses

- Leech Wilkinson cannula is used for hysterosalpingography, hydrotubation, chromopertubation during laparoscopy.
- Foley catheter is used for hysterosalpingography and sonosalpingography (Sion test).

## Hysterosalpingography

It is a radiological evaluation of uterine cavity and fallopian tubes after instillation of contrast media in fragmented dose through Foley catheter (Fig. 3.3) or Leech Wilkinson cannula (Fig. 3.1).

## Technique

- Place: Department of radiology
- Time: Preferable between D<sub>5</sub>-D<sub>10</sub> of menstrual cycle
- Contraindications of procedure must be ruled out
- Empty bladder
- Anesthesia is not required
- Premedication: Inj. Atropine 0.6 mg IM is administered half hour before procedure  
NSAIDS are given. This prevents cornual spasm and is analgesic.

## Method

- Position: lithotomy.
- Clean and drape the part.
- Bimanual examination is done to note size and position of uterus.
- Vaginal wall is retracted with speculum and cervix is held with Allis / Tenaculum.
- Introduce Leech Wilkinson cannula or Foley no. 8. If Foley catheter, inflate bulb to prevent leakage of contrast media. Speculum is removed and contrast media is injected under direct vision with fluoroscopic screen. There should be no air bubble and 15ml of media is adequate.

**Dye:** Water-soluble contrast media Diatrizolic acid (Trazograff / Urograffin 76%) is used.

Water-soluble dye is most widely used  
less chances of embolism  
less irritant to peritoneum  
less inflammatory reaction  
less adhesions  
less hypersensitivity reactions  
rapid absorption.

Oil-based dye is **not used**  
Disadvantage is  
more peritoneal reaction  
more pelvic adhesions  
more oil granuloma  
more painful.

- Screening should be performed in 10 minutes and not more than 30 minutes.
- Average radiation exposure to ovaries is 1–2 rads.



Figure 3.4: Preliminary film



Figure 3.5: Uterine filling



Figure 3.6: Peritoneal spillage

- Radiographic films: Minimum three films are required for complete study.
  - Preliminary film: Taken before injecting contrast media (control film) (Fig. 3.4)
  - Second film: Taken with uterine filling (Fig. 3.5)
  - Third film: Taken with peritoneal spillage (Fig. 3.6)

## Indications

- To study patency of tubes in infertility.  
Tubal anatomy, function, site of block is known.
  - If patent tubes:** The medium spills out of abdominal ostia and smears the adjacent bowel.
  - If blocked tubes:** Site of block is seen.

Hydrosalpinx: Large confined mass of dye without peritoneal spill is seen.

HSG is not done for diagnosis of genital tuberculosis.

Differential diagnosis of cornual block at HSG

- Tubal spasm
- Polyp
- Inspissated material.

## Confirmed by diagnostic hysteroscopy and laparoscopy

- To study uterine anomaly
  - Uterus bicornuate
  - Arcuate uterus
  - Septate uterus.
- To detect uterine synechias
  - In Asherman's syndrome uterine cavity is shrivelled and obliterated by adhesions. There can be honey combing.
- To detect uterine polyp / submucous fibroid, space occupying lesion
- Evaluate result of tuboplasty operation, i.e. tubal patency postoperatively
- To study internal os and cervical canal in habitual abortions. (length and funneling).

## Advantages

- Permanent record
- Shows exact site of block and pelvic pathology
- Enhancement of fertility.
  - 25–30% of salvage value and fertility enhancement is due to flushing and dislodgement of amorphous material (aggregate of histiocytes) that some times block fallopian tubes.

## Contraindications

- In presence of genital tract infection and bleeding per vaginum.
- Premenstrual phase (not done):
  - As may dislodge pregnancy
  - Can cause embolism

- Thick endometrium can sometimes prevent smooth flow of dye at cornual end
3. Suspected pregnancy: Avoid doing in postovulatory period
  4. Allergic to dye
  5. Genital tuberculosis.

### **Complications**

Safe procedure, inexpensive.

Complications are rare

- Ascending infection: If done in presence of genital infection
- Pelvic irritation and pain due to dye (chemical peritonitis)
- Pelvic endometriosis if HSG is done premenstrually or while women is bleeding
- Allergic reaction
- Pain and collapse: Vasovagal attack
- Uterine perforation.

### **■ Sonosalpingography (SSG)**

- Popularized by Gautam Allahabadia, et al. as “Sion Test”
- It is detection of tubal patency by ultrasonography.

### **Indications**

- Detection of submucous fibroid, polyp and intrauterine lesion
- Dysfunctional uterine bleeding to study endometrium and detect polyp
- Asherman's syndrome causing amenorrhea
- As a part of infertility investigation
- Repeat pregnancy losses (RPL) for uterine anomalies
- Prior to IVF
- Preterm labor.

### **Technique**

- Foley no. 8 is passed and bulb is inflated (3 ml) which lies above internal os and prevents leakage (Fig. 3.7).
- Under U/S guidance a slow injection of 200 ml of physiological saline is injected in uterine cavity.
- Flow of saline along tubes is visualized and observed spurting out from fimbrial ends (Fig. 3.8).



Figure 3.7: Foley catheter

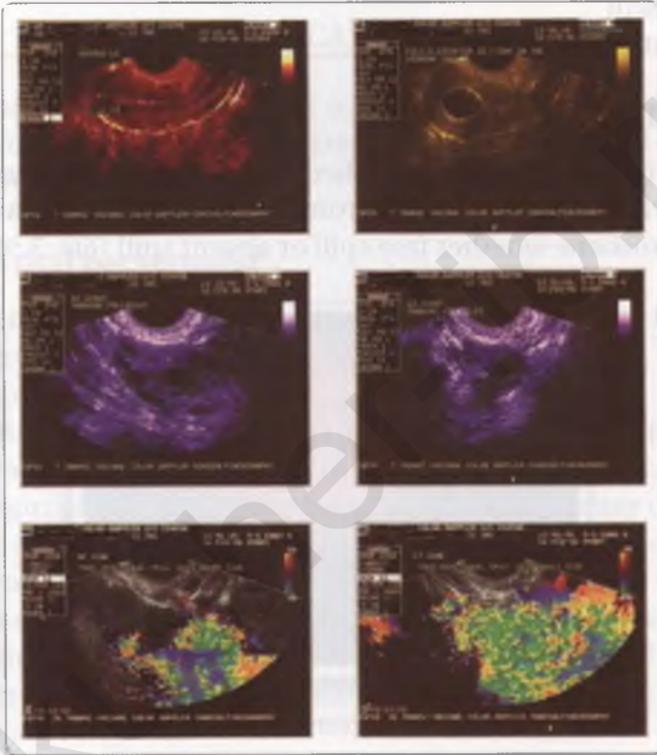


Figure 3.8: Sonosalpingography

### Interpretation

- The amount of fluid in pouch of Douglas is measured followed by injection of normal saline through Foley catheter. Increase in amount of fluid in POD indicates patency.
- Direct visualization of fluid spurting out from fimbrial ends like shower is called waterfall sign.

### Advantage

- Safe, easy and practical method.

## ■ Laparoscopic chromopertubation

It is laparoscopic visualization of pelvis, fallopian tubes and ovaries.

### Procedures

- Consent
- Anesthesia: GA.

### Method

- Methylene blue dye is pushed via cannula from cervix and appearance of spill of dye from fimbrial ends is visualized by laparoscope whether free spill or absent spill (Fig. 3.9).

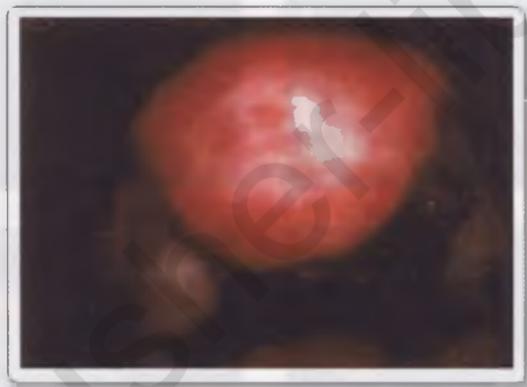


Figure 3.9: Chromopertubation

### Advantages

1. To verify findings of HSG, i.e. patency of fallopian tubes
2. External conditions: Peritoneal factors
  - Peritoneal adhesions
  - Unsuspected endometriosis.
3. Endoscopist can combined therapeutic procedure at the same sitting if adhesions or fimbrial block
4. Removal of hydrosalpinx and endometrioma excision
5. Prior to IVF procedure improves IVF results.

**Laparoscopy combined with hysteroscopy is gold standard in investigation for tubal infertility.**

## Instruments for Operative Vaginal Delivery

### OBSTETRICAL FORCEPS

A pair of instrument designed for operative vaginal delivery. It holds fetal head for speedy assisted instrumental vaginal delivery during second stage of labor.

#### ■ Historical background

- **Invention** is attributed to Chamberlaine family in England where technique was kept a secret for 100 years. Peter II Chamberlaine was inventor of obstetric forceps. In 18th century secret of forceps was first announced by Chapman.
- **Introduction of pelvic curve** was made by André Levret as straight blades could grip head only behind center of pelvic axis. Smellie introduced the shank and lock.
- **Introduction of axis traction device:** Stephane Tarnier introduced axis traction rod in 1877. Previously great force exerted by operator was lost by head being pulled against anterior pelvic wall. Detachable traction handle was devised by Haig Ferguson.
- **Introduction of rotational forceps** was made by Christian Kielland. This forceps has no pelvic curve and in 20th century is used only in low midpelvis for arrested occipitoposterior and occipitotransverse positions.
- **Introduction of piper forceps** was made by Edmund Piper for after coming head of breech.
- **Outlet forceps** was introduced by Wrigley in 1935.

#### ■ Anatomy of forceps (Fig. 4.1)

##### Blades (Two)

- Right and left (fenestrated)

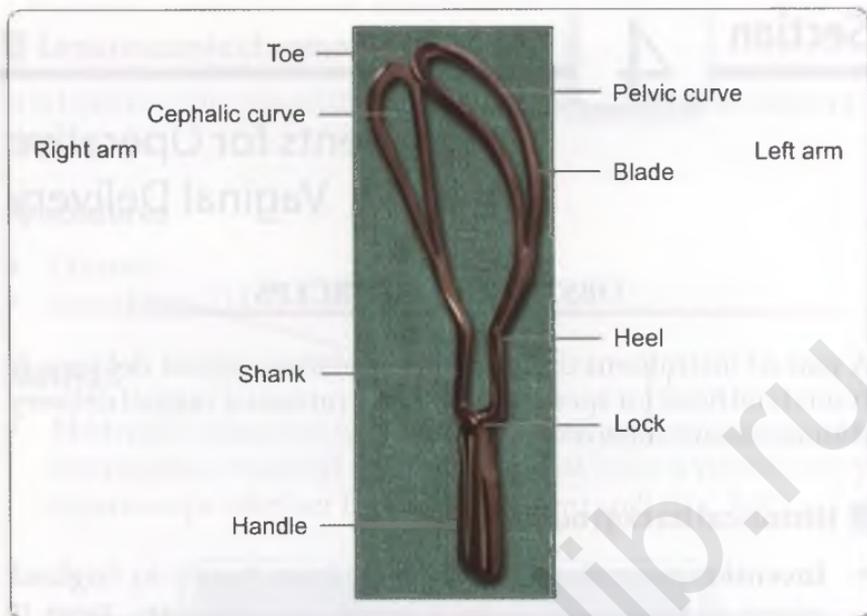


Figure 4.1: Anatomy of forceps

- Pelvic curve: Blades follow birth canal curve.
- Cephalic curve: Blades apply well to fetal head.

**Shank**

- Parallel or overlapping.

**Arm**

**Lock**

- Sliding type : Kielland forceps
- English type : Wrigley forceps.

**Handle**

■ **Classification of forceps deliveries**

The classification of American College of Obstetricians and Gynecologists (ACOG) 2002 for vacuum and forceps delivery emphasizes two important discriminators of risk for both infant and mother : **station** and **rotation**.

- Station is measured in centimeters, -5 to 0 to +5
- Deliveries are categorized as outlet, low and midpelvic procedures.
- High forceps is obsolete because instrument is applied above 0 station.

**Classification for operative vaginal delivery (ACOG 2000, 2002)**

(Classification is **same for forceps and vacuum** except that vacuum is used for traction and not for rotation).

Procedure	Criteria	Forceps used
<b>Outlet</b>	<ol style="list-style-type: none"> <li>Scalp is visible at introitus without separating the labia.</li> <li>Fetal skull has reached pelvic floor.</li> <li>Sagittal suture is in anteroposterior diameter or right/ left occiput anterior or posterior position.</li> <li>Fetal head is at or on the perineum.</li> <li>Rotation <math>&lt;45^\circ</math>.</li> </ol>	Wrigley forceps
<b>Low</b>	Leading point of fetal skull is at station $\geq +2\text{cm}$ and <b>not on pelvic floor.</b> <ul style="list-style-type: none"> <li>Rotation is <math>\leq 45^\circ</math></li> <li>Rotation is <math>&gt; 45^\circ</math>.</li> </ul>	Wrigley forceps
<b>Mid</b>	Between 0 and +2 cm.	Simpson forceps Anderson forceps
<b>High</b>	Not included in classification.	Kielland forceps

**Types of forceps**

- Long curved forceps with or without axis traction device
- Short curved forceps
- Kielland forceps.

**Types of application**

- Cephalic application: Forceps blades are applied directly in relation to fetal head in relation to biparietal diameter (BPD) and grip is occipitontal. It is **safe** and the grip causes **least injury** and compression effect on cranium.
- Pelvic application: Forceps blades are applied in relation to maternal pelvic wall and blades lie parallel to sides of pelvis irrespective to the position of head. The disadvantage is gross injury to fetal head.
- Cephalopelvic application: Ideal application. When pelvic and cephalic applications correspond to each other.

### ■ Indications of obstetrical forceps

- **Maternal** in 2nd stage of labor
  1. Cardiac disease
  2. Pulmonary injury or compromise
  3. Pregnancy induced hypertension
  4. Severe anemia
  5. Maternal exhaustion
  6. Chorioamnionitis.
- **Fetal** in 2nd stage of labor
  1. Nonreassuring fetal heart rate tracing: Fetal distress
  2. Cord prolapse if head is engaged

Other fetal causes: Prematurity.
- **Prolonged 2nd stage of labor**
  - Fault in forces*
    1. Inadequate contractions
    2. Epidural analgesia
    3. Poor maternal effort.
  - Fault in passage*
    1. Rigid perineum
    2. Mild cephalopelvic disproportion (CPD).
  - Fault in passenger*
    1. Malrotation of fetal head
    2. Malpresentations:
      - Occipitoposterior, deep transverse arrest
      - After coming head of breech.
    3. Mentoanterior face
    4. Large baby.

} maternal indications to avoid Valsalva

### ■ Mode of action of obstetric forceps

- Traction
  - Most important function of forceps. Although it is impossible to ascertain exact amount of force exerted for an individual
  - Primipara traction force is about 20 kg
  - Multipara traction force is about 13 kg.
- Compression
  - Biparietal diameter is compressed by 1 cm. More than this is harmful to baby.

- Rotation
  - In occipitoposterior and deep transverse arrest to bring sagittal suture in anteroposterior diameter of pelvis.
- Lever action
  - To and fro movements of blades make space available for the baby.
- Stimulation of uterus
  - Mechanism is unknown
  - Increases the force and intensity of uterine contractions
- Protective cage for head of baby
- As a vectis one forceps blade is used in cesarean section to deliver head.

### ■ Prerequisites for forceps application

There are at least six prerequisites for successful forceps application.

- F – Favorable head position and station
  - O – Os fully dilated
  - R – Ruptured membranes
  - C – Contractions (uterine) to be present. Consent, exclude CPD
  - E – Engaged head
  - P – Presenting part to be cephalic
  - S – Surrounding viscera, bladder and rectum to be empty.
- Stirrups: Lithotomy position.

### ■ Technique of forceps application

- Informed consent of patient is taken and discuss procedure with husband of patient.
- Patient to be informed that failed forceps can lead to cesarean section.
- Patient preparation. Empty bladder.
- Anesthetist and Pediatrician should be present.
- Anesthesia and patient positioning
  - Outlet forceps: Perineal infiltration
  - Low forceps: Pudendal block
  - Mid forceps: Spinal, epidural or GA
  - Lithotomy position

- **Prerequisites** (as described above) should be fulfilled.
- Internal examination (P/V) is done to assess uterofetal pelvic relationships
  - Uterine work and maternal effort.
  - Fetal head: Position, station, attitude, synclitism, caput, moulding.
  - Bony pelvis.
- Episiotomy is given before or during traction by forceps.

### ■ Identification of blades

- When isolated; the tip points upwards, the cephalic curve is inwards and pelvic curve is forwards
- When articulated; forceps is placed facing the pelvis with tip of the blades pointing upwards and concave side of pelvic curve is forwards. Blade applied to left maternal side is left blade and vice versa.

### ■ Low forceps operation

Forceps is applied when biparietal diameter has crossed the level of ischial spines and head is rotated and lies in anteroposterior diameter.

If head is not rotated then rotation is completed and the operation is in two steps.

#### Step I : Identification and application of blades

##### *Identification*

Assembling and identification of blades is done and **left or lower blade is applied first.**

##### *Application*

**Left blade:** Left hand of surgeon: Lower blade is held in pen holding manner and introduced first parallel to opposite inguinal ligament after protecting vagina with four fingers of right hand. The fingers and thumb of right hand guide the blade into correct position as the blade is pushed up between sacral hollow and fetal head. The left hand rotates the handle in a downward arc

till it comes to lie on left side of pelvis. Right blade is inserted in same manner using the opposite hand and shank lies straight on the perineum.

Correct application of blades should be checked by:

- Blades are equidistant from lambdoid suture.
- Sagittal suture must be perpendicular to plane of shank.
- Posterior fontanelle is not more than one finger breadth above the plane of shank.
- Operator cannot place more than a finger tip between the fenestra and the head.

### Step II. Locking of blades

Locking is easy if blades are correctly applied. If there is difficulty in locking then it indicates incomplete rotation of fetal head or improper insertion of blades.

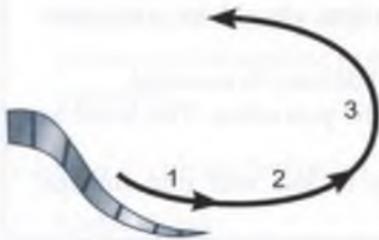
### Step III. Traction

If necessary then **rotation** to occiput anterior is performed before giving traction.

*Traction should be*

- Steady and intermittent **with uterine contraction** with locked blades.
- Gripping of handle is done by keeping middle finger in between the shank, ring and index fingers on either side on the finger guard and thumb on under surface of handle.
- Unlock the blades in between contractions and wait.
- Traction is given till occiput is under pubic symphysis.
- After each contraction one should listen to fetal heart. In low forceps operation **direction of pull** is along axis of pelvic canal.

3. **Upwards and forwards** as blades are elevated towards mother's abdomen and head is delivered.



2. **Horizontally straight** towards operator till crowning of the head.

1. **Downwards and backwards** until head comes to the perineum.

### Difficulty in traction

- Application of blades in undiagnosed occipitoposterior position
- Faulty direction of traction
- Faulty forceps application
- Pelvic contraction.

### Step IV. Removal of blades

- Removal of blades are in opposite order, i.e. **right blade is removed first** and then left as fetal head is born
- Rest of the baby is delivered normally
- Episiotomy is repaired.

### ■ Outlet forceps operation

- Wrigley forceps are used exclusively and are safe (Fig. 4.2).
- Method of introduction of blades is same as in low forceps except that two fingers are introduced in vagina for application of left blade.
- In outlet forceps operation direction of pull is straight horizontal and then upwards and forwards.

### ■ Mid forceps operation

- All mid forceps deliveries are done as trial forceps keeping facilities ready for LSCS.
- It should be attempted only by experienced obstetrician. Long curved forceps with or without axis traction device is used. Kielland forceps can be used (Fig. 4.3). Malrotation of head is corrected in unrotated occipitoposterior positions of DTA and POP.

#### *Points to remember :*

- Informed consent is must and patient should be counseled about the procedure.
- Documentation of operative vaginal delivery is essential.
- One should be willing to abandon the procedure. This leads to minimal complications.
- Always explore vagina and cervix in low and mid forceps delivery.

## Forceps application in different situations

### *After coming head of breech*

- Ordinary long forceps or Piper forceps (longest obstetrical forceps) with absent pelvic curve can be used.
- Trunk and lower limbs of baby is held upwards towards mother's abdomen by an assistant when occiput is anterior and lies against the back of pubic symphysis. Blades are preferably applied from ventral aspect of the body.
- The direction of pull is backwards, downwards, forwards and upwards.

### *Occipitoposterior position*

- Arrest in occipitotransverse (DTA) or oblique occipitoposterior position
  - Ventouse is ideal.
  - Manual rotation with forceps extraction is method of choice.
  - Forceps rotation and forceps delivery can be done (for Kielland forceps expertization is necessary).

