

# Bag valve mask

- proprietary name **Ambu bag**
- hand-held device used to provide positive pressure ventilation
- Use of the BVM to ventilate a patient is frequently called "**bagging the patient**"

# STANDARD COMPONENTS

- Mask & Bag and Valve



# Method of operation

- Ensure that the mask portion of the BVM is properly sealed around the patient's face
- The BVM directs the gas inside it via a one-way valve when compressed by a rescuer; the gas is then delivered through a mask and into the patient's trachea, bronchus and into the lungs
- Squeezing the bag once every 3 seconds for an infant or child provides an adequate respiratory rate (20 per minute in a child or infant)

- risk of over-inflating the lungs → pressure damage to the lungs and can cause air to enter the stomach, causing gastric distension → difficult to inflate the lungs

# OXYGEN RESERVIVOR

- ❑ Small corrugated ,tube like structure usually made of plastic.
- ❑ Has 2 open ends

One end is connected to air inlet of ambu bag, other end should be left open.

## **USES:**

- ❑ Increase the  $FiO_2$  of the oxygen delivered to the patient by ambu bag from 40% to more than 90%.

# OXYGEN MASK

Usually made up of plastic or rubber.

## **TYPES:**

- Uncushioned
- Cushioned

## **ADVANTAGES(of cushioned mask)**

- The mask conforms to the face
- Requires less pressure to obtain air tight seal
- Less chances of damage to eyes or other structures of the face

## SHAPES:

- Round
- Anatomically shaped-somewhat triangular in shape

Tip over the nose.



## **CHOOSING THE CORRECT SIZE OF THE MASK:**

The mask is of right size if it covers the nose and mouth including the tip of the chin but not the eyes.



# OXYGEN HOOD

- ❑ Plastic hood that can be placed over an infant's head
- ❑ It has an inlet which can be connected to the oxygen source
- ❑ Front portion is chiselled such that it lies over infant's neck while allowing easy access.
  
- ❑ Used to administer humidified oxygen to infant in all conditions associated with hypoxia



## **ADVANTAGES:**

- non invasive
- Allows humidification of oxygen

## **DISADVANTAGES:**

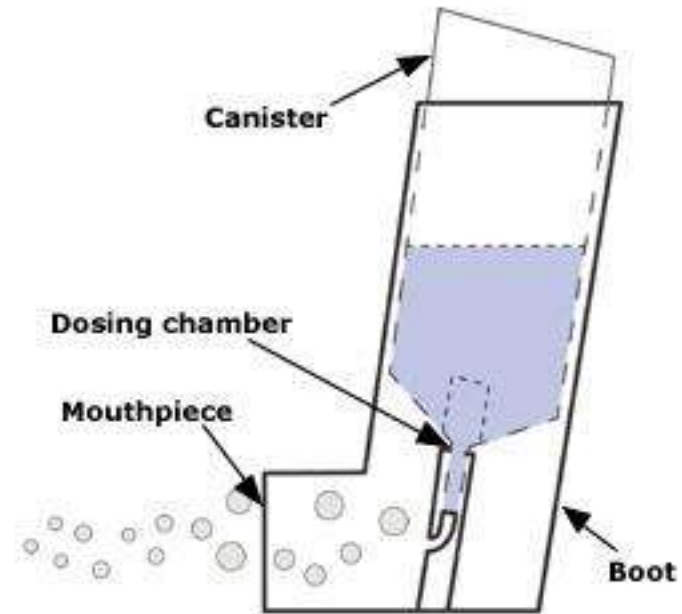
- Oxygen flow may be insufficient in cases where respiratory drive is poor
- Any change in the position of the hood may result in oxygen leaking outside the hood thus decreasing oxygen concentration
- Oral feeding is difficult
- Poorly tolerated leading to excessive crying or struggling by the child

# NASAL OXYGEN CATHETER

- Suitable for direct administration of oxygen via nasopharyngeal route
- Soft and smooth open distal end facilitates non-traumatic insertion

**METERED DOSE**

**INHALER**



## Metered dose Inhaler



**Step 1:** Shake the inhaler well.



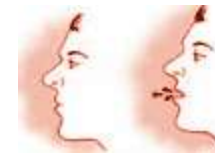
**Step 2:** Breathe out gently, place the mouthpiece in the mouth with lips curled around it.