### *Arrest in occipitosacral position*

- Application of blades is done without rotation. Direction of pull is horizontal until root of nose is under pubic symphysis. Then slowly elevate blades until occiput reaches perineum and then downwards till nose, face and chin are born by extension.

### *Forceps in face presentation*

- It is applied only in mentoanterior position to well-rotated head. Direction of pull is backwards and downwards until chin comes to rest against pubic symphysis and then forwards and upwards.

### *Forceps in contracted pelvis*

- Limited use.

### **Trial forceps**

- If an attempt at operative vaginal delivery is anticipated to be difficult the attempt made should be considered a trial.
- Trial forceps delivery is trial on head. It can be harmful for the baby if excessive compression is made on fetal head.

### **Prophylactic forceps**

- It is applied to cut short 2nd stage of labor in anticipation of maternal distress, fetal distress or prolonged 2nd stage of labor.
- Usually low forceps or outlet forceps are applied.

### *Indications*

- Medical disease like cardiac disease, eclampsia and severe preeclampsia
- Previous cesarean section
- Epidural analgesia
- After coming head of breech: Piper forceps can be used electively
- Low birth weight (no added advantage).

### *Disadvantages*

- Unsafe attempts can be dangerous and should only be applied when criteria of low forceps is fulfilled.

### **Failed forceps**

When a deliberate attempt in vaginal delivery with forceps has failed to expedite the process.

### *Causes*

- Unrotated occipitoposterior position
- Incomplete cervical dilatation
- CPD (cephalopelvic disproportion)
- Fetal abnormalities as hydrocephalus, conjoined twins

- Unrecognized malpresentation as brow
- Constriction ring.

### Management

- Reassessment
- Procedure is abandoned and cesarean section is done.

### Complications

Maternal		Late
Injuries	Vaginal, labial, perineal, periurethral and cervical lacerations	Dyspareunia, painful scar
Nerve injuries	Femoral L- 2,3,4 and lumbosacral L-4,5	Low backache
Bladder and rectal injuries		Genital prolapse, stress incontinence
PPH	Atonic Traumatic	
Infection		
Anesthesia complications		

Fetal		Late
Cephalhematoma		
Nerve injuries	Facial nerve palsy, brachial plexus injury	
Asphyxia	Cerebral compression	Cerebral palsy
Depressed skull fractures		

### ■ Wrigley short curved obstetrical forceps (Fig. 4.2)

- Small and light
- Length 27.5 cm.

**Blades:** Right blade and left blade

**Shank:** Short

**Lock:** English type

**Curve:** Cephalic curve is marked. Pelvic curve is slight.

**Handle**



Figure 4.2: Wrigley short curved obstetrical forceps

### Uses

- Outlet forceps when head is at or below + 2 station.
- **Most commonly used outlet forceps.**

### ■ Kielland long straight forceps (Fig. 4.3)

Long, straight, rotational forceps

Length 40 cm.

### Parts

No pelvic curve. It has cephalic curve.

**Blades:**

- Anterior blade
- Posterior blade.

**Shank:** 13 cm, has a directional knob.

**Lock:** Sliding type.

**Handle**



Figure 4.3: Kielland long straight forceps

### Advantage

Forceps are used for correcting asynclitism because of sliding lock.

### Methods of application

- Classical is the oldest method

- Wandering is most popular method
- Direct method.

### Use

It is no longer used as high forceps.

In 20th century this forceps is used only in low midpelvis for arrested occipitoposterior and occipitotransverse positions.

## VENTOUSE OR VACUUM EXTRACTOR

It is a device for assisted vaginal delivery by gentle traction on fetal head.

Ventouse is **preferred** to forceps for assisted vaginal delivery to reduce maternal mortality and pelvic floor injury. It is the first choice for instrumental delivery (RCOG).

### ■ History

- It was invented by James young Simpson in 1848.
- Metal cup was designed by Malmstrom of Sweden (Father of modern extractor) in 1953.

### ■ Parts

#### Cup (Fig. 4.4):

- Metal cup
- Soft cup
  - Nowadays disposable soft cups (silicon or plastic) are used
  - Plastic cup (Mityvac) has better adherence to fetal scalp
  - Rigid cup (Kiwi Omni cup) causes less trauma and less chignon.

- Shapes
  - Bell-shaped, funnel-shaped, mushroom-shaped.
- Sizes
  - 30 mm, 40 mm, 50 mm, 60 mm.

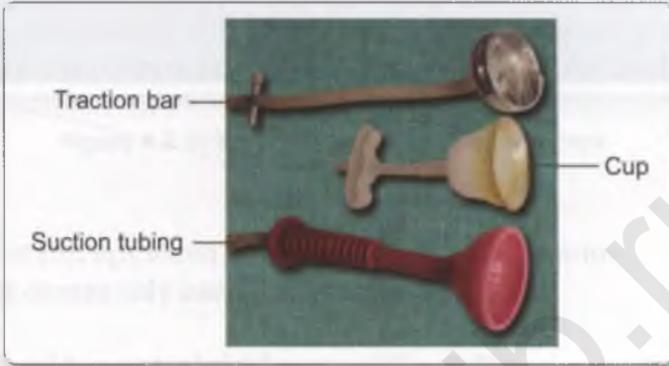


Figure 4.4: Cups

- Traction bar
- Suction tubing is made of rubber connecting the traction bar to suction apparatus which creates a negative pressure.
- Manometer is for pressure recording.

#### ■ Prerequisites

- Consent to be taken
- Engaged head
- Cervix at least 6 cm dilated
- Vertex presentation
- Bladder to be empty
- No bony resistance below head.

#### ■ Technique

- Informed consent is taken as it is medicolegal.
- Anesthesia: Local perineal infiltration with xylocaine or pudendal block is given.
- Bladder is evacuated.
- Internal examination is done to know position, station of head, to rule out any bony resistance below head and cervical dilatation.

## I. Application of cup

Appropriate size of cup is chosen.

- Goal of cup positioning is to maintain or improve flexion and avoid asynclitism.
- Largest size of cup is to be taken.
- Place cup nearer to occiput on sagittal suture at median flexion point located 3 cm anterior to posterior fontanelle and 6 cm behind anterior fontanelle (Fig. 4.5).

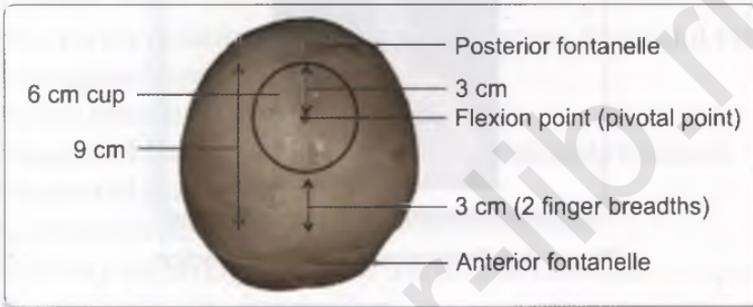


Figure 4.5: Relationship of vacuum cup to flexion point

- Cup is placed by folding the cup making sure that the cervix or the vagina are not included. It adheres to fetal head by vacuum, i.e. negative pressure.
- Rubber tubing is attached to suction and a pressure of  $0.2 \text{ kg/cm}^2$  is created and raise pressure to  $0.8 \text{ kg/cm}^2$  (600 mmHg).
- Artificial caput is formed known as **chignon (caput succedaneum)** as the scalp is sucked into the cup.

## II. Traction

- It should be in line with pelvic axis (similar to forceps) and at right angles to the surface of head to which cup is applied
- It should be intermittent with uterine contractions.
- 3 pulls in 20 minutes
- Traction during one contraction is regarded as one pull.

Traction should be with index and middle finger on traction bar and thumb of other hand on the surface of cup with four fingers placed against the scalp and underlying bone. **The two hands work in combination** with each other (Fig. 4.6). Keeping



Figure 4.6: Technique of vacuum extraction

the cup pressed to surface of scalp and fingers assessing descent the right hand ensures that traction is in perpendicular plane to the cup. As head descends episiotomy is applied and when head is delivered the cup is removed off the chignon by releasing pressure valve. Cup is detached and delivery is completed in usual way.

*Operator should not switch from vacuum to forceps or vice versa.*

### ■ Indications

- Indications for its use are the **same** as for forceps delivery (ACOG 2000, 2002 as per classification for operative vaginal delivery.)
- Vacuum extraction is reserved for fetuses of gestation age > 34 weeks.
  1. As an alternative to obstetric forceps in 2nd stage of labor
  2. As an alternative to rotational forceps in DTA / OP / OT / OA when head is malrotated with adequate pelvis
  3. If there is delay in delivery of head in 2nd baby of twin
  4. To deliver head at lower segment cesarean section
  5. If there is delay in late first stage of labor, i.e. uterine inertia or primary cervical dystocia.

*Points to remember :*

- Vacuum before full dilatation is not recommended now as LSCS is safer
- It is not used now for midpelvic operations except for 2nd baby of twin.

**Contraindications**

- Fetal prematurity (if < 34 weeks chances of more fetal scalp injury)
- Nonvertex positions, i.e. face presentation, brow and breech.
- Unengaged head
- Active bleeding
- Suspected fetal coagulation defect (fetal scalp trauma).
- Suspected macrosomia (> 4kg)
- Cephalopelvic disproportion
- Delivery requiring excessive traction or rotation
- Recent scalp blood sampling
- Fetal distress (forceps preferred).

**Complications****Fetal**

- Scalp abrasion
- Sloughing of scalp
- Cephalhematoma 6%. Rupture of emissary vein (most common)
- Subgaleal hemorrhage
- Retinal hemorrhage
- Intracranial hemorrhage
- Neonatal jaundice.

**Maternal**

- Soft tissue injuries: Cervix and vaginal wall if included inside the cup.
- Traumatic PPH.
- Annular detachment of cervix.

### Advantages of ventouse over forceps

Ventouse Advantages	Forceps Disadvantages
<ul style="list-style-type: none"> <li>• Autorotation: so can be used in unrotated, malrotated, occipitoposterior position of head.</li> </ul>	<ul style="list-style-type: none"> <li>• No autorotation.</li> </ul>
<ul style="list-style-type: none"> <li>• Can be applied in 1st stage of labor, i.e. cervix not fully dilated but &gt;6cm (should not be applied if head is above ischial spine).</li> </ul>	<ul style="list-style-type: none"> <li>• Used in 2nd stage of labor i.e. full dilatation of cervix (should not be used if head is above +2 station and unengaged).</li> </ul>
<ul style="list-style-type: none"> <li>• Traction force required is less (10 kg approx).</li> </ul>	<ul style="list-style-type: none"> <li>• Traction force required is more (13 kg approx).</li> </ul>
<ul style="list-style-type: none"> <li>• Anesthesia: GA is not required.</li> </ul>	<ul style="list-style-type: none"> <li>• Anesthesia: GA/pudendal block is required.</li> </ul>
<ul style="list-style-type: none"> <li>• Space required is less.</li> </ul>	<ul style="list-style-type: none"> <li>• Space required is more.</li> </ul>
<ul style="list-style-type: none"> <li>• Maternal trauma is less.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Maternal trauma and blood loss is more.</b></li> <li>• More 3rd and 4th degree lacerations</li> </ul>

### Advantages of forceps over ventouse

Ventouse Disadvantages	Forceps Advantages
<ul style="list-style-type: none"> <li>• Takes time in fetal distress as chignon takes time to form.</li> </ul>	<ul style="list-style-type: none"> <li>• Quick in <b>fetal distress</b> to expedite delivery.</li> </ul>
<ul style="list-style-type: none"> <li>• Cannot be used in preterm.</li> </ul>	<ul style="list-style-type: none"> <li>• Can be used in preterm as it acts as a protective cage.</li> </ul>
<ul style="list-style-type: none"> <li>• Contraindicated in malpresentations: Face presentation Breech presentation Brow presentation.</li> </ul>	<ul style="list-style-type: none"> <li>• Can be used in malpresentations: Occipitoposterior Face in mentoanterior Breech (after coming head)</li> </ul>
<ul style="list-style-type: none"> <li>• Requires maternal effort.</li> </ul>	<ul style="list-style-type: none"> <li>• No maternal effort needed.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>More neonatal injuries</b> Cephalhematomas Subgaleal hemorrhage Incidence of neonatal jaundice is more.</li> </ul>	<ul style="list-style-type: none"> <li>• Less neonatal injuries.</li> </ul>

## Instruments for Destructive Operations

### INSTRUMENTS FOR DESTRUCTIVE OPERATIONS

**Embryotomy:** Refers to operations involving the destruction of dead fetus to diminish its bulk, i.e. fetal head or trunk to facilitate its extraction through vagina.

1. Craniotomy: Reducing head size
2. Evisceration: Reducing thorax and abdomen
3. Cleidotomy: Clavicle is divided.
4. Decapitation: Fetal head is severed from the trunk.

#### ■ Craniotomy

- It refers to various methods of reducing the size of fetal head
- Perforation of head and drainage of CSF and brain matter is done
- Extraction of perforated head is done by maternal effort/forceps/cranioclast/cephalotribe/cranioclasm.

#### **Simpson's modification of Oldham's perforator (Fig. 5.1)**

It is used in craniotomy to enter fetal skull and collapse it by draining brain matter.

#### *Indications*

##### Dead baby

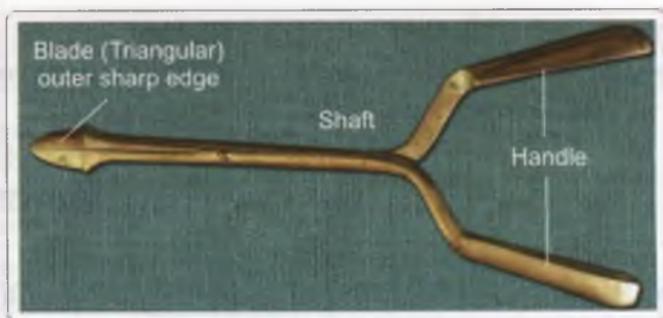
- Vertex : Failed forceps/ventouse in CPD
- Malposition : Brow, mentoposterior face, after coming head of breech
- Interlocking head of twins.

##### Live baby

- Hydrocephalus.

#### *Prerequisites*

- Baby is dead
- Cervix is fully dilated.



**Figure 5.1:** Simpson's modification of Oldham's perforator

### *Technique*

- Anesthesia: GA.
- Lithotomy position, clean and drape part.
- Cranial cavity of fetus is opened and evacuated preferably through skull bone rather than suture as sutures tend to close when cranial cavity collapses.
- Site of perforation
  - Parietal bone : In forecoming head
  - Occipital bone : In after coming head
  - Orbits : In brow position.
- Perforation is done during uterine contraction.
- Assistant fixes part from above, i.e. head suprapubically.
- Blades are closed, fixed and introduced under cover of surgeon's hand to prevent any injury to surrounding tissues.
- Tip of instrument is guided into site of perforation by finger of one hand and is pushed in by other hand.
- Once tip enters the cranial cavity blades are opened up to enlarge the hole.
- Blades are closed again and instrument is rotated to 90°. Reopen again and close till brain material is sucked out and cranial cavity collapses.
- Suprapubic pressure will drain out brain matter or drained with flushing curette or suction cannula or Drew Smythe's catheter.

### *Complications*

- Severe maternal injury
- Uterine rupture.

### Cranioclast and cephalotribe combined (Fig. 5.2)



Figure 5.2: Cranioclast and cephalotribe combined

Central blade is pushed through perforated skull and screwed in foramen magnum.

Side blade is introduced and two blades are screwed together to obtain a firm grip on head to crush vault.

**Cephalotripsy:** In certain cases the perforated head may be completely crushed before extraction.

**Cranioclastism:** In certain cases avulsion of cranial vault bones is needed before extraction.

### Drew Smythe's catheter (Fig. 5.3)

#### Parts

'S' shaped sinusoidal double curved instrument with double tube.

There is an inlet and outlet.



Figure 5.3: Drew Smythe's catheter

#### Uses

1. High rupture of membranes in polyhydramnios.
2. Perforation of hydrocephalic after coming head of breech through foramen magnum or through spina bifida in breech.

3. In normal labor when 3/4th cervix is dilated and contractions are weak, rupture of membranes helps to accelerate progress.

### *Advantages*

Controlled leakage of amniotic fluid and so chances of the cord prolapse and accidental hemorrhage are reduced.

### **Flushing curette (Fig. 5.4)**

Metallic spoon-shaped cannula.



**Figure 5.4:** Flushing curette

### *Use*

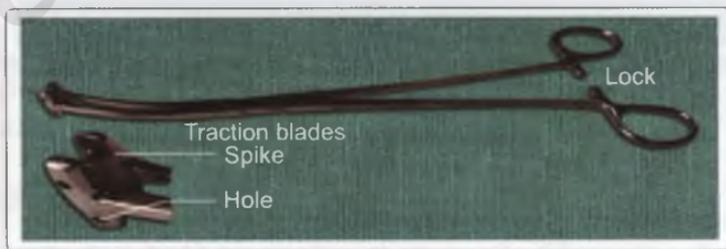
Flushing out of brain matter.

### **Willets scalp traction forceps (Fig. 5.5)**

#### *Parts*

Blades:

- Shaped like letter 'T' blades have oblique serrations on inner aspect with one blade having two spikes on its inner aspect



**Figure 5.5:** Willets scalp traction forceps

corresponding to holes on the other blade which gives firm grip of fetal scalp.

Lock

Handle with finger grips.

*Uses*

No role in modern obstetrics except in dead baby.

1. To extract fetal head after perforation during craniotomy operation by scalp traction.
2. Delivery of an IUD baby.

### ■ Evisceration

Thoracic and abdominal cavities are opened up with the strong embryotomy scissors and viscera is removed in piecemeal.

### Indications

- Shoulder presentation in dead baby
- Fetal ascites
- Cystic kidney.

### Embryotomy scissors (Fig. 5.6)



Figure 5.6: Embryotomy scissors

### ■ Cleidotomy

One or both clavicles are divided with embryotomy scissors to decrease bisacromial diameter in dead fetus.

### Indication

Shoulder dystocia in large baby.

## ■ Decapitation

Head of baby is severed from the neck and then head and trunk are delivered per vaginum.

### Indications

- Neglected shoulder presentation in dead fetus.
- Locked twins.

### Ramsbotham's decapitation hook and saw (Fig. 5.7)



Figure 5.7: Ramsbotham's decapitation hook and saw

### Parts

- Blade is hooked with inner serrations
- Handle.

### Technique

- Prolapsed arm is pulled down and neck is brought down as low as possible by giving traction on prolapsed arm.
- Decapitation saw is introduced under cover of palmer surface of left hand till it reaches neck of baby. Then it is rotated to 90° and fetus is decapitated by sawing movements. Remaining tissue can be cut by embryotomy scissors.
- Baby is delivered by pulling arm.
- Severed head is delivered by putting finger in mouth and giving traction/craniotomy /forceps/crochet and hook/giant vulsellum.

### Breech hook with crochet (Fig. 5.8)

### Parts

- Crochet : Acutely bent.
- Hook : Wider and gradually bent.



Figure 5.8: Breech hook with crochet

### Uses

- Crochet : Used to hook down a decapitated head through mouth or hole in skull.
- Hook : To put traction on groin in case of impacted breech of a dead fetus.

**CATHETERS**

1. Plain or simple red rubber catheter. Nonself-retaining.
2. Indwelling or self-retaining type.

**■ Plain rubber catheter or simple catheter**

Nonself-retaining catheter.

**Parts**

- Blunt end of tube is rounded with subterminal opening for drainage (Fig. 6.1).
- Other end is expanded.

It comes in various sizes. It is made of red rubber.



**Figure 6.1:** Plain rubber catheter

**Uses**

1. Single urethral catheterization.
2. To administer oxygen as an alternative to oxytube or oxygen set.

3. As tourniquet during myomectomy operation
4. As a tourniquet for drawing blood samples
5. To collect urine sample for culture sensitivity in chronic UTI
6. To do three swab test in urinary fistula.

### ■ Metal urinary catheter

It is a metal catheter for urine drainage.

#### Parts



Figure 6.2: Metal urinary catheter

Tip has curve and two eyes near tip (Fig. 6.2).

#### Use

Only when rubber catheter cannot be passed.

#### Disadvantage

Traumatic.

### ■ Foley catheter

- Self-retaining catheter. Designed by Dr Frederic Foley.
- It is made of latex with silicon coating.

#### Parts

- Tip has subterminal opening for drainage. Beyond this is a balloon which is inflated with saline or plain water. Capacity of bulb is mentioned in catheters.
  - There can be 2–3 channels. 2 channel catheter is generally used.
    - Main channel is for drainage. Another channel is for inflating bulb (Fig. 6.3).
    - Third channel may be present for irrigation of bladder.
- Some catheters have catheter inserter.

### Sizes (Fig. 6.4)

- Foley catheter is available in a variety of sizes marked by numbers according to French scale.

$$\text{Diameter of catheter in mm} = \frac{\text{Catheter number}}{3}$$



Figure 6.3: Foley self-retaining catheter

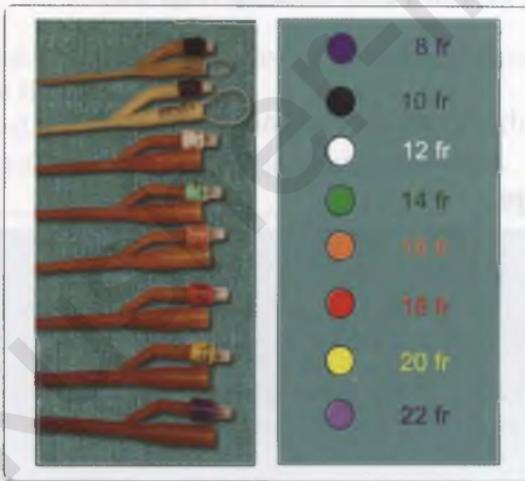


Figure 6.4: Funnel color reference chart

### Technique

- Hand washing and wearing of sterile gloves is essential. No touch aseptic technique is used as UTI is a lifelong morbidity given to the patient.
- Part is cleaned and draped from above downwards as labia minora is separated with left index finger and thumb and the labia is not allowed to fall back.

- Catheter is held in right hand. Inner covering of catheter is kept intact, exposing only tip. Tip should not touch fingers or vulva.
- External urethral meatus is identified and catheter is introduced in female urethra. When the catheter starts draining urine that means it is in urinary bladder and not in urethra. Then balloon is inflated according to capacity mentioned. Balloon should go beyond urethra otherwise while inflating bulb urethral damage can happen.
- Catheter is connected to urobag.
- Catheter can be removed by deflating the balloon. If it becomes difficult to deflate then balloon can be palpated per vaginum, punctured with a needle and then removed.

## Indications of catheterization

### *Gynecological indications*

1. Gynecological operations
  - Hysterectomy
  - Laparotomy
  - Fothergill's repair
  - VVF repair
  - Wertheim's hysterectomy
  - Vaginoplasty
  - SI (stress incontinence)
  - Repair of bladder injury
2. Acute/chronic retention of urine
3. Incontinence of urine
4. Unconscious patients
5. To measure residual urine
6. SSG, HSG to push dye
7. Cystourethrography
8. Neurogenic bladder.

### *Obstetrical indications*

1. Retention of urine in retroverted gravid uterus
2. Operations
  - Cesarean section
  - Obstructed labor
  - Hysterectomy.
3. During labor to void urine before ventouse/forceps
4. APH / PPH / ectopic pregnancy
5. 2nd trimester MTP for extraamniotic instillation of ethacridil lactate.
6. Eclampsia.

### Complications

- Urinary tract infection
- Loss of bladder tone on prolonged catheterization.

### ■ Malecot's catheter

Self-retaining catheter.

### Parts

Tip: Bulbous winged tip made of red rubber (Fig. 6.5).



Figure 6.5: Malecot's catheter

### Technique

Bulbous tip is stretched over an artery forceps to straighten it and catheter is introduced.

When clamp is removed the elastic recoil of catheter reforms the tip into bulbous form to make it self-retaining.

### Indication

For draining body cavities, i.e. serosanguineous fluid, pus and blood.

### Advantage

It can be easily removed by gentle pulling.

## Section

# 7

## General Instruments in Obstetrics and Gynecology

### CHEATLE FORCEPS

It is a large heavy metallic forceps.

#### ■ Parts

##### Blades

Curved and have serrations for better grip (Fig. 7.1).

##### Lock

There is **no lock**.



Figure 7.1: Cheatle forceps

#### Use

To pick and transfer sterilized linen or instruments from one tray to other.

#### ■ Sterilization

Instrument is kept sterilized by keeping it dipped in Savlon, cidex or autoclaved.

## TOWEL CLIPS

It is an instrument which is about 4"–5" in length, light and strong.

### ■ Parts

#### Blades

- Small and curved curvature is such that whole thickness of drapes can be held easily and firmly (Figs 7.2 and 7.3).
- Tip of blades are sharp and pointed for better grasping.

#### Lock



Figure 7.2: Jones towel clip



Figure 7.3: Mayo's towel clip

### ■ Uses

1. Fix the drapes so that operating field is clear before surgery.
2. Fix suction tubing, cord, wire to drapes so as to prevent its falling.

## SPONGE HOLDING FORCEPS

It is a long forceps with thin shafts.

### ■ Parts

#### Blades

Blades are ring-like, round, blunt and fenestrated.

There are serrations on inner aspect of blades (Fig. 7.4).

#### Handle

Handle has finger grips and a catch lock, which helps in holding the sponge or swab firmly.



Figure 7.4: Rampley's sponge holding forceps

### ■ Uses

#### General

1. Cleaning of operative field
2. Dressing of patient
3. Swabbing of cavity, e.g. vaginal canal, vaginal wash down.

#### Uses in gynecology

1. Mopping ooze from operative area by holding small round gauze pieces

2. For applying pressure and checking hemostasis during pelvic surgery.
3. For packing away intestines and omentum out of pelvis for clear operative field.

### Uses in obstetrics

1. Holding cervix in pregnant patient in cerclage operation.
2. Holding angles of uterus in cesarean section in place of green armytage.
3. Used in place of ovum forceps in PPH, incomplete abortion, missed abortion.
4. As a clamp for clamping umbilical cord.
5. Holding terminal part of placental membranes while delivery of placenta.
6. Packing of cavity, e.g. vagina in cervical tear.

### BARD PARKER'S KNIFE

- Popularly known as **surgeon's knife**.



Figure 7.5: Surgical blades



**Figure 7.6:** Handle with blade

- It has a straight handle with a notch. Different sizes of blades can be attached with different sizes of handles. Larger sizes of blades are used for larger tissues and incisions. Smaller sizes of blades are used for finer incisions (Figs 7.5 and 7.6).
- The no. 10 scalpel blade is the most commonly used size. Acute angle of no. 11 blade is used for giving stab incisions for drains and in draining abscesses, e.g. Bartholin's abscess.

### ■ Technique

When using no. 10 and 20 blades, scalpel is held at 20–30° angle to skin and drawn firmly along the skin using arm with **minimal** wrist and finger movement. Full length of scalpel belly is used avoiding burying of tip and incision cuts dermis. Scalpel with blade is held with shaft of scalpel in palm of hand with index finger on top of blade, i.e. knife holding position.

Avoid multiple tracks and irregular skin edges by giving firm **traction** on lateral aspect of incision. Surgeon makes the cut towards himself or herself.

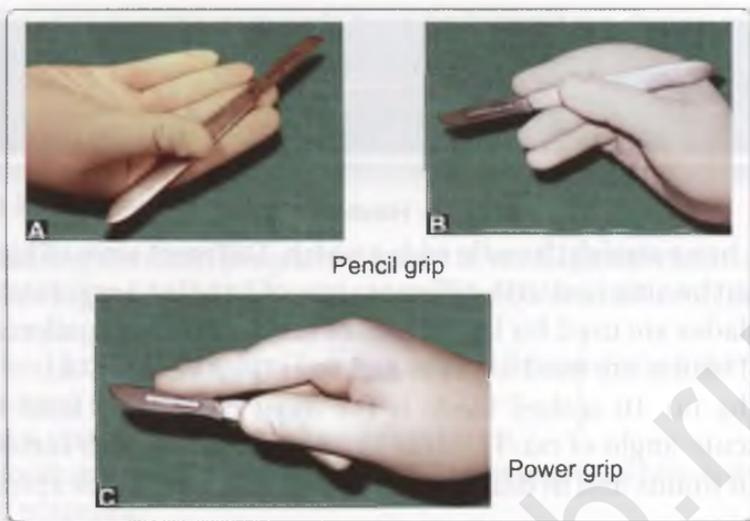
Creating tension at the skin surface is necessary to reduce the amount of force required for penetration. Omission of this step can result in uncontrolled penetration of underlying structure.

### **Pencil grip (Figs 7.7A and B)**

Scalpel is held like a pencil and movement is directed by thumb and index finger.

### **Power grip (Fig. 7.7C)**

Scalpel is held between thumb and index finger and both exert downward pressure. End of blade is forced up against the thenar muscles of hand as the incision is given.



Figures 7.7 A to C: Knife holding positions

### ■ Uses

1. For opening the abdomen by incising skin and subcutaneous tissue
2. For cutting pedicles
3. For sharp dissection
4. For finer incision that is incision of tough walled abscess.

## RETRACTORS

These instruments are used for clear visualization of operative field. They help the surgeon to obtain a good exposure by enlarging the operative field with minimal damage to adjacent structures.

Bleeding area is better exposed and bleeders are easily caught and tied.

## ■ Technique

They are introduced along long axis of wound and not at right angle to minimize trauma to wound.

Traction should be gentle and undue tension to tissues should be avoided.

## ■ Types

1. Self-retaining
2. Hand held or plain retractor or nonself-retaining.

## ■ Retractor used in abdominal surgery

### 1. Self-retaining retractor

These retractors have movable blades the position of which can be fixed by screw locks. These retractors hold abdominal wall muscles apart in three or four directions. Blades pull the bladder caudally and anterior abdominal wall muscles laterally. Blades should be shallow to avoid compression of femoral and genitofemoral nerve (Fig. 7.8).

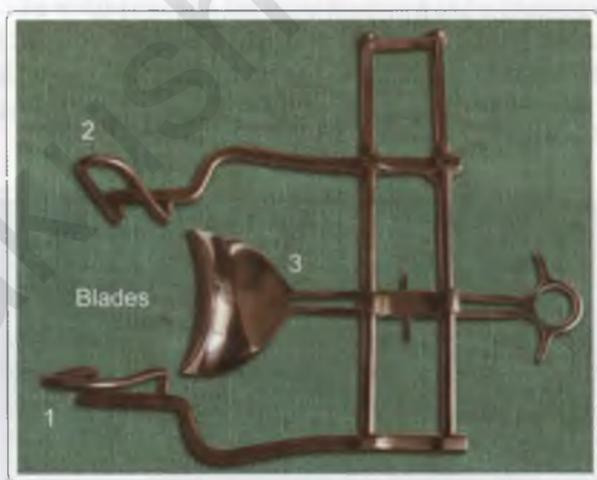


Figure 7.8: Self-retaining retractor

### Use

Used in prolonged surgeries and difficult surgeries.

### *Advantages*

- Assistant is free to participate in surgery.
- Correct and uniform amount of traction is possible throughout operation.

### *Disadvantage*

If it is used for extended period of time it can cause bruising, compression of nerve, even necrosis of rectus muscles.

## **2. Nonself-retaining or hand held retractor**

These are simple in design and retract tissues in one direction only. Can be placed and repositioned quickly. They have a handle and a blade.

Bonney and Wertheim preferred manual retraction of the abdominal incision edges by assistant.

### ■ **Deaver retractor**

#### *Blade*

Gentle arching shape and conform easily to curve of anterior abdominal wall. Increased blade depth is used to retract bowel, bladder or anterior abdominal wall muscles (Fig. 7.9).

#### *Handle*

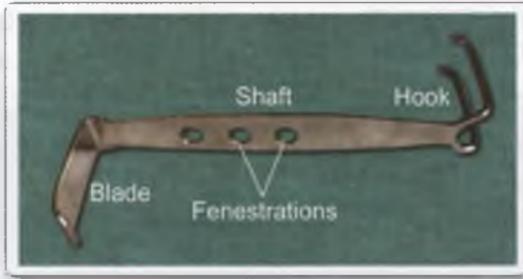
Handle is strong.



Figure 7.9: Deaver retractor

### ■ **Czerny retractor**

Nonself-retaining abdominal retractor. It has blade at one end and a biflanged hook on other end directed in opposite



**Figure 7.10:** Czerny retractor

direction. Fenestrations of shaft is to make the instrument lighter (Fig. 7.10).

It is a superficial retractor.

*Uses*

1. To retract layers of abdominal wall and muscles.
2. Biflanged end may be used for giving the last deep stitch during closure.

**Doyen's retractor**

Nonself-retaining, strong, heavy abdominal retractor. Large curved blade with inward turning margin is to minimize trauma to anterior abdominal wall muscles. The solid blade compresses the cut edges of abdominal wall and thus reduces blood loss from injured vessels (Fig. 7.11).

*Uses*

Uses in gynecology

1. Abdominal surgeries to retract abdominal wall suprapubically



**Figure 7.11:** Doyen's retractor

2. Deep pelvic surgery
3. Exploratory laparotomy for ovarian tumors.

#### Uses in obstetrics

1. Cesarean section to retract bladder
2. Cesarean hysterectomy
3. Exploratory laparotomy for ruptured tubal ectopic pregnancy.

### ■ Retractor used in vaginal surgery

Vaginal surgery requires separation of vaginal walls.

#### Types

- Self-retaining
- Hand held retractors. Single-bladed vaginal retractors are used (Fig. 7.12).



Figure 7.12: Retractors in vaginal hysterectomy

### ■ Sims single bladed retractor (Fig. 7.13)

### ■ Landon bladder retractor (Fig. 7.14)

- It is 'L' shaped instrument
- Flat blade (2cm) at right angle to handle.

#### Uses

1. Vaginal surgery
2. To retract bladder during vaginal hysterectomy

3. To retract the lateral and anterior vaginal wall during vaginal operations.

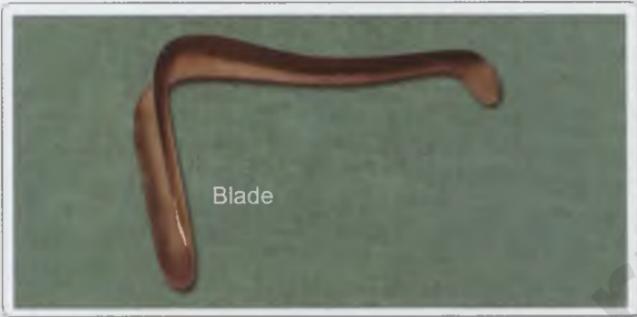


Figure 7.13: Sims single bladed retractor



Figure 7.14: Landon bladder retractor

Instrument tray for vaginal hysterectomy (Fig. 7.15)



Figure 7.15: Instruments for vaginal hysterectomy. 1. Jones towel clip; 2. Allis forceps; 3. Mosquito forceps; 4. Scissors; 5. Single bladed Sims speculum; 6. Scalpel handle with blade; 7. Vulsellum; 8. Needle holder; 9. Dissecting forceps; 10. Hysterectomy clamps; 11. Vicryl suture

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Instrument tray for abdominal hysterectomy (Fig. 7.16)

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**Figure 7.16:** Instruments for abdominal hysterectomy. 1. Jones towel clip; 2. Allis forceps; 3. Mosquito forceps; 4. Scissors; 5. Czerny retractor; 6. Scalpel handle with blade; 7. Vulsellum; 8. Needle holder; 9. Dissecting forceps; 10. Hysterectomy clamps; 11. Vicryl suture; 12. Deaver retractor

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Instrument tray for LSCS (Fig. 7.17)

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**Figure 7.17:** Instruments for LSCS (lower segment cesarean section). 1. Sponge holder; 2. Mayo's towel clip; 3. Scalpel handle with blade; 4. Scissors; 5. Dissecting forceps; 6. Needle holder; 7. Allis forceps; 8. Mosquito forceps; 9. Cord clamps; 10. Green armytage forceps; 11. Doyen's retractor; 12. Vicryl suture

## NEEDLE HOLDER

It is an instrument used to grasp needle while passing sutures during surgery.

### Types

- Straight is commonly used
- Curved is used in cavities.

### Parts

#### Blades

Two blades which have serrations on inner surface as crisscross with a longitudinal groove to prevent slipping and turning of needle (Fig. 7.18).

#### Handle

#### Lock

It is differentiated from artery forceps by following points:

- Blades are much smaller as compared to handle
- Crisscross serrations on inner surface of blades.

### Technique

- The instrument is used to hold the curved needles
- Needles ideally pierce tissues perpendicularly.



Figure 7.18: Needle holder

- Mostly the needle holder grasps a needle at right angle at the tip of needle holder and at a site approximately 2/3rd from needle tip for smooth clockwise movement of hand.
- In curved needle holder the grasp is similar and inner curve of holder faces the needle swage.
- Short handled needle holder is used for skin closer.
- Long handled needle holder is used for placing sutures deep inside the body.

### ■ Grips

- Traditionally needle holder is held with thumb and fourth finger in the rings. This helps to pronate, supinate, open and close the instruments (Figs 7.19 and 7.20).

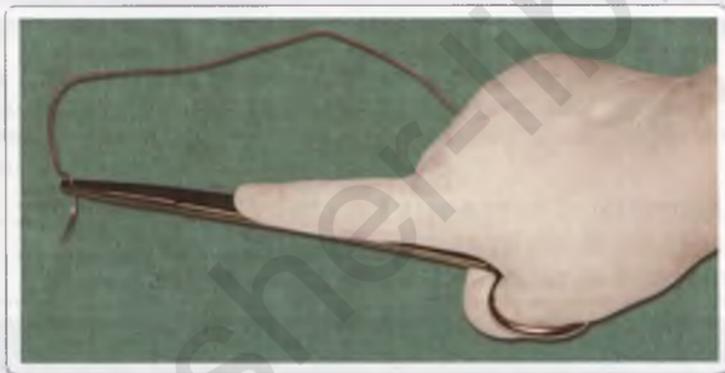


Figure 7.19: Needle holder grip



Figure 7.20: Needle holder grip

- Alternatively palmer grip can be used. In this fingers are not put into rings at all.  
If needle is held more posteriorly at the swaged end the needle may break as it is the weakest point near the eye of needle. If held more towards needle tip then there is mechanical disadvantage and it deforms the needle shape.

### ■ Use

To hold needle during suturing.

## DISSECTING FORCEPS

(Syn : Thumb forceps)

These are two armed instruments for holding tissues for clear operative field.

### ■ Types

- Toothed (Fig. 7.21)
- Nontoothed (Fig. 7.22).

### ■ Parts

- Two arms are designed in such a way that on pressing limbs the tips are well-apposed and do not slip off.
- Inner aspect of tip is serrated.
- Outer aspect is made rough by groove and ridges for firm grip.
- Toothed forceps has teeth on inner surface of tip.

### ■ Technique

Forceps is held between extended thumb and index finger. Base of forceps should rest in web space between thumb and index finger (Fig. 7.23).



Figure 7.21: Toothed dissecting forceps



Figure 7.22: Nontoothed dissecting forceps



Figure 7.23: Forceps holding technique

## ■ Uses

### Toothed type

- To hold structures which are tough like skin, fascia, rectus sheath, edges of vaginal vault.
- Used as a hook in skin closer without grasping the tissue.

### Nontoothed type (atraumatic)

- To hold delicate structures like peritoneum, bowel, vessels,

soft friable tissues and to pick individual layers during anastomosis.

- To grasp needle when repositioning the needle holder.
- During suture removal.

## ARTERY FORCEPS

### ■ Parts

#### Blade

Two blades, have transverse serrations on inner aspect and on closure are well-apposed leaving no gap in between blunt conical ends.

#### Handle

Handle with finger grips.

#### Lock

**Three catches:** First catch catches the tissue  
 Second catch clamps  
 Third catch crushes the tissue.

### ■ Sizes

- Small or Halsted mosquito
- Medium
- Large or pedicular.

### ■ Types

- Straight (Fig. 7.24)



Figure 7.24: Straight artery forceps

- **Curved (Fig. 7.25)**



Figure 7.25: Curved artery forceps

- Can be: Toothed, e.g. Kocher's hemostatic forceps or non-toothed.

### ■ Technique

- Bleeder is localized by stream of blood.
- Hold bleeder by blunt conical ends to avoid damage to the adjacent structure.
- Ligation or cauterization of artery is done.
- Release of forceps is done as surgeon tightens the knot while ligating the artery.
- Smaller vessels stop bleeding by simple application of artery forceps (hemostats) and are not ligated as intima of vessels is damaged and bleeding stops by natural mechanism of hemostasis.

### ■ Uses

- As **hemostat** while ligating vessel or cautery and crushing bleeders

- To hold fascia and peritoneum during dissection
- To hold free ends of suture
- To hold any marker suture, e.g. during hysterectomy
- To hold retraction sutures for better visibility
- To open up abscess cavity
- To hold gauze pellets for blunt dissection (Peanut swab).

### ■ Mosquito artery forceps (Fig. 7.26)

- **Smaller ones**



Figure 7.26: Mosquito artery forceps

### ■ Kocher's artery forceps

It is a **toothed** variety of hemostatic forceps. It is a long and strong instrument.

#### Parts

##### *Blades*

- Especially designed for efficient hemostasis
- Transverse serrations are on inner aspect
- Longitudinal serrations have advantage over transverse serrations.

##### *Tooth*

- Single sharp tooth at tip for correct apposition and firm grip. Single tooth interdigitating with double tooth at the tip of jaw assists correct apposition (Fig. 7.27).



Figure 7.27: Kocher's artery forceps

Catch lock: 3 locks for catch, clamp and crush.

### Technique

- Special use in hysterectomy operation for clamping cutting and ligating pedicles.
- Double clamps are applied where danger of slipping of ligature.
- Pedicle is held between two clamps and ligature is passed and anchored.
- Assistant releases the proximal clamp and then the distal one slowly as surgeon tightens the knot.