**Step 3:** Begin breathing in slowly but at the same time, press down on the inhaler canister.



**Step 4:** Continue breathing in slowly and steadily until the lungs are full.



**Step 5:** Hold your breath for 10 seconds or for as long as comfortable. Breathe out slowly.

**MDI**



**DRY POWDER**

**INHALER**

➤ ROTHALER

➤ DISKHALER

➤ SPINHALER

➤ TURBOHALER

➤ ACUHALER

# Rotahaler



**Step 1:** Insert a rotacap, transparent end first, into the raised square hole of the rotahaler



**Step 2:** Rotate the base of the Rotahaler in order to separate the two halves of the rotacap.



**Step 3:** Breathe in as deeply as you can\*. Hold your breath for 10 seconds. Breathe out slowly.

\*Note: If you are breathing correctly, you will hear the soft rattling sound of the rotacap.



- SALBUTAMOL – 100mcg MDI/200mcg R
- SALMETEROL – 25mcg MDI/50mcg R
- IPRATROPIUM - 20mcgMDI/40mcgR
- SODIUM CROMOGLYCATE-5mg MDI
- BECLOMETHASONE-50,100,200mcg
- BUDESONIDE – 100, 200, 400mcg

THANK U



# How to use the Spacer [Less coordination required]

**Step 1:** Assemble your Spacer by fitting the two parts together



**Step 2:** Shake the Inhaler. Fill the inhaler into the slot opposite the mouthpiece.



**Step 3:** Close your lips firmly around the mouthpiece.



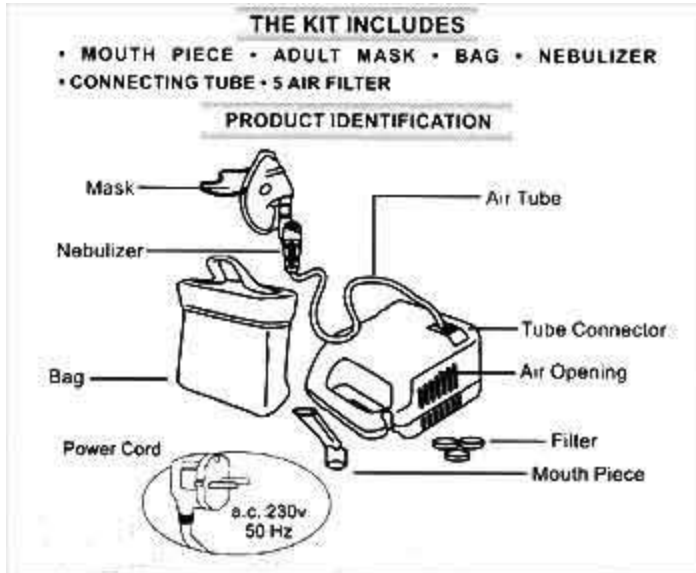
**Step 4:** Release a dose of medicine into the Spacer and breathe in steadily and deeply through your mouth.



**Step 5:** Remove the Spacer and hold your breath for as long as comfortable . Breathe out slowly

***Zerostat Spacer***

# Nebulizer



## MDI

- Drug micronized
- And under pressure
- Sprayed into the mouth
- Then pt. inhales



## Rotahaler

- Powder in a capsule
- Pt effort is
- Required to draw the drug and inhale



## Nebulizer

- Drug driven by compressed air/oxygen
- Motorized
- Less pt effort
- Emergencies
- Expensive



# SPACER



AISWARYA S



- Spacers are bottle-shaped plastic devices which have a mouth piece at one end and other end has an opening which the MDI can be attached.



# DISADVANTAGE OF MDI

- Requires perfect co-ordination between inspiration and activation of device.
- Not possible in small children
- To eliminate this problem spacer is advised.



ADAM.