### Uses

#### *Uses in gynecology*

1. As pedicle clamp in operations of abdominal hysterectomy, vaginal hysterectomy, Fothergill's operation
2. As pedicle clamp in salpingectomy, ovarian tumor
3. For holding **tough structures like rectus, fibrous fascia.**

#### *Uses in obstetrics*

1. As cord clamp
2. For artificial rupture of membranes
3. As pedicle clamp in cesarean hysterectomy.

## PESSARY

- Only palliative.
- Made of plastic or rubber.

### Categories of pessaries

1. Supportive  
Supportive pessary (Ring pessary) (Fig. 7.28) is recommended for stage I and II prolapse.
2. Space filling  
Space filling pessary (Gelhorn pessary) is used for stage III and IV prolapse.

### Method

- Position: Lithotomy
- Empty bladder, P/V examination.
- Appropriate size of pessary is taken, folded and inserted inside vagina pushing it high to an area behind the symphysis pubis and more posteriorly to avoid urethra. When fitted, the patient is asked to stand, perform Valsalva and cough to ensure that the pessary is retained.
- Patient comes to follow up visits to see proper placement of the pessary and support of the prolapse as well as continence efficacy should be ensured.
- **Size of ring pessary** is determined by distance between posterior fornix and lower border of pubic symphysis by P/V examination. This is diameter of pessary.

They act by supporting the uterus by resting on the two levator ani muscles and thus acting as shelves.

### Indications

- Pregnancy with uterine prolapse
- Young women planning to conceive
- During lactation
- As a part of pessary test
- Patient unfit for operation
- Unwilling for operation
- To allow decubitus ulcer on cervix to heal before surgery.



Figure 7.28: Ring pessary

### ■ Complications

- Vaginal discharge, odor and vaginitis
- Failure to retain pessary
- Too large pessary can cause irritation and excoriation
- Rarely VVF, RVF if forgotten pessary.

Plastic pessaries are available presterilized. The rubber ring pessaries can be sterilized by chemical methods.

## TISSUE HOLDING FORCEPS

1. Traumatic, i.e. Allis
2. Nontraumatic, i.e. Babcocks.

### ■ Allis tissue holding forceps

It is **traumatic** tissue holding forceps.

#### Parts

##### *Blades*

- Blades are two in number, straight with distance in between which prevents trauma and crushing of structures held.

### Teeth

- Teeth at tip are sharp, multiple, fine and interlocking for firm grip
- They are three into four or four into five
- Teeth are curved inwards (Fig. 7.29).

### Lock

Lock has catch lock mechanism.

### Handle

Handle has a finger grip with a lock.

### Uses

#### Uses in gynecology

- To hold thin and tough structures like skin deep fascia, rectus sheath during operation.
- To hold vaginal wall or its cut edges in vaginal hysterectomy, anterior colporrhaphy, posterior colpoperineorrhaphy.
- To hold tissue like fibrous capsule of fibroid, small fibroid in myomectomy.
- To hold bleeding edges of vaginal vault after the uterus has been removed in abdominal hysterectomy.
- To hold cervix in D and C, HSG.
- To hold apex of any wound, i.e. episiotomy, perineal tear.



Figure 7.29: Allis tissue holding forceps

- To hold torn ends of the anal sphincter in operation of complete perineal tear.

#### *Use in obstetrics*

To hold angles of the uterine incision in place of Green Armytage forceps in LSCS.

### ■ **Babcock's tissue holding forceps**

- **Nontraumatic** tissue holding forceps which is small and light
- Used for holding tubular structure.

#### **Parts**

##### *Blades*

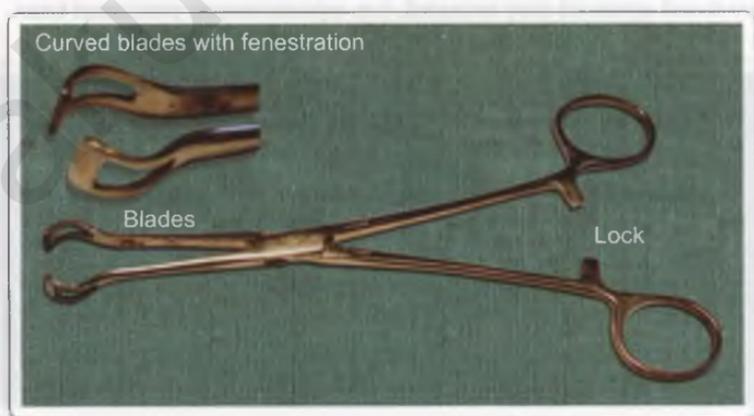
- Blades are two in number, curved and fenestrated which makes instrument light and delicate.
- Fenestration allows soft tissue to bulge through them and prevents damage.
- Transverse bar at the tip makes it atraumatic (Fig. 7.30).

##### *Teeth*

There are no teeth.

##### *Handle*

Handle has a lock.



**Figure 7.30:** Babcock's tissue holding forceps

## Uses

1. To hold fallopian tube:           in tubal ligation  
  in tuboplasty
2. To hold round ligament       in plication
3. To hold two levator ani muscles in order to bring them to center for approximation in perineal tear and repair operations
4. To hold ureter                       in radical surgery
5. To hold ovary                       in ovarian conservative surgery
6. To hold appendix                 in appendicectomy
7. To hold bowel and bladder

## SCISSORS

These are instruments used for blunt and sharp dissection and cutting sutures and pedicles.

They are used to divide tissues, dissect and define planes, cut pedicles and sutures.

Modification in blade shapes and sizes allows their use in a variety of tissue textures.

### ■ Types

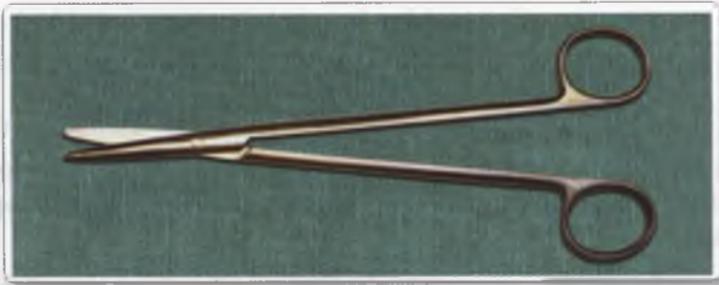
#### **Straight scissors**

- Blunt (Fig. 7.31)
- Fine pointed (Fig. 7.32).

Sterilization of scissors is by immersion in Lysol or Cetrimide. It should not be boiled as it decreases its sharpness.

#### **Curved on flat scissors**

- Curvature at tip is in vertical plane along its long axis (Fig. 7.33).



**Figure 7.31:** Blunt scissors



**Figure 7.32:** Fine pointed scissors



**Figure 7.33:** Curved scissors

- They are used for dissecting at a depth and thus improves visibility.
- They are used in cutting adhesions, growth and incising vaginal cuff in abdominal hysterectomy.

### **Curved on angle scissors**

- Curved at acute angle along its long axis in horizontal plane
- Used for cutting obliquely directed structures.

(I) *Stitch cutting scissors*

- Curved on angle type (Fig. 7.34).
- Curvature at tip is in same horizontal plane.
- Blunt ends avoid possibility that tip will injure the structures distal to the suture.
- One blade has serrations. The stitch is hacked into these serrations by passing the blade beneath stitches. The stitches are cut after hooking them.
- The free end of knot is held with toothed forceps to lift suture.
- They should never be used for cutting tissue.

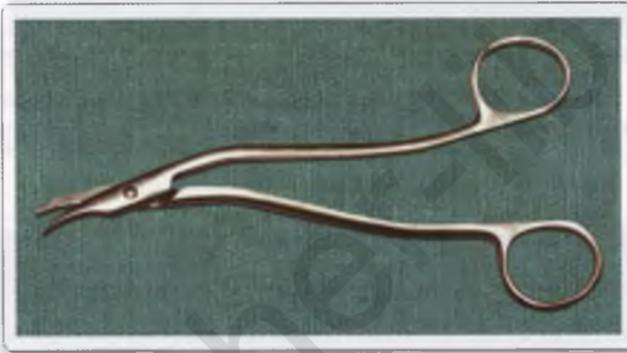


Figure 7.34: Stitch cutting scissors

(II) *Episiotomy scissors*

- Curved on angle scissors with blunt tip as to avoid damage to any structure (Fig. 7.35).
- Episiotomy is given at crowning of head.



Figure 7.35: Episiotomy scissors

## Instrument tray for delivery (Fig. 7.36)



**Figure 7.36:** Delivery instruments. 1. Episiotomy scissors; 2. Artery forceps; 3. Needle holder; 4. Dissecting forceps; 5. Cord clamps; 6. Catgut; 7. Syringe; 8. Inj. xylocaine vial; 9. Sponge holder; 10. Kidney tray

### ■ Mayo scissors (dissecting scissors)

- Sturdy scissors and is also called **tissue scissors** (Fig. 7.37)
- Blunt ends do little damage while separating the tissues
- Used for tough tissue dissection such as rectus fascia, parametrial tissues, vaginal cuff
- They are heavy and accurate for gentle dissection particularly “separate and cut”
- It has no ratchet and operating end is sharp.



**Figure 7.37:** Mayo scissors

### ■ Metzebaum scissors

- Delicate than Mayo

- For cutting thinner tissues peritoneum, adhesions, vaginal epithelium (Fig. 7.38)



Figure 7.38: Metzebaum scissors

- They are used for retroperitoneal dissection and for developing tissue planes in distorted and adhered tissue.

#### ■ Iris scissors



Figure 7.39: Iris scissors

- They are small scissors (Fig. 7.39)
- They are used for precise vaginal surgery and vulvar surgery
- Used for delicate dissection.

#### Technique (Figs 7.40 to 7.42)

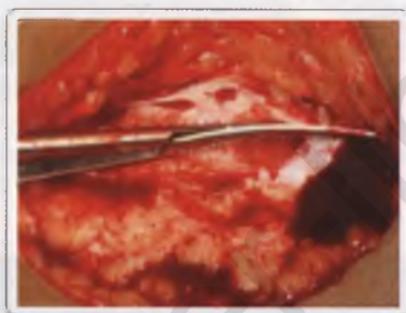
Surgeon keeps thumb and fourth finger within the instrument's rings and index finger is set against the crosspiece of scissors for greater control. This tripod grip (Fig. 7.43) allows maximum shear, torque, stability, control and closing force.



**Figure 7.40:** Blades are closed and inserted between planes



**Figure 7.41 :** Blades are opened and withdrawn



**Figure 7.42:** Turn wrist and blade 90° and reinsert lower blade. Tissues are divided



**Figure 7.43:** Tripod grip

### Uses of scissors

- Blunt dissection and sharp dissection
- Divide tissues, i.e. adhesions, peritoneum, vaginal epithelium
- Dissect and define plane
- Cut pedicles and suture
- Extending incision made by scissors.

## UMBILICAL CORD CLAMP

1. Disposable clamp made of plastic (Fig. 7.44)
2. Inner surface has transverse serrations for tight grip on cord



Figure 7.44: Umbilical cord clamp

3. Open end can be locked after clamping the cord by giving pressure
4. Clamp sheds off when cord dries and falls off
5. By delaying cord clamping about 80 ml blood goes to fetus
6. Early cord clamping is done in:
  - Rh isoimmunization (to prevent antibody transfer from mother to baby)
  - Asphyxia
  - Preterm (to prevent hypervolemia)
  - Diabetic mother
  - Low birth weight.

## Section

# 8

## Special Instruments in Obstetrics and Gynecology

### GREEN ARMYTAGE FORCEPS

It is a straight forceps used in cesarean section.

#### ■ Parts



Figure 8.1: Green armytage forceps

#### Blades

Tips are flat, solid triangular with transverse serrations at inner edge (Fig. 8.1).

#### ■ Uses

- To grasp cut edges of uterine incision in cesarean section. It compresses large uterine sinuses and clears the operating field.
- Can lift the uterine edges during suturing in cesarean section.
- To hold cervix in cervical tear in place of the sponge holding forceps.

#### ■ Advantages

- Hemostatic: Broad flattened blades achieve good hemostasis by compressing the bleeding uterine vessels over a large area.
- Atraumatic.

## DOYEN'S MYOMA SCREW

### ■ Parts

- Handle is ring-shaped.
- End has corkscrew like arrangement and tip is pointed (Fig. 8.2).



Figure 8.2: Doyen's myoma screw

### ■ Use

To fix and give traction on myoma during myomectomy operation after incising the capsule.

## BONNEY'S MYOMECTOMY CLAMP

- Designed by Victor Bonney
- It is used to reduce intraoperative blood loss in operations.



Figure 8.3: Bonney's myomectomy clamp

## ■ Parts

### Blades

- These are at an angle of  $120^\circ$  to the shaft
- It has overlapping transverse bar dividing it into two compartments
- There is a rubber tubing in anterior half of the compartment which prevents trauma to the structures.

### Shaft

### Handle

- Handle has two pairs of finger grips (Fig. 8.3)
- Distal finger grip is used for applying and removing the instrument
- Proximal finger grip can open up the instrument wider in bulky uterus.

## ■ Technique

- The clamp is applied with curve downwards from pubic end of abdominal wound.
- Two round ligaments are included in grip of blades to prevent the instrument from slipping and keeping it anteverted.
- Uterine arteries are clamped at level of internal os. The ring forceps can be applied to the ovarian vessels.
- Clamp is released every 20 minutes to prevent tissue anoxia and accumulation of histamine.

## ■ Uses

To control bleeding during operation of:

- Myomectomy

- Hysterotomy
- Metroplasty.

**Use has become less because myoma can be removed by latest methods:**

1. Laparoscopic myomectomy
2. Motorized morcellation
3. Minilap incision.

## IUCD REMOVING HOOK

It is a long instrument, angled and has a hook at the end.

### ■ Parts

**Hook**

**Handle**

It is differentiated from uterine sound by following points:

- It has no graduations
- It has a hook at tip to remove IUCD (Fig. 8.4).



**Figure 8.4:** IUCD removing hook

### ■ Technique

- OPD procedure
- Anesthesia is not required. LA can be given if required

- Retract anterior and posterior vaginal walls and hold cervix with vulsellum
- Cervical dilatation is not required
- Under strict asepsis hook is introduced into uterine cavity
- IUCD is hooked out with the instrument.

### ■ Uses

- Removal of IUCD when thread is missing or rolled up
- Removal of embedded IUCD from the uterine cavity
- Removal of tubal prosthesis from the uterine cavity.

### ■ Disadvantages

- Perforation
- Injury.

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## UTERINE PACKING FORCEPS

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It is a 'S' shaped forceps with curvatures corresponding to the axis of birth canal.

### ■ Parts

- Blades are blunt and curved with transverse serrations on its inner surface
- Handle is slightly curved posteriorly
- There are two curves to accommodate angles of uterus and vagina (Fig. 8.5).



Figure 8.5: Uterine packing forceps

### ■ Technique

- Retract anterior and posterior vaginal wall and hold cervix with the sponge holder.
- Sterilized ribbon gauze is introduced into the uterine cavity starting from one cornual end to other cornual end and back again till whole cavity is packed leaving no dead space.
- Cervix and vagina are packed and the number of ribbon gauze is documented.
- Watch for vitals, bleeding P/V and increase in fundal height.

### ■ Uses

#### Uses in obstetrics

1. Packing uterus: In atonic PPH and postabortal hemorrhage
2. Packing vagina: To control bleeding in traumatic PPH.

#### Uses in gynecology

1. To control oozing from vault after vaginal hysterectomy
2. To control secondary hemorrhage from operative sites, e.g. vault, cervix, vagina
3. To control bleeding after hysteroscopy
4. To control bleeding after polypectomy and cervical biopsy.

## UTERUS HOLDING FORCEPS

It is an instrument for holding the uterus during operations.

### ■ Shirodkar uterus holding forceps

#### Blades

- Blades have curved transverse bars at tip with distance in between
- Transverse bars have a gap to make it atraumatic
- Bars occlude the isthmic region and cervical canal
- Firm grip allows manipulation of uterus. It is to hold and steady uterus during operations (Fig. 8.6).



Figure 8.6: Shirodkar uterus holding forceps

### ■ Dartigue's uterus holding forceps

#### Blades

- Blades with a shape of question mark
- Blades are curved in opposite direction
- Blades do not occlude isthmus so not used for chromoperturbation in tuboplasty operations (Fig. 8.7).



Figure 8.7: Dartigue's uterus holding forceps

## ■ Uses

- Tuboplasty operations for chromopertubation (Fig. 8.6)
- Gilliam's operation for retroversion of uterus
- Sling operations
- Repair of VVF and RVF by abdominal route.

## MERSILENE TAPE

It is a nonabsorbable sterilized needled polyester fiber tape 30cm×5mm on a ½ circle heavy round bodied double needle. It is used in cervical incompetence for giving **McDonald** stitch which is a cerclage operation (Fig. 8.8).



Figure 8.8: Mersilene tape

## ■ Technique

- Anesthesia: Regional anesthesia or GA.
- Vaginal preparation is done.

- Vaginal walls are retracted and cervix is visualized. Cervical lip is pulled down by sponge holding forceps.
  - Purse string suture is given taking four successive deep bites as high as possible in the body of cervix and very near the level of internal os.
  - At completion of encirclement, the suture is tightened around the cervical canal thus reducing diameter of the canal to 5–10mm.
  - Knot is tied
  - *Postoperative advice*
    - Rest and tocolytics
    - Avoid journey and intercourse
    - Report if bleeding or pain.
- Stitch should be removed at 37th week gestation or early if any complication arises.

### ■ Advantages

- Simple
- Less blood loss
- Good success rate 85–95%.

### ■ Complications

- PROM (premature rupture of membranes)
- Chorioamnionitis
- PTL (preterm labor)
- Vaginal bleeding due to cervical laceration/cutting through of suture
- Uterine contractions and irritability
- Rarely bladder injury
- Cervical dystocia
- Uterine rupture.

### ■ Contraindications

- Ruptured membranes
- Infection
- Uterine bleeding
- Uterine contractions
- Cervical dilatation > 4 cm
- Fetal anomaly.

## Instrument tray for McDonald suture (Fig. 8.9)



**Figure 8.9:** Instruments for McDonald suture. 1. Sponge holder for cleaning; 2. Sims speculum; 3. Sponge holders; 4. Needle holder; 5. Mayo scissors; 6. Dissecting forceps; 7. Mersilene tape

### SHIRODKAR CERVICAL ENCERCLAGE NEEDLES

- They are used for modified Shirodkar cerclage operation for incompetent cervix.
- A cervical encircling suture (nonabsorbable) is passed around cervix at the level of internal os.
- Uterine polarity is disturbed and thus prevents “Taking up” of lower segment.

### ■ Parts

- These are two right and left needles which are half circled and each has an eye at tip.
- Needles are mirror image of each other. They are 5 cm long (Fig. 8.10).

### Time

- Cervical cerclage is given at 14 weeks or 2 weeks before the age of gestation at which the patient aborts.

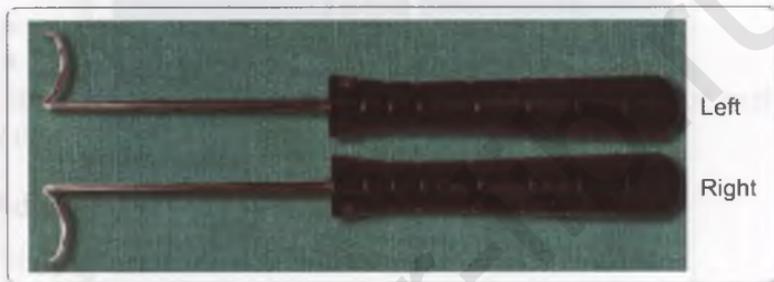


Figure 8.10: Shirodkar cervical encerclage needles

### ■ Technique

- Consent
- Anesthesia: GA
- Lithotomy position
- Cervix is exposed by retracting the vaginal walls and held by Allis or sponge holding forceps. A 2cm transverse incision is made anteriorly on vaginal wall below the base of bladder
- Bladder is pushed up. A transverse incision is then made posteriorly at cervicovaginal junction
- Nonabsorbable 5 mm mersilene tape is passed by Shirodkar needle
- Ends of suture are cut 3cm long and knot is tied posteriorly
- Vaginal mucosa is repaired
- Stitch should be removed at 37th week gestation or early if any complication.

#### *Postoperative advice*

- Rest and tocolytics

- To avoid journey and intercourse
- Report if there is pain or bleeding.

### ■ Advantages

- Stitch can be placed high at internal os
- Suture is buried under vaginal mucosa and thus reducing risk of infection.

### ■ Disadvantages

- Greater technical difficulty and dissection
- Difficulty in removing suture at term.

## INTRAUTERINE INSEMINATION CANNULA

It is a thin flexible catheter which is placed in uterine cavity for intrauterine insemination (IUI).

### ■ Indications

AIH (artificial insemination husband)

- Mild to moderate male subfertility: Oligospermia, asthenospermia, teratospermia, oligoasthenoteratozoospermia, pyospermia, semen volume and liquefaction defects.
- Impotency.
- Premature ejaculation, retrograde ejaculation.
- Anatomical defects, i.e. hypospadias, vaginal and cervical defects.
- Unexplained infertility.
- Cervical factor, i.e. hostile cervical mucus, antisperm antibodies in cervical mucus.

- Immunological factors: Presence of antisperm antibodies.
- Endometriosis: Mild or moderate.
- Chronic anovulation.
- X-Y fractionation of sperm for sex selection in chromosomal and genetic abnormalities.
- HIV positive woman or man.

AID (artificial insemination donor)

- Azoospermia
- Immunological factor if not correctable
- Genetic disease in the husband
  - Screening is done for HIV, STD, Hepatitis B. To minimize HIV transmission frozen semen is stored for 6 months. By end of this period if donor remains HIV negative then insemination is thawed and used.

### ■ Techniques

Insemination can be:

- Intrauterine (commonest)
- Intrafallopian
- Intracervical
- Vaginal
- Intraperitoneal.

**IUI (intrauterine insemination):** It is placement of 0.3ml of washed processed and concentrated sperms (devoid of seminal plasma) into intrauterine cavity by transcervical catheterization (Fig. 8.11).

**Purpose:** To bypass endocervical canal and place increased number of motile sperms close to fallopian tube to reach ovulated eggs thereby increases chances of meeting.



Figure 8.11: Intrauterine insemination cannula

Prerequisite: For the best pregnancy rates IUI sperm count is  $> 5\text{m/ml}$  (forward progressive motile sperms).

Proper selection and investigations of couple is necessary.

## ■ Steps in IUI

### I - Monitoring of natural or stimulated cycle so to know time of ovulation by USG

- $D_{2/3}$  AFC (antral follicle count) TVS to rule out corpus luteal or follicular cyst
- $D_{6/7}$  if follicles  $> 10\text{mm}$  size and no.  $> 4$  then no addition of FSH/hMG
- $D_{9/10}$  Follicular size, endometrial thickness
  - Timing of hCG to be determined
  - There should be follicular endometrial synchrony.

#### Stimulated cycle:

Superovulation aims at production of 2–3 mature oocytes.

#### Protocols are:

- CC (clomiphene citrate)
- CC + hCG (human chorionic gonadotrophin)
- CC + hMG / FSH + hCG

Timing of IUI is key to success.

**Natural cycle:** Ovulation is expected to occur 24 hours after endogenous LH surge.

**In induced cycle:** Ovulation is  $> 36$  hours of administration of exogenous hCG so insemination is carried out between 38–40 hours of hCG injection.

Ovulation trigger by administration of hCG

- When leading follicle is 18–20mm
- Number of follicles  $> 16\text{mm}$  should not be  $> 4$
- Serum  $E_2$  is not  $> 1500\text{--}2000\text{pg/ml}$ .

### II – Semen preparation techniques

- Swim up technique
- Density gradient technique.

### *Advantages of semen preparation*

- Removes dead sperms
- Concentrates sperms in small volume
- To get rid of antimotility and anticapacitation factors
- Eliminates prostaglandins
- Removes debris and red blood cells.

### **III – Procedure of insemination**

‘Time’ of IUI is key to success

- Consent.
- Lithotomy position: Head end is lower than foot end. Vulva is cleaned with normal saline.
- Cusco’s speculum is introduced to expose cervix.
- Hold at junction of cervix and vagina by Allis.
- Loaded cannula is gently inserted in uterine cavity 2cm inside os, not to touch fundus otherwise cramping occurs. Content is emptied into the uterus and patient is asked to lie down for 15 min.

**Success rate** AIH: For 4 cycles is 30% overall.

### **ELECTROSURGICAL LOOP (FIG. 8.12)**

- LEEP (loop electrosurgical excision procedure). Requires electrosurgical unit, wire loop electrode, insulated speculum and smoke evacuation system.
- LLETZ (large loop excision of transformation zone).

#### **Parts**

Thin wire semicircular electrode made of stainless steel or tungsten.



Figure 8.12: Electrosurgical loop

### ■ Technique

- Consent is taken.
- Anesthesia and patient position:
  - Dorsal lithotomy position
  - Office anesthesia/GA.

### ■ Method

- Electrosurgical grounding pad is placed under buttock and insulated speculum inserted into vagina.
- Smoke evacuation tubing is attached.
- Application of Lugol iodine outlines lesion margins.
- Electric current is passed in tissue via 0.2mm stainless steel or tungsten wire electrode.

#### Single pass excision (ideal)

- Correct loop diameter should incorporate entire lesion diameter to a depth of 5mm–8mm.
- Cutting mode typically 30–50W is required. Loop is positioned 3–5mm outside the lateral perimeter of lesion.
- The loop is advanced into cervix lateral to lesion until required depth is reached.
- The loop is taken across to opposite side and cone of tissue is removed.

#### Multiple pass excision (if required).

Control of bleeding sites is done.

### ■ Advantages

- Specimen for HPE is available with local excision
- Preferred over cryosurgery, as low cost and minimal discomfort.

### ■ Disadvantages

- Short term: Abdominal pain, bleeding, cramping, spasm

- Long term: Persistence of disease, cervical stenosis, incompetent os, preterm labor, dystocia, bladder injury.

### **CERVICAL PUNCH BIOPSY FORCEPS**

It is a strong instrument.

#### **Parts**

##### **Blade**

- There are two blades
- Smaller blade has sharp cutting edge and fits into larger blade (Fig. 8.13)
- Specimen is held in it like a basket.

##### **Handle**

- Handle is angulated to avoid obstruction of field of vision.

##### **Lock and finger grips**



**Figure 8.13:** Cervical punch biopsy forceps

### ■ Technique

- Anesthesia given is paracervical block with or without sedation.
- Vagina is prepared.
- Area of biopsy is marked out by VIA, Schiller's iodine stain or colposcopy.
- Punched area should include adequate bite of **normal and abnormal** tissue. Four quadrant biopsy is taken.
- Biopsy tissue should contain sufficient subepithelial connective tissue so that possibility of microinvasion can be ruled out, i.e. 3–5mm stroma in addition to surface epithelium.
- Hemostasis of raw area is done by packing or taking stitch. Tissue is sent for HPE in formalin.

### ■ Indications

- Bad cervix, recurrent cervicitis and nonhealing erosions
- Postcoital bleeding P/V
- Abnormal Pap smear
- Abnormal finding on Schiller's test, i.e. iodine negative areas on colposcopy.

### ■ Disadvantage

Hemorrhage.

### CRYOMACHINE (FIG. 8.14)

Used for cryosurgery (Syn:cryocautery / cryotherapy) which is an ablative method used to eliminate cervical intraepithelial lesion.

Compressed gas creates extremely cold temperature that necroses cervical epithelium. As compressed gas expands it

drains heat away from cervical epithelium and causes destruction of cell by crystallization of intracellular fluid.

## Parts

**Cryoprobe:** Tip is made of silver or copper and is in contact with surface of cervix.



Figure 8.14: Cryomachine

### Refrigerating gas cylinder:

i) Nitric oxide : Commonest gas which is used.

Probe temperature can reach  $(-65^{\circ}\text{C})$

ii)  $\text{CO}_2$  : Temperature  $(-60^{\circ}\text{C})$

iii) Freon : Temperature  $(-60^{\circ}\text{C})$

**Cryogun** is attached with connecting tube to a cylinder of refrigerating gas, i.e. nitrous oxide cylinder with pressure gauge.

Pressure of at least 20 pounds is required.

## Patient evaluation

- CIN is confirmed by colposcopy/cervical biopsy and there should be no evidence of invasive cancer.
- Woman should not be pregnant or recently delivered.
- The entire lesion is located in ectocervix with no extension in endocervix and vagina.
- The lesion is visible in its entire extent and does not extend more than 2–3mm into the endocervical canal.

- The lesion should be adequately covered by the largest cryoprobe and lesion should extend less than 2mm beyond the cryoprobe.

### ■ Technique

- Informed consent: Preferred postmenstrually and generally no analgesia is required. Dorsal lithotomy position.
- Cryoprobe placement: Appropriate probe is placed firmly on cervix to cover transformation zone and lesion.
- Ice ball formation: Gas tank valve is opened and pressure of 20 pounds is created. The trigger is squeezed and gas forms a layer called 'ice ball' on cervix (Fig. 8.15).
- The portion of ice ball in which temperature falls below  $-20^{\circ}\text{C}$  is called "lethal zone".
- This zone extends from center of cryoprobe to a point 2 mm inside outer ice ball edge. Cells reduced to  $-20^{\circ}\text{C}$  for one minute or more undergo cryonecrosis.
- When cryotherapy is performed the ice ball is allowed to enlarge until it reaches a mark 7 mm distal to probe margin.
- This ensures freezing depth of 7 mm, (i.e. 5 mm lethal zone). A depth of 5mm is sufficient to treat endocervical glandular crypt involvement of most lesions.



Figure 8.15: Cryocautery

- Caution: Cryoprobe should not contact the vaginal side walls. If it happens gas delivery is stopped. Allow probe warming.

Single freeze	3 Min	5 Min	
	(Freeze)	(Thaw)	
Double freeze	3 Min	5 Min	3 Min
(Preferred)	(Freeze)	(Thaw)	(Freeze)

■ **Advantages**

- Best tolerated
- Cheap
- Least painful.

Postoperative advice—Abstinence for 4 weeks  
Cryocautery can be repeated after 3 months.

■ **Complications**

- Watery discharge (most common) and patient may require sanitary pads
- Bleeding
- Lower abdominal pain and cramping
- Cervical stenosis: Rare
- Infection.

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## SUTURE MATERIALS

A suture is any strand of material used to approximate tissues or ligate vessels (Fig. 8.16).

Selection of suture material is essential to maximize wound healing and tissue support.

United States Pharmacopeia (USP) defines; Absorbable suture as a “sterile strand prepared from collagen derived from healthy mammals or a synthetic polymer which is capable of being absorbed by living mammalian tissue (Table 8.1).

Nonabsorbable sutures are strands of material that are resistant to the action of living mammalian tissue (Table 8.2).

### Types

Absorbable	Nonabsorbable
1. Plain catgut (Biologic)	1. Silk (Biologic)
2. Chromic catgut (Biologic)	2. Cotton (Biologic)
3. Polyglactin 910 (Vicryl)	3. Nylon
4. Polydioxanone (PDS)	4. Steel
5. Polyglyconate	5. Polypropylene (Prolene)
6. Polyglycolic acid (Dexon-5)	6. Polyethylene terephthalate
7. Poliglecaprone 25	(Dacron mersilene)

### Reading the suture label

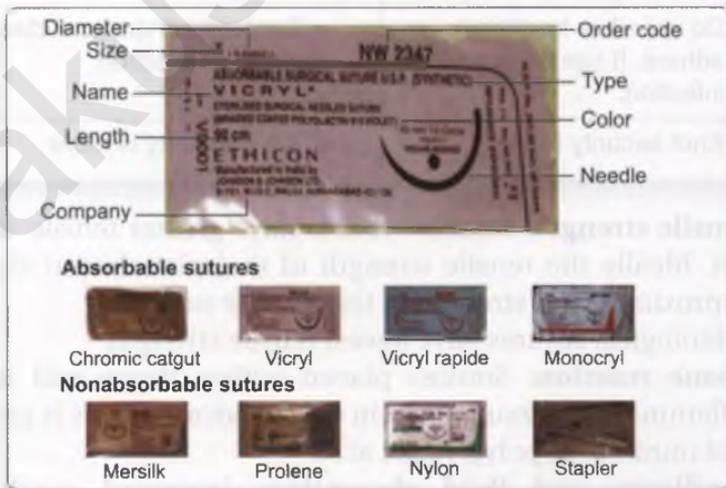


Figure 8.16: Sutures

### Selection of suture material depends on following factors

1. Absorbable	Nonabsorbable
<ul style="list-style-type: none"> <li>• <b>Destroyed</b> enzymatically or hydrolyzed, so no foreign body is left.</li> </ul>	<ul style="list-style-type: none"> <li>• Persists and is encapsulated, so used in long term approximation of tissues.</li> </ul>
<ul style="list-style-type: none"> <li>• Used in <b>rapidly healing</b> tissue like peritoneum, vagina.</li> </ul>	<ul style="list-style-type: none"> <li>• Used in <b>slow healing</b> tissues like pelvic floor construction, hernia repair.</li> </ul>
<ul style="list-style-type: none"> <li>• Ideal for urinary tract and biliary tract as no stone formation.</li> </ul>	<ul style="list-style-type: none"> <li>• Ideal for tissues made up of mainly collagen, i.e. fascia, tendon, aponeurosis.</li> </ul>
	<ul style="list-style-type: none"> <li>• Used in hypoproteinemic patients.</li> </ul>

2. Monofilament (e.g. Catgut, PDS, Prolene)	Multifilament (e.g. Vicryl, Silk, Cotton Dexon)
<ul style="list-style-type: none"> <li>• Made of single strand.</li> </ul>	<ul style="list-style-type: none"> <li>• Several filaments twisted or braided.</li> </ul>
<ul style="list-style-type: none"> <li>• Lower friction coefficient, pull easy less tissue injury.</li> </ul>	<ul style="list-style-type: none"> <li>• Easier to tie and handle.</li> </ul>
<ul style="list-style-type: none"> <li>• Do not allow bacteria to adhere. It can be used in infection.</li> </ul>	<ul style="list-style-type: none"> <li>• Bacteria adhere to surface. Avoid in infection.</li> </ul>
<ul style="list-style-type: none"> <li>• Knot security is less.</li> </ul>	<ul style="list-style-type: none"> <li>• Knot security is more.</li> </ul>

**3. Tensile strength:** Nonabsorbable have greater tensile strength. Ideally the tensile strength of material chosen should approximate the strength of tissue to be sutured.

Biological sutures have lowest tensile strength.

**4. Tissue reaction:** Sutures placed within tissue will incite inflammation. Tissue reaction of biological sutures is greater and minimal in polyglycolic acid.

**5. Capillarity and fluid absorption:** Increased capillarity and fluid absorption ability greatly increases the number

of bacteria absorbed. Multifilament sutures have greater capillarity than monofilament.

- 6. Caliber:** Diameter of suture reflects its size and is measured in tenths of millimeter.

Midpoint diameter size is 0. Suture diameter increases above this and decreases below this. Suture designation is from no. 5 to 10-0, e.g. 1 catgut is thicker than 0 catgut and 2-0 is greater in diameter than 3-0. Choice of suture caliber should be such as to limit tissue damage during placement and minimize tissue reaction.

Where cosmetic results are important use smallest inert monofilament suture.

- 7. Ease of handling:** Good in silk, Mersilene, Dexon, Vicryl and poor in Prolene.
- 8. Knot security:** Knot is the weakest link in tied suture and knot failure can lead to complication.

Knot security is good with silk, Mersilene, Dexon.

**Table 8.1:** Absorbable Sutures

Suture	Source	Color	Tensile strength	Tissue reaction	Absorption rate	Uses	Contraindications
Plain catgut (biologic) twisted monofilament	Collagen from bovine intestinal mucosa of cow, sheep	Straw	70% loss in 7–10 days more rapid loss of tensile strength if infection is present	High	Enzymatic and proteolytic process 7–10 days	For rapidly healing tissues, subcutaneous tissue (general suture for small vessels) Pomeroy's tubal ligation	Not for slow healing tissues
Chromic catgut (biologic) twisted monofilament	-do- Catgut is treated with 20% chromic acid to make it more inert and lesser tissue reaction as it binds with antigenic sites of collagen	Dark brown	Lost in 21–28 days	Moderate	Totally absorbed in 70 days by proteases released by WBC	Suture for tissue mucosa peritoneum. 3knots (poor knot security)	Replaced by Vicryl and PDS in some countries

Contd...

Contd...

Suture	Source	Color	Tensile strength	Tissue reaction	Absorption rate	Uses	Contraindications
Polyglactin Vicryl (Synthetic) braided multifilament	Copolymer of 90% glycolide and 10% lactide	Undyed natural violet	No loss in first week 60% remains at 2 weeks, 30% remains at 3 weeks Vicryl rapide: 70% lost at 7 days. All strength lost at 14 days. Tensile strength and absorption are not affected in presence of infection	Mild	Completely absorbed in 60–90 days by hydrolysis (nonenzymatically)	<b>Vicryl 910.</b> Good for fascial closure 4 knots ( <b>Good</b> knot security). Strength and reliability more than catgut. <b>Workhorse suture in most surgeries. Vicryl rapide</b> is used in subcuticular tissues. Ideal in episiotomy and vaginal mucosa. <b>Vicryl plus</b> FDA approved antibacterial suture.	Not used in tissues where prolonged approximation is required under stress
Polydioxanone (PDS) (synthetic) monofilament	Polyester polymer	Colorless /dyed	70% remains at 2 weeks 50% remains at 4 weeks 14 % remains at 8 weeks	Mild	Minimal hydrolysis till 90 days, all absorbed at 180 days	Can be used in infected area and where slightly longer wound support is required. Knot security poor	-do-

Contd...

Contd...

Suture	Source	Color	Tensile strength	Tissue reaction	Absorption rate	Uses	Contraindications
Polyglycolic acid (dexon) (synthetic) braided multifilament	Glycolic acid polymer	Violet or undyed	40% remains at 1 week 20% remains at 3 weeks	Minimal	Absorption in 60–90 days	Alternative to Vicryl and PDS. 6 knots (good knot security)	-do-
Poliglecaprone (monocryl) (synthetic) monofilament	Copolymer of glycolite and caprolactone	Undyed natural violet	Lost by 21 days	Minimal	Absorption 90–120 days	Subcuticular in skin, gastrointestinal surgery	Not used for extended support
Polyglyconate monofilament	Copolymer of glycolic acid and trimethylene carbonate	Undyed or dyed	70% remains at 2 weeks	Mild	Absorbed in 180 days	Alternative to Vicryl and PDS	Not used in tissues where prolonged approximation is required under stress

**Table 8.2:** Nonabsorbable Sutures

Suture	Source	Color	Tensile strength	Tissue reaction	Absorption rate	Uses	Contraindications
Cotton (naturally occurring) twisted multifilament	Cotton fibers aligned and twisted	White	50% lost by 6 months 70% lost by 2 years	Moderate	Remains encapsulated in body tissues		Rarely used in modern surgical practice
Silk (naturally occurring) braided twisted multifilament	Protein thread secreted by silk worm for its cocoon	Black	It is used dry as tensile strength decreases in moisture	Moderate to high	Most or all by 1 year to 2 year	Used for suturing and ligation in noninfected tissue. Secure knot	Nidus in presence of infection
Surgical steel (naturally occurring) monofilament multifilament	Iron nickel chromium alloy	Silver metallic	Indefinite	Minimal	Remains encapsulated in body tissues	Little use in gynecological surgery	

*Contd...*

Contd...

Suture	Source	Color	Tensile strength	Tissue reaction	Absorption rate	Uses	Contraindications
Prolene polypropylene (synthetic) monofilament	Polymer of propylene	Blue dyed undyed	Indefinite	Low	-do-	Used for skin closure, vascular surgery, pull out suture, tuboplasty, cosmetic surgery, hernia repair. 5–6 knots	None
Nylon monofilament multifilament braided	Polyamide Polymer	Dyed undyed	Loss 15–20% per year	Low	Degrades 15–20% per year	Used in skin closure as retention suture pull out suture, cosmetic surgery, hernia repair, ophthalmic neurosurgery 6–7 knots	None
Polyethylene terephthalate (mersilene) braided multifilament monofilament	Polyester (Polyethylene terephthalate)	Green dyed undyed	Indefinite	Low	Remains encapsulated in body tissues	Used in heart surgery, plastic surgery and general surgery 5 knots	None

**Points to remember:**

- All the natural sutures, catgut, linen, cotton, silk are now replaced by polymeric synthetic materials in some countries because:
  - Inflammatory reaction is reduced
  - Strength is predictable
  - Absorption is more predictable and complete.
- Absorbable synthetic sutures impregnated with antiseptic prevent postoperative infections, e.g. Vicryl plus (Triclosan).
- **Rate of healing**  
Tissues that heal slowly, i.e. skin, fascia, tendon are closed with nonabsorbable sutures. Rapid healing tissues are closed with absorbable suture material.
- **Urinary and biliary tracts**  
Nonabsorbable sutures are not used in urinary tract and biliary tract as stone formation can occur.
- **Tissue contamination**  
Since genital tract is a potentially contaminated area absorbable sutures should be used.  
For episiotomy repair polyglactin 910 rapide is preferred. Multifilament sutures are avoided in infections.  
Absorbable or monofilament sutures are used. Absorbable sutures cause minimal tissue reaction as they are absorbed. Monofilament sutures have no interstices in thread and so there is less risk of bacterial adherence.
- **Suture size**  
The amount of suture material used should be minimum. The finest size of suture material should be used with respect to natural strength of the tissue.
- **Nutritional status**  
In hypoproteinemic and undernourished patients nonabsorbable sutures should be used.
- **Cosmetic results**  
Use the smallest, inert monofilament suture material such as polypropylene or polyamide (Nylon) for cosmetic results.  
Whenever possible give subcuticular stitches instead of skin sutures with poliglecaprone 25 monofilament, coated polyglactin 910, polyamide or polypropylene for cosmetic results.
- **Microsurgical procedure**  
Polyamide monofilament 10-0 or coated polyglactin 910 no. 9-0 is used.
- Secure knots will prevent slippage.
- Retention sutures can be used if required.
- Polyesters, i.e. Terylene and Dacron are sutures of choice in cardiovascular surgery.