# How to use MDI with spacer device

- Remove the cap of MDI shake it and insert in to spacer device.
- Place mouth piece of spacer in mouth or attach to face mask in case of infants and younger children
- Start breathing in and out gently and observe movements of valve.



# NEBULISER



# NEBULISER



- **Nebulizers** are devices which are useful in delivering aerosolized drugs
- **USED IN** - acute severe episodes of asthma, bronchiolitis or status asthmaticus.
- Helpful when when inspiratory effort is weak as in case of infants



# How to use nebulizer?

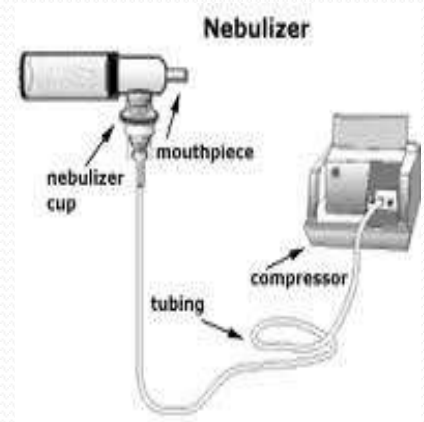
- Connect nebulizer to mains



- Connect output of compressor to nebulizer chamber by the tubings provided with nebulizer



- Put measured amount of drug in the nebulizer chamber and normal saline to make it 2.5-3ml





- Switch on the compressor and look for aerosol coming out from other end of nebulizer
- ↓
- Attach facemask to this end of nebulizer chamber and fit it to cover nose and mouth of child
- ↓
- Encourage child to take tidal breathing with open mouth






# Drugs which can be delivered to lungs by nebulizer

- Beta -2 agonist – salbutamol
- Inhaled anticholinergics- Ipratropium Bromide
- Inhaled steroids- Budesonide
- Inhaled racemic epinephrine – in case of bronchiolitis
- Inhaled chromolyn sodium- for maintenance therapy of asthma.



- 
- The commonly used nebulizer solution of salbutamol contains 5mg of salbutamol per ml of solution.
  - The dosage of salbutamol is 0.15mg/kg/dose
  - Amount should be diluted with about 2-3ml of normal saline before nebulization.

# ADVANTAGES

- INCREASED EFFICENCY AND DECREASED SIDE EFFECTS.
- MDI-rarely deliver the full amount of inhaled medicines to the lung (majority get deposited in oropharynx)