## Instruments for Cervical Screening

### AYRE'S SPATULA AND CYTOBRUSH

Ayre's spatula and cytobrush are used for collection of cells for cytology screening.

#### ■ Instruments

##### Spatula

It is made of plastic or wood. It has blades on both ends. One blade is bifid with one tongue smaller than other and predominantly samples **ectocervix**. The other end is broad, rectangular to take smears from vaginal wall for hormonal cytology (Fig. 9.2).

Plastic spatula is preferred to wood because cells are more easily released from plastic surface (Fig. 9.1A).



Figures 9.1A to C: Cervical cytology

##### Cytobrush

Endocervical brush samples **endocervical canal** and is used in combination with spatula. It has plastic bristles (Fig. 9.1B).

##### Plastic broom

It is for liquid-based cytology (Fig. 9.3). It samples both **endo** and **ectocervical** epithelia simultaneously. Broom has longer central bristles and is inserted in endocervical canal. Shorter bristles



**Figure 9.2:** Conventional cytology

**Figure 9.3:** Liquid-based cytology

splay out over ectocervix (Fig. 9.1C). Cervex brush gives more reliable sampling reducing unsatisfactory smear.

- Pap test can detect 60–70% of cervical cancers, 70% of endometrial cancers.
- Sensitivity of Pap smear for HSIL is 70–80%, specificity is 95–98%.
- **False-positive** test can be in presence of infection.
- **False-negative** test (10–15%) can be due to screening error, sampling error, interpretation error, which can be reduced to 1% by repeated tests.
- Pap smear should be obtained prior to P/V examination because fingers may remove desquamated cervical cells and lubricant may prevent detection of organism which gives false-negative results.
- During pregnancy external os becomes patulous and squamocolumnar junction (SCJ) is well-exposed. Pap smear yields most accurate results.
- Pap smear in postmenopausal woman is sometimes inaccurate or negative due to indrawing of SCJ, dry vagina. This can be improved by giving estrogen cream locally for 10 days daily.

### ■ Uses

1. Cervical cytology
2. Posterior vaginal wall cytology
3. Cytohormonal evaluation.

## I. Cervical cytology

Cytology is a Greek word meaning study of cells.

Pap test was first described by Papanicolaou and Traut in 1943. It is a screening test for cervical cancers. It is also called surface biopsy or exfoliative cytology.

### Screening guidelines ACOG (2009)

1. Initiation of screening	<b>Begin at 21 years</b>	
2. Screening interval	<b>21–29 years</b> (ACOG) (USPSTF/ ACS/ ASCP)	<b>2 yearly</b> <b>3 yearly</b> <b>(not yearly)</b>
Average risk	<b>&gt; 30 years</b> Only cytology	<b>3 yearly</b> if 3 previous tests are negative
	Cytology with HPV	<b>5 yearly</b>
High risk	DES exposure in utero, immunocompromised HIV infection Prior CIN-2, CIN-3, cervical cancer	Screening is more frequent  Screening annually for life Screening annually for at least 20 years
3. Discontinuation of screening	<b>Stop at 65–70 years</b> (avg. risk of cervical cancer)	If 3 tests are negative in prior 10 years
	<b>Continue</b> routine screening	If sexually active, multiple partners, H/o abnormal cytology
4. Hysterectomy	<b>Discontinue</b>	<b>Total hysterectomy</b> done for benign disease or no past history of CIN or cervical cancer
	<b>Continue</b>	If <b>subtotal hysterectomy</b> has been done

## ■ Technique

- Patient preparation:  
Dorsal position.  
Clean with plain water. No antiseptic is to be used. Smear is taken **before P/V examination** because fingers may remove desquamated cells and give false-negative report. Lubricants distort cell morphology.
- Patient should abstain from vaginal intercourse, douching, use of tampons, medicinal or contraceptive creams for minimum 24–48 hours before test.
- Treatment of vaginitis or cervicitis prior to test is optimal.
- Vaginal walls are retracted by Cusco's speculum and cervix is visualized without use of lubricant jelly.
- The **squamocolumnar junction is scraped** with Ayre's spatula rotating it to 360°. Longer tongue of spatula rotating goes into endocervical canal.  
Squamocolumnar junction is a vital zone to female since this is the focal point where cancer arises.
- Endocervical brush is inserted into endocervical canal only until the outermost bristles remain visible just within external os. Brush is rotated only one quarter to one half turn.
- The slides are labelled and numbered for reference and fixed by dipping in 95% ethylalcohol solution in bottle. The slide is stained by Pap method or Shorr's stain.

## ■ Location

Sampling of transformation zone is essential. Smear should contain cells from SCJ, TZ and endocervix.

## ■ Conventional slide collection (Fig. 9.2)

Special care is taken to avoid air drying of cells. Spatula and brush are quickly spread as evenly as possible over one half to two-third of a glass slide.

## ■ Liquid based cytology (LBC) (Fig. 9.3)

Plastic broom brush can be broken off and put in liquid medium which is buffered methanol (as per specifications by manufacturer sampling and cell transfer to liquid medium).

FDA has approved use of hybrid capture 2 test for HR HPV in combination with cytology. Predictive value is 96%.

### **Advantages of LBC**

- Liquid based cytology is superior to Pap smear
- Decreases number of false-negative results
- Can be used for HPV typing and testing
- Cytology with HPV testing helps to triage ASC-US and CIN cells and yields 96% sensitivity as compared to 60–70% with Pap smear.

### **■ Uses of cervical cytology**

1. Screening of cervical cancer
2. Follow up in treated patients having abnormal smear.

### **■ Reporting of cervical cytology**

Pap test is interpreted as either normal/inflammatory/pre-cancer/cancer.

- **Bethesda system** is used in cytology request form
- **Cytology detail**
- **Clinical detail**
- **Specimen type**  
Conventional Pap test  
Thin layer liquid based cytology (LBC).
- **Specimen adequacy**  
Satisfactory for evaluation  
Unsatisfactory for evaluation.

### **Interpretation/result (The 2001 Bethesda system)**

1. Negative for intraepithelial lesion or malignancy (NILM):  
When no epithelial cells show neoplastic change, i.e. non-neoplastic lesions.
- Infective organisms:  
Trichomonas vaginalis  
Fungal candida species  
Bacterial vaginosis  
Actinomyces species  
Herpes simplex viral infection.

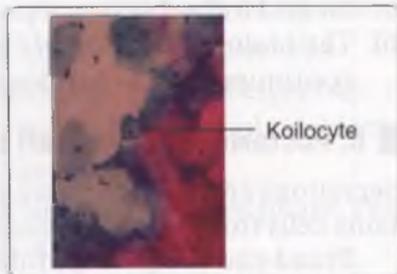
- Others:
  - Reactive cellular changes (inflammatory/due to radiation/IUCD use)
  - Glandular cells status after hysterectomy atrophy.
- 2. Endometrial cells (especially in  $\geq 40$  years of age)
- 3. Epithelial cell abnormalities (Table 9.1).

**Table 9.1:** Epithelial cell abnormalities

Squamous cell	Glandular cell
Atypical squamous cells (ASC) <ul style="list-style-type: none"> <li>• Of undetermined significance (<b>ASC-US</b>): When difficulties in distinction between reactive change and LSIL.</li> <li>• Cannot exclude HSIL (<b>ASC-H</b>): When difficulties in distinction between reactive immature metaplasia and HSIL.</li> </ul>	Atypical glandular cells (AGC) <ul style="list-style-type: none"> <li>• Endocervical cells</li> <li>• Endometrial cells</li> <li>• Glandular cells (Not otherwise specified (NOS) or specify in comments)</li> </ul>
Low-grade squamous intraepithelial lesion ( <b>LSIL</b> )	Atypical endocervical cells, glandular cells (favor neoplasia)
High-grade squamous intraepithelial lesion ( <b>HSIL</b> )	Endocervical adenocarcinoma in situ
Squamous cell carcinoma	Adenocarcinoma (endocervical, endometrial, extrauterine, not otherwise specified)

In HPV infection koilocytes (Fig. 9.4) are seen with perinuclear halo with peripheral condensation of cytoplasm. The nucleus is irregular and hyperchromatic.

Pap smear is a screening test only. Positive test requires further investigations like colposcopy, cervical biopsy and fractional curettage.

**Figure 9.4:** Koilocyte

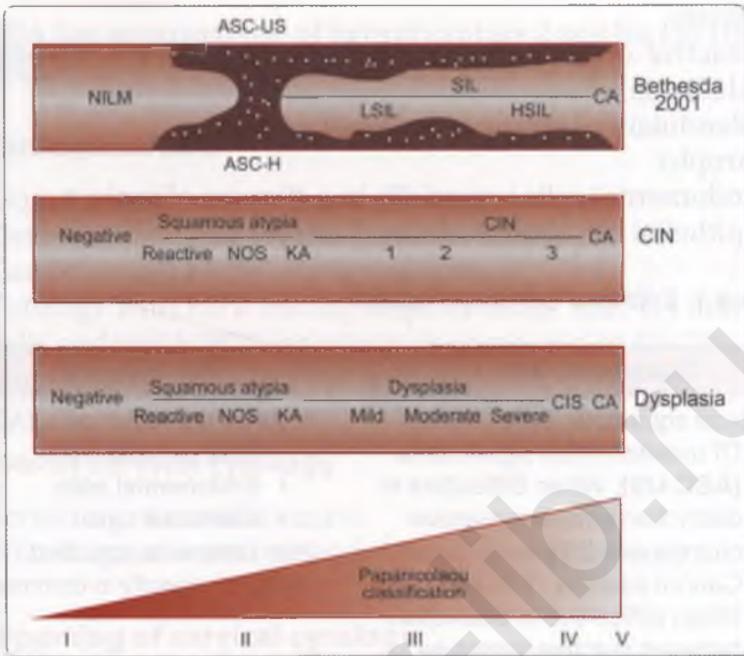


Figure 9.5: Cervical cytology

**Comparison of four cytologic classifications for squamous cells:** Bethesda 2001, CIN nomenclature, dysplasia nomenclature and Papanicolaou classification (Fig. 9.5).

**The Bethesda System 2001** proposed a two tier division (low-grade, high-grade SIL), instead of three tiers of dysplasia classification or CIN classification, because:

- i. Two treatment strategies: Low-grade lesions often followed, while higher grades had colposcopic evaluation.
- ii. The lesser the number of diagnostic categories, better the inter and intraobserver reproducibility.
- iii. The biologic progress of cervical abnormalities may not be as continuous as the previous classifications suggested.

## II. Posterior vaginal wall cytology

Secretions are collected from posterior vaginal fornix which contains cells from uterus, endocervical canal and cervix.

Broad end of Ayre's spatula is used.

### Use

Diagnosing endometrial carcinoma.

### III. Cytohormonal evaluation

Smear is made from upper 1/3rd of lateral vaginal wall as this area is sensitive to hormonal influences. Broad end of Ayre's spatula is used. Maximum glycogen content in vaginal epithelium is found in vaginal fornices.

#### Interpretation of cytohormonal effect (Table 9.2)

**Table 9.2:** Interpretation of cytohormonal effect

Estrogen effect	Progesterone effect
More mature squamous cells (i.e. superficial squamous cells) <ul style="list-style-type: none"> <li>• Cell: Large, polygonal</li> <li>• Cytoplasm: Pink, eosinophilic</li> <li>• Nucleus: Dense pyknotic</li> </ul>	More proliferating cells (i.e. intermediate squamous cells) <ul style="list-style-type: none"> <li>• Cell: Polygonal with folded borders and overlapping</li> <li>• Cytoplasm: Blue, cyanophilic</li> <li>• Nucleus: Vesicular (mesh like)</li> </ul>
Less glycogen	More glycogen
Few Döderlein bacilli	More Döderlein bacilli
Clean background	Dirty background due to wisps of cytoplasm because of cytolysis by bacteria

#### Important indices used in cytohormonal evaluation:

- a. Karyopyknotic index (KI): Percentage of superficial squamous cells (with pyknotic nuclei) to all mature squamous cells.
- b. Eosinophilic index (EI)/cornification index: Percentage of mature squamous cells with eosinophilic cytoplasm/cornified cells to all mature squamous cells.  
Both KI and EI : High in estrogenic /proliferative phase. Peak at time of ovulation (around 50–80%).
- c. Maturation index (MI): Maturation of the squamous cells as relationship of parabasal cells/intermediate cells/ superficial cells (respectively) (Table 9.3).

**Table 9.3:** Maturation index

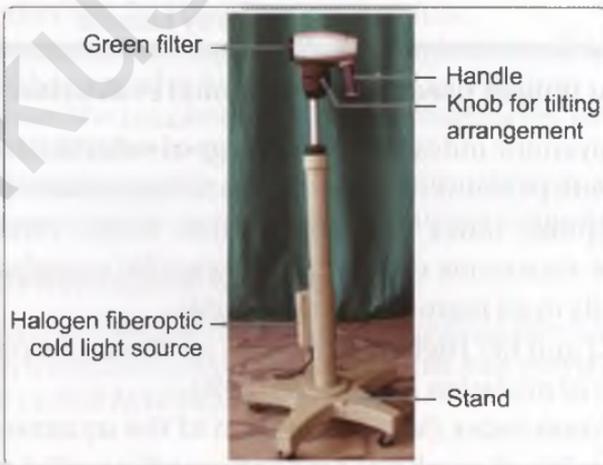
Shift to right, i.e. estrogenic effect	(0/0/100)
Shift to left, i.e. vaginal atrophy, postmenopausal	(90/10/0)
At ovulation/peak of proliferative phase	(0/35/65)
Secretory phase/postovulatory	(0/65/35)
Pregnancy	(0/90/10)

### COLPOSCOPE (FIG. 9.6)

A binocular microscope to study the epithelium of lower ano-genital tract under illumination and magnification.

It was introduced by Hans Hinselmann in 1927.

#### ■ Parts



**Figure 9.6:** Colposcope

## ■ Indications

### Diagnostic indications

Colposcopy is not needed routinely in all patients. Only those with positive Pap smear for suspicious cells or malignant cells needs colposcopy with clinically normal looking cervix.

- Abnormal Pap smear of the cervix, CIN -1 with positive HPV infection
- Abnormal areas on the vagina
- Abnormal areas on the vulva
- Locate the abnormal areas so that selective biopsy can be taken under magnification.

### Therapeutic indications

- Under colposcopic guidance precise conservative treatment with laser and cone can be done. Adequate depth of destruction is 4–5mm in CIN lesions.
- Colposcopic directed biopsy can be performed in CIN lesions.
- Lifelong follow up of conservative treatment is required.

## ■ Technique of colposcopy

- Informed consent.
- Position: Lithotomy.
- No P/V examination. Cervix is exposed with bivalve speculum and inspect cervix and vagina.
- Colposcope is focused on external os at a distance of 20 cm.
- Magnification taken is 6x–15x.
- Pap smear is taken if required.
- Purpose of colposcopy is to identify SCJ (Fig. 9.7), detect suspicious area, take direct biopsy.
- **Saline technique** physiological saline is applied with cotton swab 2"× 2" before application of acetic acid and Lugol iodine. This helps in removing the cervical mucus and studying the subepithelial vascular pattern.
- **Green filter** to study vascular pattern. Blood vessels appear black (Fig. 9.8).
- **Application of acetic acid** 3–5% acetic acid is applied with cotton balls held by sponge holder.

Principle: Acetic acid precipitates protein (clumps nuclear chromatin) and abnormal epithelium appears white called acetowhite (AW) change (Fig. 9.9).

- **Application of Schiller's iodine** (Lugol iodine test) (Fig. 9.10) Normal epithelium is mahogany or black due to glycogen content.

Dysplastic epithelium is mustard or saffron yellow because it is glycogen free.

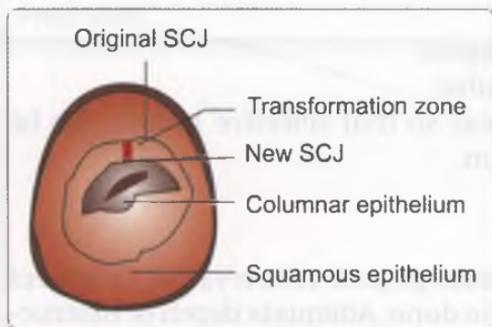


Figure 9.7: Identification of transformation zone

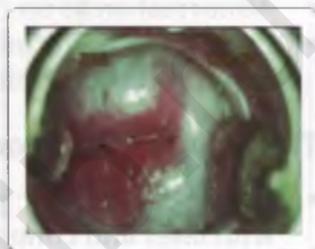


Figure 9.8: After green filter

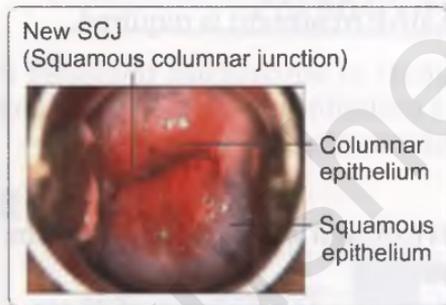


Figure 9.9: After acetic acid wash



Figure 9.10: After iodine application

Iodine uptake is only in glycogen containing squamous epithelium as iodine is glycophilic.

- **Endocervical curettage** and biopsy is taken if it is required.
- **Findings are documented** satisfactory or unsatisfactory (if SCJ is seen or not).
- **Normal findings:**  
Normal columnar epithelium is red grape-like.  
Normal squamous epithelium is homogenous gray.
- **Insignificant findings:**  
Acetowhite epithelium is shiny or semitransparent.  
Borders are not sharp.

Vessels: Fine punctation, fine mosaic, ICD (intercapillary distance) is short.

- **Abnormal findings significant:**

Dense acetowhite area with sharp border. Appears faster and lasts longer (Fig. 9.11).

Vessels are dilated, irregular or coiled (coarse punctation and mosaic) atypical vessels.

Intercapillary distance is more.



Figure 9.11: After acetic acid wash

Table 9.4: Reid index

Reid index			
Feature	0 Point	1 Point	2 Points
Color of acetowhite (AW) area	Shiny, snowy, translucent, transient	Duller white	Dull oyster-white, gray
AW lesion margin and surface configuration	Feathered margins; angular, jagged lesion, flat lesions with indistinct margins, condylomatous, micropapillary margins	Regular lesions with smooth straight outline	Rolled, peeling edges; interval demarcations
Vessels	Fine/uniform vessels; poorly formed patterns of fine punctation and/or fine mosaic	Absent vessels	Well-defined coarse pattern

Contd...

Contd...

Reid index			
Feature	0 Point	1 Point	2 Points
Iodine staining	Positive iodine uptake, giving mahogany brown colors	Partial iodine uptake	Negative iodine uptake

Reid index scoring (Table 9.4): 0–2 points likely to be CIN 1  
 3–4 points likely to be CIN 1–2  
 5–8 points likely to be CIN 2–3

### ■ Advantages

- Colposcopy can locate abnormal areas so that selected biopsy can be taken
- Unnecessary biopsy can be avoided if findings are normal
- Colposcopy can reduce size of biopsy and conization
- Therapeutically colposcopic ablative techniques can be done in preinvasive cancer of cervix and vagina.

# Section 10

## Diagnostic Tools

### CARDIOTOCOGRAPH

A cardiotocograph machine is used for continuous recording of fetal heart rate (FHR) and uterine contractions (Fig. 10.1).

#### ■ Parts



Figure 10.1: Cardiotocograph machine

#### ■ Indications

##### Maternal conditions

- Medical diseases, e.g. hypertension, diabetes, cardiac disease, anemia
- Previous cesarean section delivery
- Induced, augmented or prolonged labor
- Antepartum hemorrhage
- Abnormal uterine activity
- Regional analgesia.

## Fetal conditions

- Suspected fetal distress in labor, e.g. meconium staining of amniotic fluid
- Abnormal FHR on auscultation
- Small fetus (IUGR), preterm fetus, postterm pregnancy
- Oligohydramnios
- Multiple pregnancies
- Rh isoimmunization.

## Advantages

1. It gives information about FHR which cannot be measured by intermittent auscultation. It can detect fetal hypoxia early.
2. Accurate monitoring of uterine contractions can be done.
3. A permanent record is available on the paper.

- **Interpretation of FHR (Fetal heart rate) recordings:** (4 essential components).
  1. Baseline FHR: Normal 110–160 beats per minute (bpm)
  2. Baseline variability
  3. Accelerations present or absent
  4. Decelerations if present then early, late or variable.

Admission Test (AT). CTG (Cardiotocograph) tracing is done at time of admission of patient to identify high risk cases.

## ■ Categorization of CTG traces (RCOG/NICE guidelines)

- **Normal:** A CTG where all four features fall into the reassuring category.
- **Suspicious:** A CTG whose one feature falls into the non-reassuring category and rest three in reassuring category.
- **Pathological:** A CTG whose two or more features fall into non-reassuring category and one or more in abnormal category.

### Comparison of classification systems for EFM-CTG

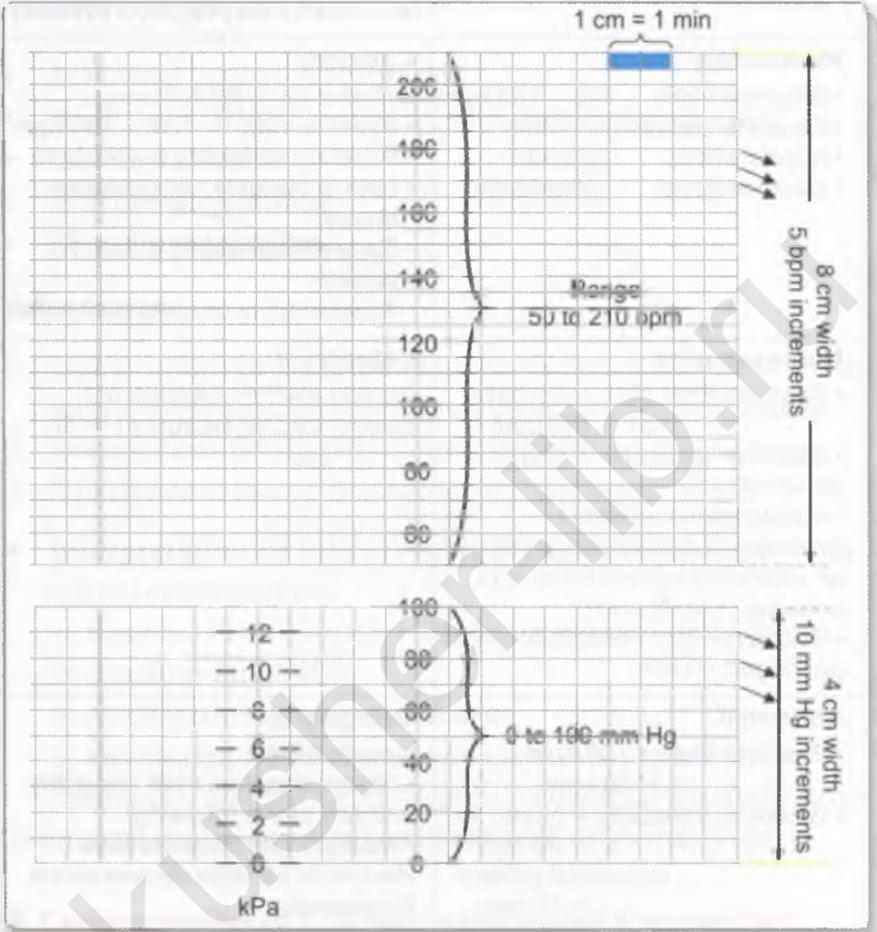
RCOG/NICE Guidelines	NICHD Guidelines (Three-Tier fetal heart interpretation system)
<p><b>Reassuring</b></p> <ul style="list-style-type: none"> <li>• Baseline FHR 110 – 160 bpm</li> <li>• Baseline variability <math>\geq</math> 5 bpm</li> <li>• Accelerations: present</li> <li>• Decelerations: none/early</li> </ul>	<p><b>Category I</b></p> <p>includes all of the following:</p> <ul style="list-style-type: none"> <li>• Baseline rate: 110 – 160 bpm</li> <li>• Baseline variability 6 – 25 bpm</li> <li>• Late or variable decelerations absent</li> <li>• Early decelerations present or absent</li> <li>• Accelerations present or absent</li> </ul>
<p><b>Nonreassuring</b></p> <ul style="list-style-type: none"> <li>• Baseline FHR 100 – 109 bpm 161 – 180 bpm</li> <li>• Baseline variability &lt; 5 bpm for 40–90 min</li> <li>• Accelerations: absent (absence of accelerations with an otherwise normal trace is of uncertain significance)</li> <li>• Decelerations: Variable or single prolonged &lt;3 min</li> </ul>	<p><b>Category II</b></p> <p>Include all FHR tracings not categorized as category I or III.</p>
<p><b>Abnormal</b></p> <ul style="list-style-type: none"> <li>• Baseline FHR &lt; 100 bpm &gt;180 bpm</li> <li>• Baseline variability &lt; 5 bpm for &gt; 90 min sinusoidal pattern &gt; 10 min</li> <li>• Decelerations: Atypical variable and late &gt; 30 min single prolonged &gt; 3 min</li> <li>• Accelerations: Absent</li> </ul>	<p><b>Category III</b></p> <p>Include either:</p> <ul style="list-style-type: none"> <li>• Absent baseline FHR variability and any of the following: Recurrent late decelerations Recurrent variable decelerations Bradycardia</li> <li>• Sinusoidal pattern</li> </ul>

RCOG—Royal College of Obstetricians and Gynecologists

NICE—National Institute of Clinical Excellence

NICHD—National Institute of Child Health and Human Development

**Fetal monitor paper scale (Fig. 10.2)**



**Figure 10.2:** Paper speed @ 1 cm/min as used in countries outside North America

**Vertical axis**

Fetal Heart Rate

- Range 50 to 210 bpm
- Scale Increments of 5 bpm (20 bpm/cm)

Uterine Activity

- Range 0 to 100 mm Hg pressure
- Scale Increments of 10 mm Hg

**Horizontal axis**

- Paper speed 1 cm/min = 2 subsections

### Fetal monitor paper scale (Fig. 10.3)

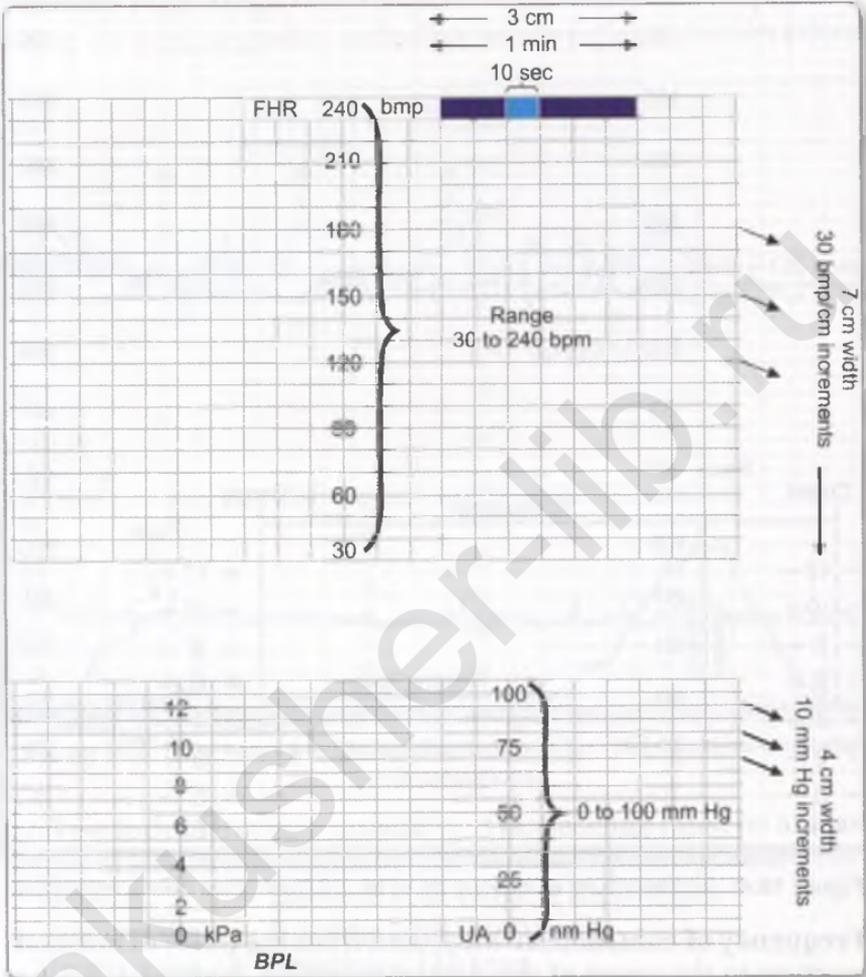


Figure 10.3: Paper speed @ 3 cm/min as used in North America

#### Vertical axis

##### Fetal Heart Rate

Range 30 to 240 bpm

Scale Increments of 10 bpm (30 bpm/cm)

##### Uterine Activity

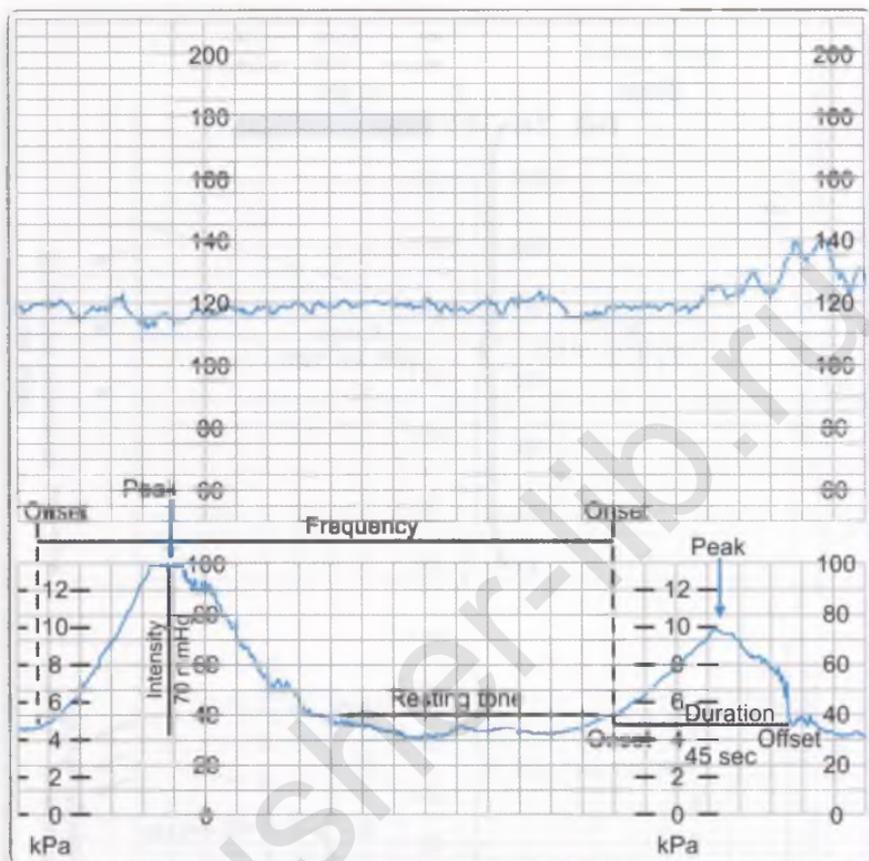
Range 0 to 100 mm Hg pressure

Scale Increments of 10 mm Hg

#### Horizontal axis

Paper speed 3 cm/min = 6 subsections

## Electronic monitoring of uterine activity (Fig. 10.4)



**Figure 10.4:** Uterine activity evaluation by EFM (US/Toco) toco needs adjustment

**Frequency of contraction:** Measured from the onset of one contraction to the onset of the next contraction (normal = 2–5 per 10 min).

**Duration of contraction:** Measured from contraction onset to offset (normal 45–80 sec not exceeding 90 sec).

**Strength/ intensity of contractions:** 1st stage 40 – 70 mmHg  
2nd stage may rise to over 80 mmHg.

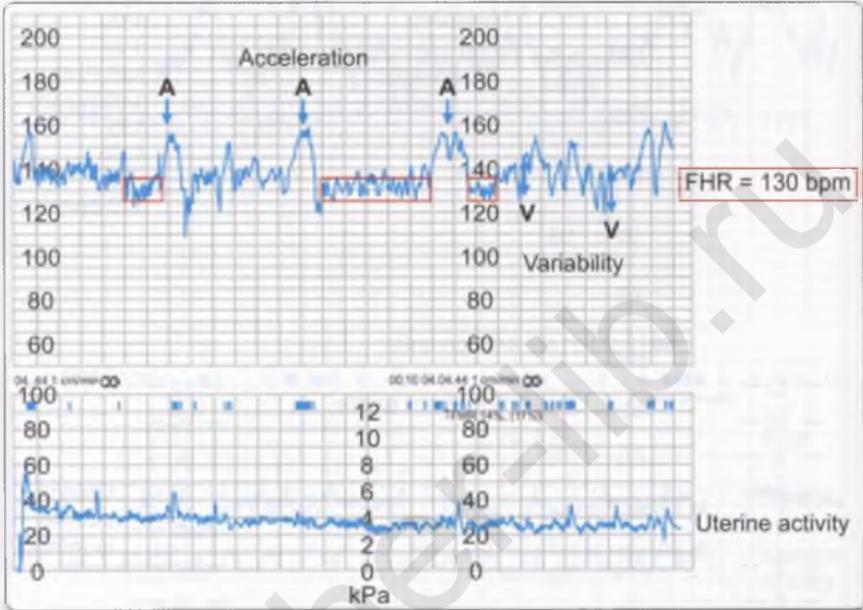
**Resting tone:** Generally set/ reset to the level of 10 on uterine activity portion of CTG trace.

MVUs (montevideo units) measurement of uterine activity  
1st stage 100–250 MVUs, 2nd stage 300–400 MVUs.

MVUs is calculated by simple addition of individual contraction intensities (peak of contraction less resting tone) over 10 min.

## Interpretation of FHR (Fetal heart rate) recordings (Fig. 10.5)

**Baseline FHR:** Mean FHR rounded to increments of 5 bpm during a 10 min. segment excluding accelerations, decelerations



**Figure 10.5:** Fetal heart rate tracing showing baseline FHR, baseline variability and accelerations

and periods of marked variability. The baseline must be at least 2 min in any 10 min segment (not necessarily contiguous).

Normal Baseline FHR range: 110–160bpm

Tachycardia Baseline FHR > 160 bpm

Bradycardia Baseline < 110 bpm

**Baseline variability:** Fluctuation in the baseline that are irregular in amplitude and frequency. Quantitated as the amplitude of the peak-to-trough in bpm.

Absent: Amplitude range undetectable

Minimal: Amplitude range detectable but  $\leq 5$  bpm

Moderate: Amplitude range 6–25 bpm

Marked: Amplitude range > 25 bpm

**Acceleration:** Abrupt increase (onset to peak < 30 seconds) in the FHR from baseline.

An acceleration peaks  $\geq 15$  bpm above the baseline and lasts  $\geq 15$  sec but < 2 min ( at 32 weeks and beyond).

■ **How to read a CTG trace (Fig. 10.6)**

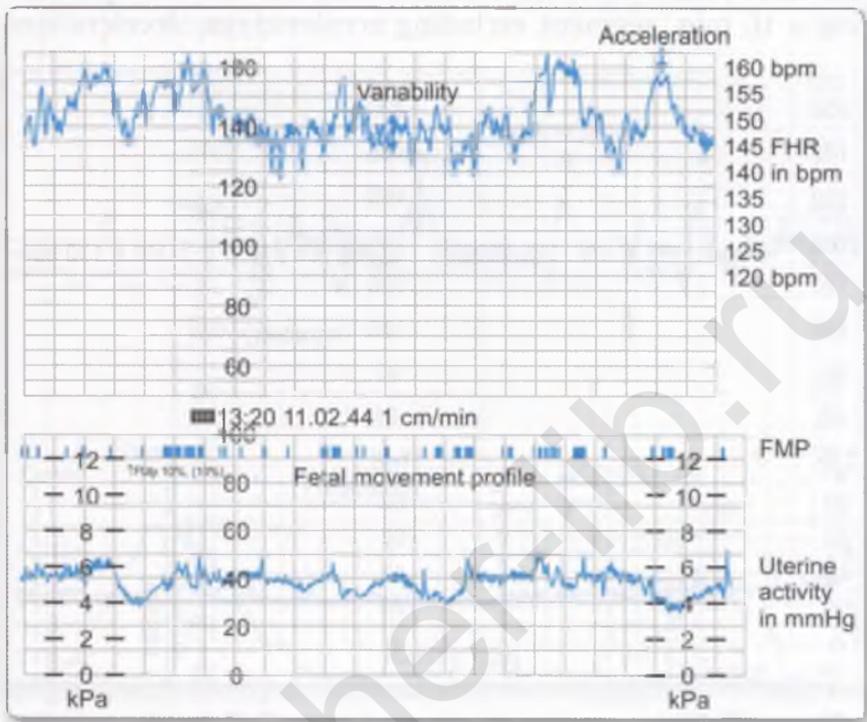


Figure 10.6: Normal first stage FHR trace

**Monitoring mode:** US/Toco

**FHR components:**

- Baseline FHR 140 bpm
- Baseline variability 5–25 bpm
- Accelerations present
- Decelerations absent

**Uterine activity:** Normal but the toco needs to be adjusted to provide clearer pickup of contractions.

**Category:** I

**Interpretation:** Healthy fetus

**Action:** Repeat CTG tracing if required.

**Note:** FHR variation is falsely displayed at 1 cm/min paper speed as compared to 3 cm/min.

### Suspicious trace (Fig. 10.7)

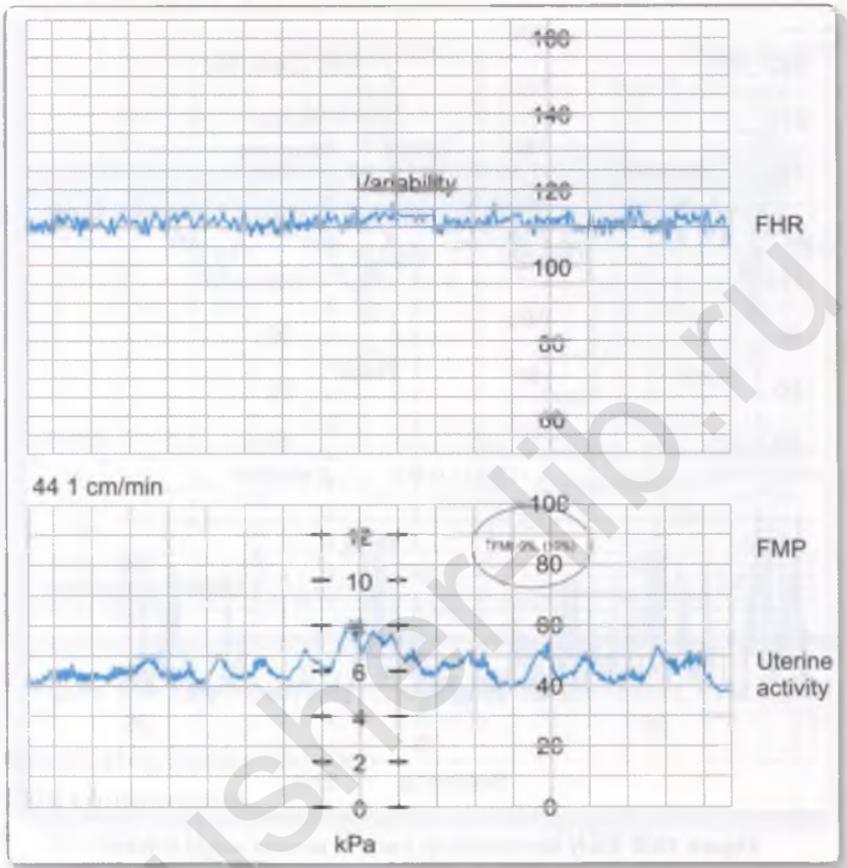


Figure 10.7: Suspicious trace

**Monitoring mode:** US/Toco

**FHR components:**

- |                                |         |
|--------------------------------|---------|
| • Baseline FHR                 | 110 bpm |
| • Baseline variability reduced | 5 bpm   |
| • Accelerations                | absent  |
| • Decelerations                | absent  |

**Uterine activity:** Normal but the toco needs to be adjusted to provide clearer pickup of contractions.

**Category:** II

**Interpretation:** Physiological or early chronic hypoxia

**Action:** Continue CTG monitoring / further evaluation, i.e. fetal scalp pH.

### Early decelerations trace (Fig. 10.8)

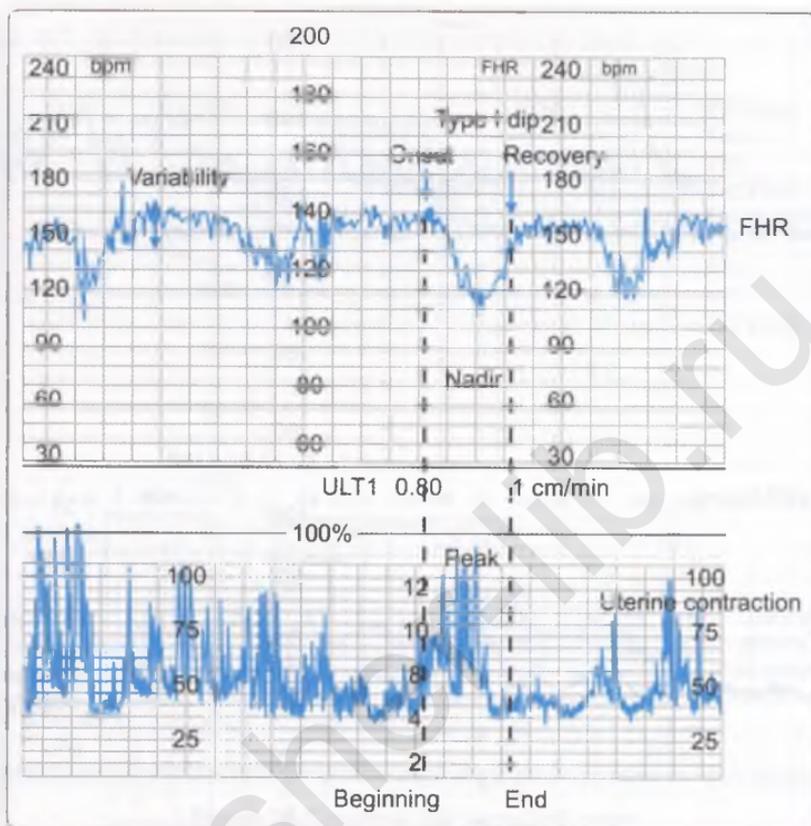


Figure 10.8: Early decelerations trace in second stage of labor

**Monitoring mode:** US/Toco

**FHR components:**

- Baseline FHR 140 bpm
- Baseline variability 5–15 bpm
- Accelerations absent
- Decelerations present early

There is gradual (onset to nadir  $\geq 30$  sec) decrease in FHR during uterine contraction.