Lumbar puncture

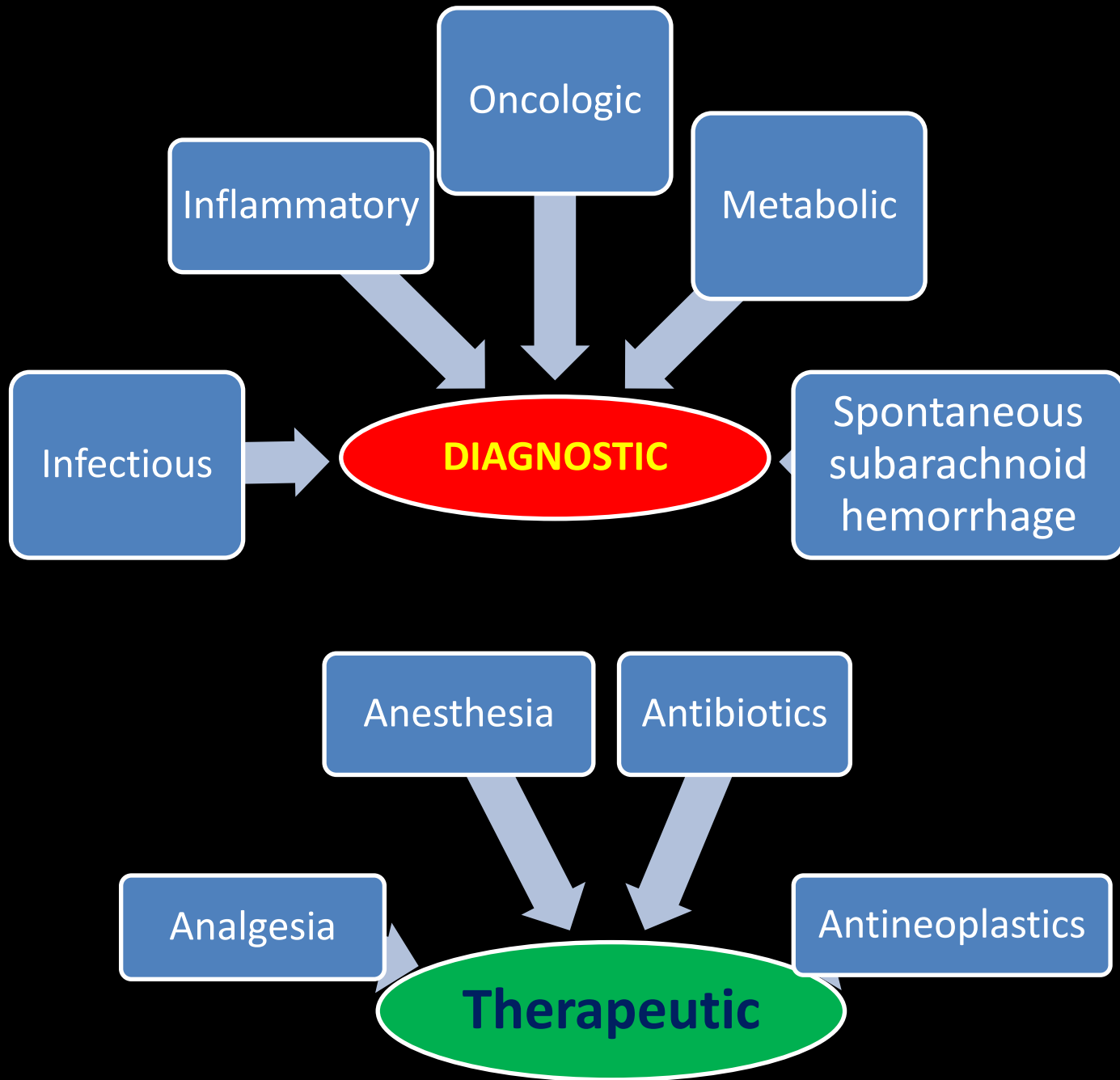


CSF



# LUMBAR PUNCTURE

# INDICATIONS:



# CONTRAINDICATIONS :

- Increased intracranial pressure
- Space occupying lesion
  
- Prior lumbar surgery
- vertebral osteoarthritis or degenerative disc disease
  
- Coagulopathy
- Significant cardiorespiratory compromise
  
- Infection near the puncture site

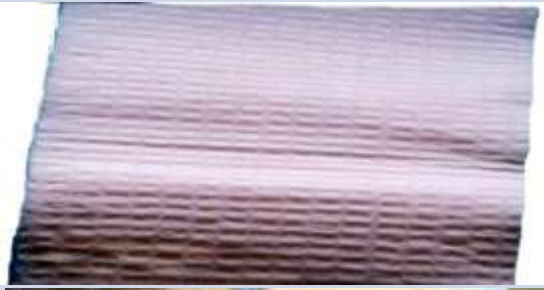
# EQUIPMENT :



- Spinal needle
  - Less than 1 yr: 1.5in
  - 1yr to middle childhood: 2.5in
  - Older children and adults: 3.5in
- Three-way stopcock
- Manometer
- 4 specimen tubes
- Local anesthesia
- Drapes
- Betadine



## Equipment Tray



**White sheet**



**Blue sheet**



**Sponge sticks**



**Test tubes**



**Bandaid**



**Manometer**



**Stopcock**



**Lidocaine**



**20 gauge needle**



**Syringe and 25 gauge needle**



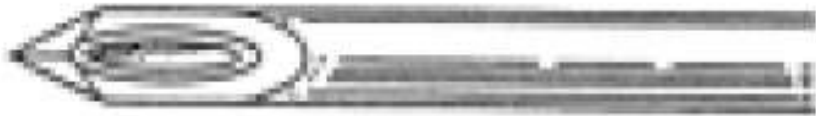
**Spinal needle**



**Proiodine tray**



**Gloves**



Quincke

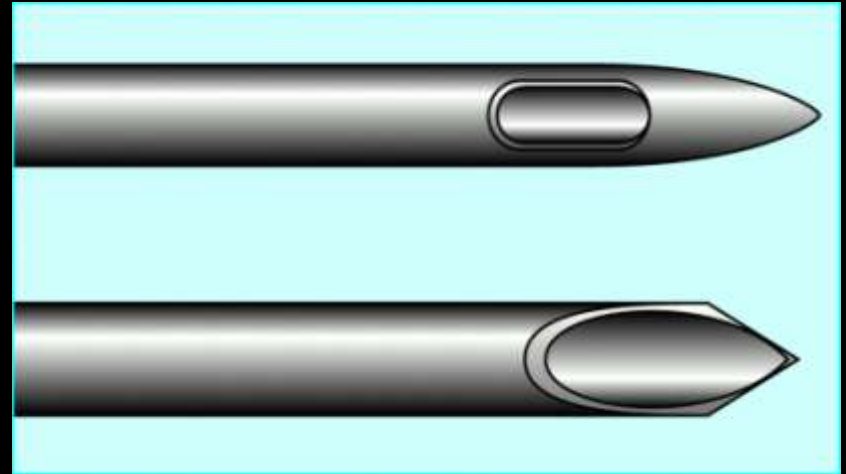


Whitacre



Sprotte

# NEEDLES

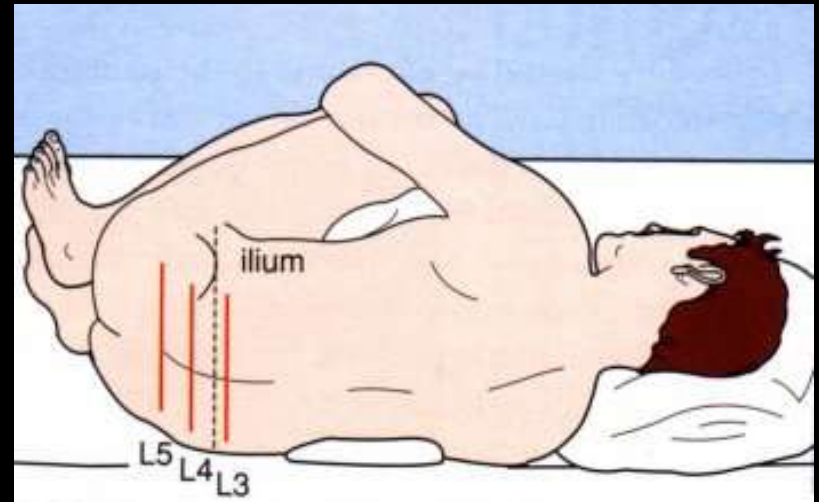