Onset, nadir and recovery of deceleration coincides with the beginning, peak and ending of uterine contraction.

**Uterine activity:** Excessive uterine activity as relaxation time is not sufficient.

**Category:** I

**Interpretation:** Early deceleration is due to head compression and is a physiological finding during second stage of labor.

### Late decelerations trace (Fig. 10.9)

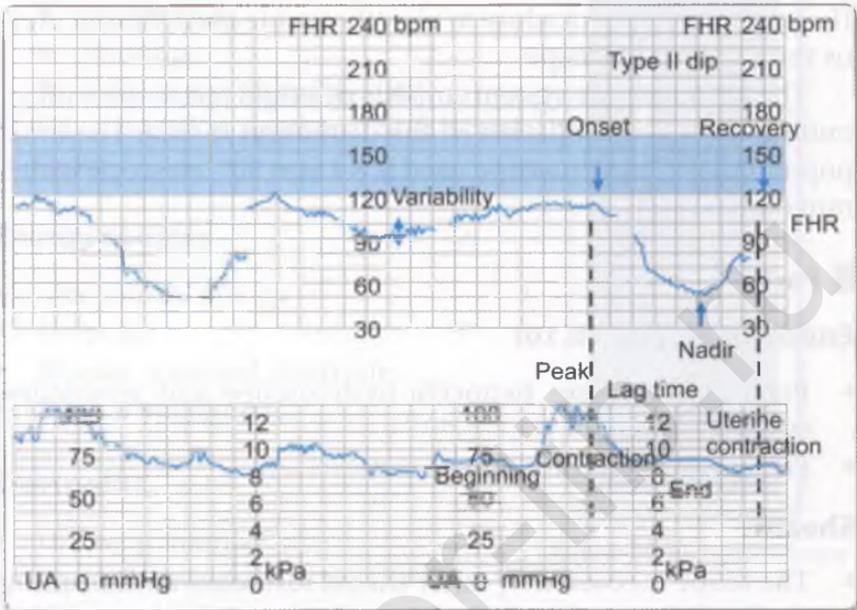


Figure 10.9: Late decelerations trace in second stage of labor: Pathological

**Monitoring mode:** US/Toco

**FHR components:**

- Baseline FHR 110 bpm
- Baseline variability reduced <5 bpm
- Accelerations absent
- Decelerations present late

There is gradual (onset nadir  $\geq 30$  second) decrease in FHR during a uterine contraction.

Onset, nadir and recovery occur after the beginning, peak and end of the contraction.

**Uterine activity:** Toco needs to be adjusted to provide clearer pickup of contractions.

**Category:** III.

**Interpretation:** The late decelerations reflect interruption of the oxygen pathway and there is a possibility of fetal metabolic acidemia.

**Action:** Consider immediate delivery.

## HYSTEROSCOPE

Hysteroscopy is a procedure to view the inside of cervix and uterus through hysteroscope.

The hysteroscope system consists of a rigid telescope with an outer sheath for instillation of the distention media. The most popular size of hysteroscope used is a 4 mm 30° telescope with 5 mm outer sheath.

### ■ Parts

#### Endoscopes (Fig. 10.10)

- Rigid hysteroscope: Bettocchi hysteroscope and versascope system.
- Flexible hysterofibrosopes.

#### Sheaths

- The scope is covered by inner sheath for inflow of distending media and outer sheath for its out flow.

#### Light source and cable

- Halogen and xenon are used.

#### Endoscopic camera and monitor

- In office hysteroscopy it is preferable to use camera with zoom system. A single chip endoscopic camera is adequate for diagnostic and minor operative work.

#### Recording devices

- Video and digital recording.

#### Monitors

- Digitalized flat screen or high resolution monitors are used for good clarity view.

#### Distention systems

- Fluid distention systems

- Gravity
- Pressure cuff
- Hysteromat
- Endomat
- Total input output system.
- Gas distention systems: CO<sub>2</sub> hystero-flator.

### Energy sources

- Mechanical energy
- Unipolar
- Bipolar standard electrode
- Bipolar versapoint.

### Electrodes

- Unipolar, bipolar
- Bipolar versapoint
- Unipolar resectoscope
- Bipolar versapoint resectoscope.



Figure 10.10: Hysteroscope

### Types of distention media

1. Gas: CO<sub>2</sub> gas: The uterine cavity is distended with CO<sub>2</sub> at the rate of 70ml/minute and pressure < 100 mm Hg.
2. Fluids
  - Low viscosity fluids
    - Electrolytes/ionic distention media, e.g. normal saline, dextrose, Ringer lactate
    - Nonelectrolyte/nonionic distention media, e.g. sorbitol, mannitol, glycine
  - High viscosity fluids, e.g. Hyskon.

Contact hysteroscopy is done without distending medium for diagnostic purpose.

**Office hysteroscopy** is done in an office based setting with or without local anesthesia to perform diagnostic and limited operative hysteroscopic work.

## ■ Technique

- Time: Preovulatory in early or mid proliferative phase when endometrium is thin.
  - Consent: Patient preparation, empty bladder
  - Anesthesia and patient positioning
    - Diagnostic: Local anesthesia and sedation is given
    - Operative: General anesthesia
    - Lithotomy, bimanual examination.
- In TCRE (transcervical resection of endometrium) endometrial shrinkage can be obtained by progestogen, danazol or GnRH for 6–8 weeks.
- Method
    - Cervical dilatation is not always required.
    - The cervix is dilated upto 4–5 mm if required.
    - The hysteroscope is then connected to the source of distending media which distends the cervical canal and uterine cavity.
    - The telescope advances progressively in uterine cavity under direct vision to study endocervical canal and uterine lining and both uterine ostia are identified.

## ■ Diagnostic indications

- To study endocervical mucosal lining
- Asherman's syndrome (Koch's, PID)
- Congenital malformation of uterus
- Misplaced IUCD
- Polyp
- Cornual tubal blockage
- Abnormal uterine bleeding.

## ■ Therapeutic indications

- Uterine septum
- Embedded IUCD removal
- Asherman's syndrome
- Polyp
- Submucous fibroid
- TCRE in DUB

- Cannulation of tubal ostia
- Removal of bone spicule left after previous abortion.

### ■ Contraindications

- Pregnancy
- Infections
- Enlarged and scarred uterus.

### ■ Complications

#### Early

1. Complications due to anesthesia
2. Complications due to patient positioning  
Incorrect patient position causes pressure on peroneal nerve and result in paresthesia and foot drop.
3. Complications due to distending media  
Fluid overload  
Pulmonary edema  
Hyponatremia
4. Complications due to surgical procedure  
Perforation: Uterine, bowel injury  
Hemorrhage.

#### Late

- Infections
- Discharge
- Intrauterine adhesions
- Hematometra.

## LAPAROSCOPE

It is a telescope for visualization of body cavities and viscera through minimal invasive surgery (MIS) and small incision for therapeutic and diagnostic purpose. (Laparo=abdomen).

### ■ Instruments for laparoscopy (Figs 10.11 and 10.12)

- **Optics:** Telescope is 30 cm long and diameter is between 4 and 10 mm with 0–50° viewing angles. 30° viewing angle is useful during suturing and complex surgical procedures.
- **Light source:** Delivers cold light from an external source to the distal lens by fiber glass cables. Light source of 300 W is required for illumination of abdominal cavity and 1000 W for photography.
- **Documentation equipment:** For permanent record.
- **Insufflation equipment:** To create pneumoperitoneum using CO<sub>2</sub> gas.
- **Accessory instruments:** Trocar and cannula for insertion of laparoscopic instruments. Verres needle.
- **Ancillary instruments:** Graspers, blunt probe, scissors, uterine manipulator, needle holder, aspirators and irrigators.
- **Electrosurgical unit:** Unipolar or bipolar units. Harmonic scalpel.

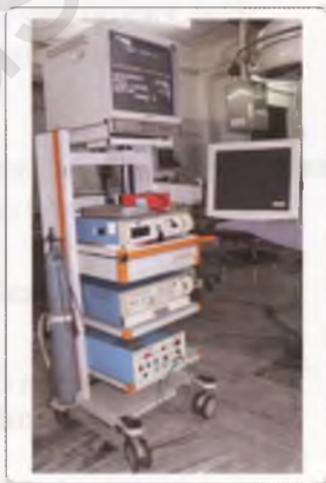


Figure 10.11: Video monitor, CO<sub>2</sub> insufflator



Figure 10.12: Laparoscopic instruments

### ■ Preoperative tests and preparation

- CBC, BT, CT, blood group Rh factor, urine analysis, blood sugar, blood urea, serum creatinine, HIV, Australia Ag, HCV testing, X-ray chest, ECG, whole abdomen U/S.
- One day bowel preparation: Liquid, semisolid diet, avoid milk, give laxative, vaginal hygiene, NPO after midnight, Inj. tetanus toxoid IM and prophylactic IV antibiotic.

### ■ Technique

- Anesthesia: GA for therapeutic procedure  
LA with sedation for diagnostic procedure.
- Position: Semilithotomy and slight Trendelenburg position.
- Pneumoperitoneum: Verres needle is passed through infra umbilical incision to create pneumoperitoneum using CO<sub>2</sub> gas. Continuous flow of CO<sub>2</sub> with pressure of 15–25 mm of mercury and at the rate of 200 ml/minute is maintained.
- Through the same skin incision Trocar and laparoscope insertion is done. Additional portals can be made if desired and uterine manipulator can be used transcervically to manipulate uterus. Abdominal organs are inspected under fiberoptic illumination.

Suction and irrigation is done to clear fluid and blood.  
Bipolar cautery is safer than monopolar cautery.

## ■ Indications for laparoscopy

### Diagnostic laparoscopy

- Infertility and tubal disease
- Chronic pelvic pain
- Suspected endometriosis
- Ovarian disorders (PCOD, ovarian cyst)
- Suspected ectopic pregnancy, suspected adnexal masses
- Ovarian malignancy
- Pelvic inflammatory disease
- Evaluation in ascites
- Uterine abnormalities
- Tuberculosis.

### Operative laparoscopy

- Operations on uterus:
  - Laparoscopy assisted vaginal hysterectomy (LAVH)
  - Total laparoscopic hysterectomy (TLH)
  - Hysterectomy for malignant conditions
  - Myomectomy
  - Müllerian anomalies.
- Operations on adnexa
  - Ovarian drilling
  - Ovarian cystectomy, ovarian cyst puncture
  - Conservative surgeries:
    - Ovariolysis, fimbriolysis, salpingolysis.
    - Salpingostomy, fimbrioplasty, tuboplasty.
  - Radical surgeries: Salpingectomy, adnexectomy
- Laparoscopic tubal sterilization for family planning
- Endometriosis:
  - Adhesiolysis
  - Coagulation/excision of peritoneal deposits
  - Endometrioma drainage and fulgeration of lining.
- Genital suspension operations
- Others:
  - Second look laparoscopy
  - Laparoscopy during pregnancy.

## ■ Complications

- Anesthetic complications. Cardiac arrhythmias, hypotension, cardiopulmonary arrest
- Pneumoperitoneum: Gas embolism (excess CO<sub>2</sub>), emphysema
- Vascular injuries:
  - Retroperitoneal major vessel injury
  - Abdominal wall vessel injury.
- Cautery burns
- Traumatic injuries:
  - Intestinal injury, bladder injury, ureteric injury
- Sepsis
- Late complications: Adhesions, hernia.

## ■ Contraindications

- Cardiac and respiratory diseases
- Extreme obesity
- Previous abdominal scar
- Acute PID
- Umbilical hernia.

## ■ Advantages of laparoscopy over laparotomy

- Quick recovery and less pain
- Hospital stay is short
- Small abdominal scar
- Less peritoneal adhesions, less blood loss.

## ULTRASOUND

Ian Donald (1910–1987) is the pioneer of ultrasonography in obstetrics and gynecology.

**Sonography (ultrasonography or diagnostic ultrasound)** is a diagnostic imaging technique in real time utilizing high frequency sound waves (ultrasound) to create images of specific areas of body.

The term “ultrasound” refers to sound waves of frequency greater than that of human ear can appreciate. In diagnostic radiology usually frequency of 2–15 MHz is used.

### ■ Parts

#### Ultrasound machine (Fig. 10.13)

- Monitor
  - It has screen for viewing ultrasound pictures.
  - Knobs are for decreasing or increasing contrast and brightness.
- Transducers
  - Transabdominal transducer
  - Transvaginal transducer.
- Front Panel with knobs
  - B mode brightness mode display for 2D images
  - M mode to study moving organ, e.g. fetal heart.
- Doppler ultrasound
  - It is for flow velocity waveform (FWV)
  - 3D images (three dimensional).

#### External device

- Camera
- Thermal paper printing
- Computer



Constant power supply



Figure 10.13: Ultrasound machine

## ■ Sonographic techniques

- Transabdominal sonography (TAS) is performed with distended urinary bladder which provides acoustic window to view the pelvic organs. TAS transducer of frequency at least 3.5 MHz is used (Fig. 10.14A).
- Transvaginal sonography (TVS) is performed with empty bladder to bring the pelvic organs into the focal zone of the transvaginal transducer. TVS transducer of frequency at least 5MHz is used (Fig. 10.14B).
- Transperineal sonography is used rarely.
- Transrectal sonography (TRS) is used rarely in gynecology practice for ruling out hematocolpos or to mark the extent and parametrial infiltration of pelvic tumors.

## ■ Preparation

### Preparation for TAS

- Preparation of patient: Urinary bladder must be full by drinking copious amount of water (4–5 glasses) or alternatively fill the bladder through a urethral catheter with normal saline in special cases.
- Position: Usually in supine position.
- Choice of transducer: At least 3.5 MHz of frequency. Apply coupling agent (water-based gel) liberally to lower abdomen.
- Correct settings of sonography machine.

### Preparation for TVS

- Preparation of patient: Bladder must be completely empty.
- Position: Supine position with knees flexed and hips elevated slightly on pillow.
- Choice of transducer: Special transducer with long handle is needed to perform endovaginal sonography with frequency at least 5 MHz. Transducer is covered with a disposable plastic cover (usually a condom) with sufficient coupling agent inside.
- Correct settings of sonography machine.

### ■ Advantages

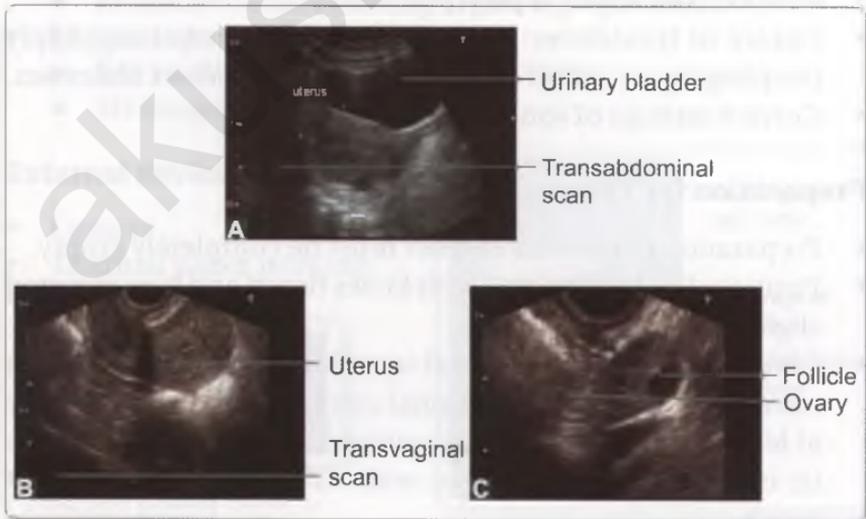
- Noninvasive
- Nonradiating: Suitable in pregnancy and for long-term follow-up
- Easily available
- Inexpensive
- It can be performed bedside also
- Guided biopsy can be done.

### ■ Disadvantages

- Highly operator dependent technique
- Artifacts (especially with air bubble in condom during TVS)
- Obese patient can pose difficulty in performing sonography.

### ■ Advantages of TVS over TAS

- Full bladder is not required
- In obese patients TVS gives a better image and resolution of pelvic organs
- Ultrasound guided therapeutic and diagnostic procedures can be done with accuracy, i.e. aspiration/biopsy.



Figures 10.14 A to C: Normal TAS and TVS scan of pelvic organs

## ■ Indications

### I. Obstetrical indications

#### *Indications for first trimester*

- Confirmation of intrauterine pregnancy, estimation of gestational age and viability, embryo, yolk sac, CRL.
- Cause of vaginal bleeding:  
Threatened/missed/blighted ovum/anembryonic pregnancy/irregular sac/incomplete/complete abortion/local cause
- Suspected ectopic pregnancy
- Evaluation of suspected gestational trophoblastic disease
- Suspected multiple gestation
- Evaluation of pelvic pain
- Evaluation of pelvic masses or uterine abnormalities
- Adjunct to chorionic villus sampling
- Detection of chromosomal anomaly by measuring nuchal translucency (NT scan) 11–14 weeks.

#### *Indications for second and third trimester*

##### Standard

- Gestational age
- Fetal number; multiple gestations: Fetal sizes, amniotic fluid volume
- Presentation of fetus
- Fetal viability
- Extrafetal evaluation
  - Placenta: Location, morphology, retroplacental area, focal lesions, placental separation.
  - Amniotic fluid: Volume; normal, oligohydramnios, polyhydramnios, amniotic bands.
  - Uterus, adnexa and cervix: Internal os width, length of cervix for incompetent os and short cervix.
- Fetal weight
- Fetal anatomical survey which should include documentation of technical limitations, level II ultrasound.

##### Specialized

- Fetal echocardiography
- Biometric studies:

- Biparietal diameter (BPD)
- Occipitofrontal diameter, head perimeter (HC)
- Abdominal perimeter (AC), femoral length (FL)
- Humeral length.
- Biophysical profile: Manning score
- Color Doppler evaluation for uterine artery, umbilical artery, fetal circulation and placental perfusion.
- Adjunct to any procedure, e.g. amniocentesis, cordocentesis, cervical cerclage and abnormal serum alpha fetoprotein.

## II. Gynecological indications

### *Diagnostic*

- In infertility for follicular monitoring (Fig. 10.14C) and sonosalpingography to study patency of fallopian tubes
- Diagnosis of ectopic pregnancy
- To detect adnexal mass
- Endometriosis
- To diagnose uterine pathology—Adenomyosis, fibroids
- In dysfunctional uterine bleeding
- In postmenopausal bleeding to study endometrial lining
- To diagnose hematocolpos, hematometra
- To study ovarian pathology, e.g. PCOD, ovarian tumor, and ovarian cyst
- Location of misplaced IUCD
- To diagnose congenital müllerian malformations
- Fine needle aspiration cytology (FNAC) in malignancy.

### *Therapeutic*

- In IVF program for oocyte retrieval
- Aspiration of simple benign cyst of ovary
- Drainage of pelvic abscess
- Ultrasound guided MTP and D and C
- Removal of embedded IUCD
- Injection of methotrexate into ectopic gestational sac.

## Contraindications

- For transabdominal sonography (TAS):
  - As such no absolute contraindication.
- For transvaginal sonography (TVS):

- Virgin patients
- Patients with narrow introitus or vagina, who experience discomfort at attempted insertion of transducer.

### **Pearls**

- Air is barrier to ultrasound waves so liberal amount of coupling agent (gel) must be used.
- Highest ultrasound frequency permitting clear visualization should be used.
- Ultrasound machine settings including gain setting, time gain compensation (TGC) must be well known to the user (further discussion is beyond the scope of this book).
- Color Doppler imaging can be added to sonography (gray scale imaging) to know flow and direction of blood (e.g. in fetal circulation, RPOC, ectopic pregnancy, benign vs malignant lesions).

## FURTHER READING

---

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