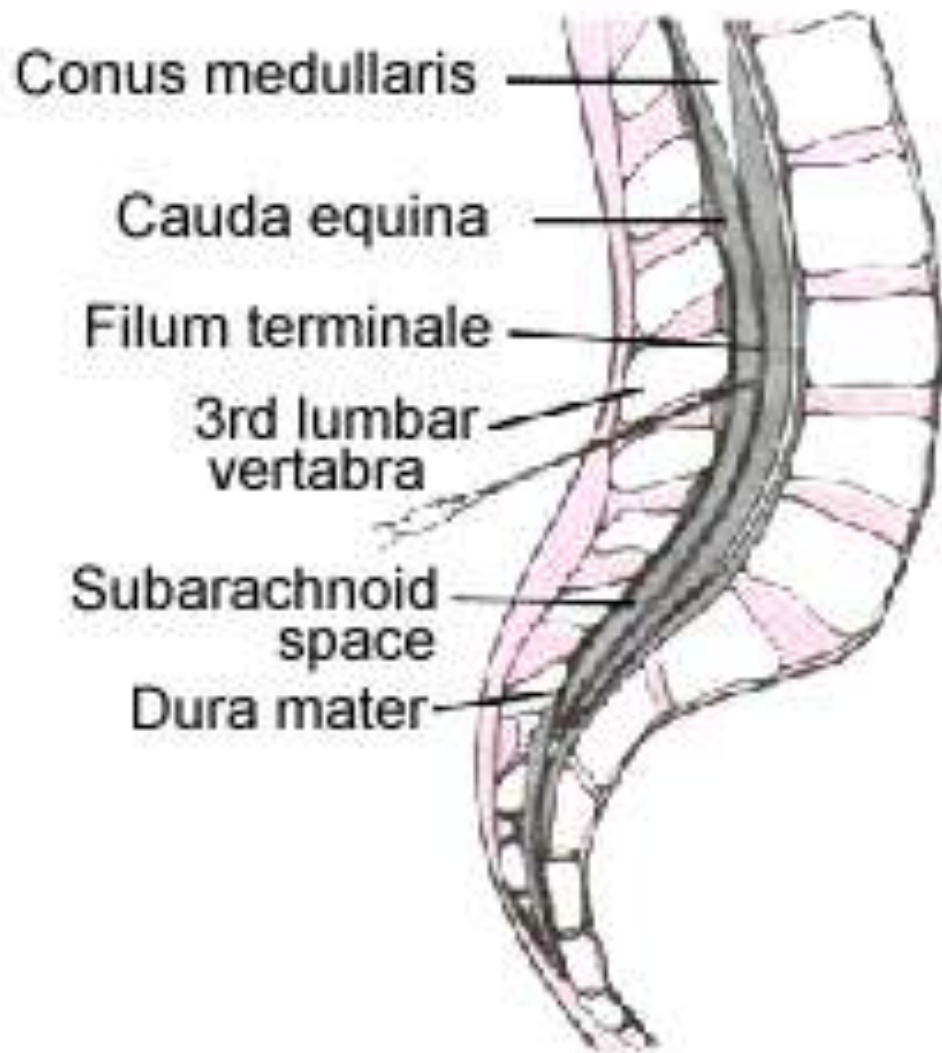
Spirotte vs.  
Quincke

# PROCEDURE :

- Lateral recumbent position.
- A line connecting the posterior superior iliac crest = L4 spinous process.

Spinal needles entering the subarachnoid space at this point are well **below the termination** of the spinal cord.





LP in older children may be performed from L2-L3 interspace to the L5-S1 interspace.

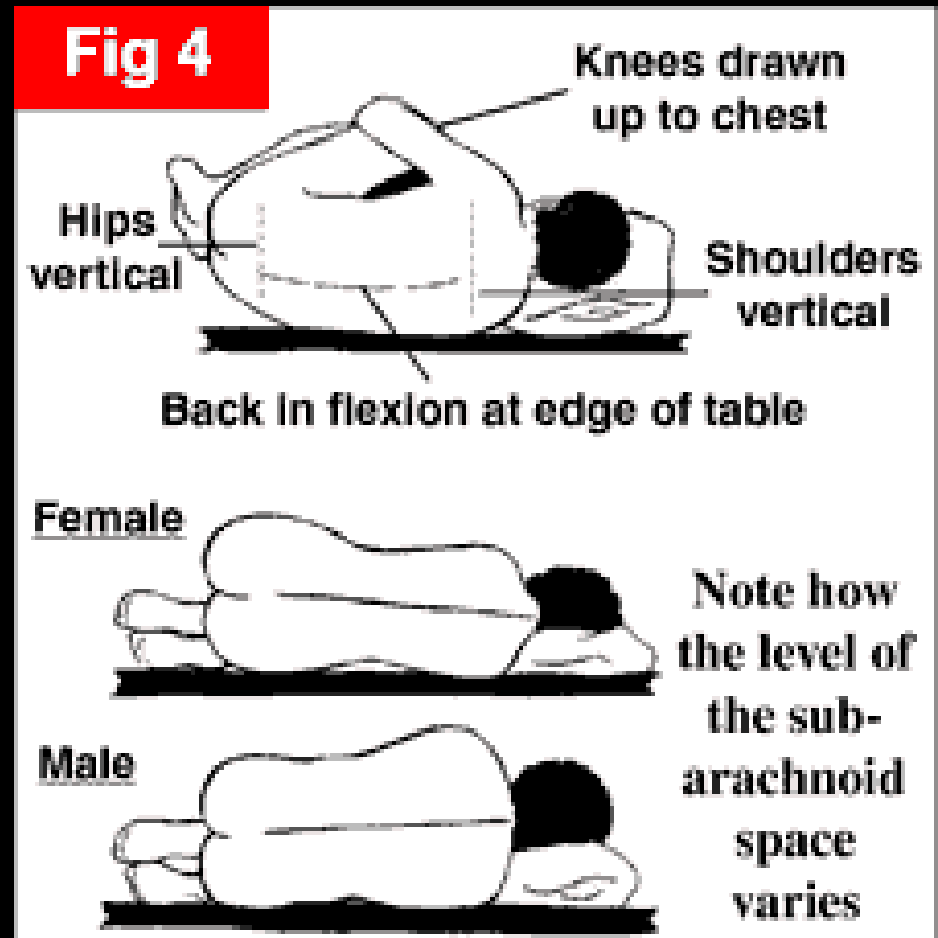
At birth, the cord ends at the level of L3.

LP in infant may be performed at the L4-L5 or L5-S1 interspace.

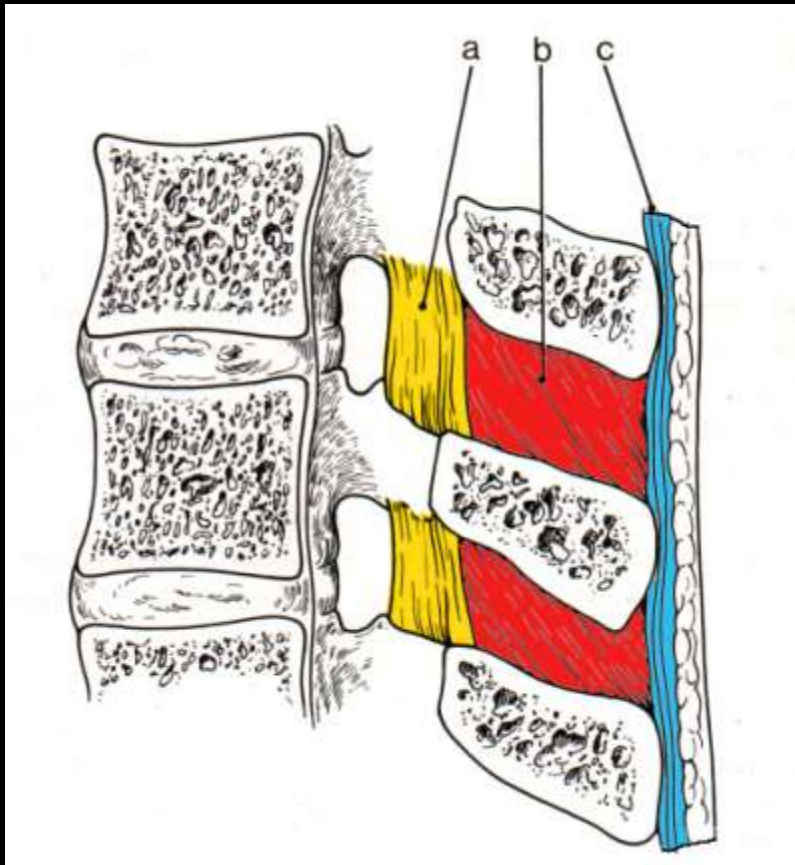
# Position the patient:

Lateral decubitus position.

- A pillow is placed under the **HEAD** to keep it in the same plane as the spine.
- **SHOULDERS** and **HIPS** are positioned perpendicular with the table.
- **LOWER BACK** should be arched toward practitioner.



# Structures crossed



- a. Ligament Flavum
- b. Interspinal ligaments
- c. Supraspinal ligament



Back should be carefully prepared and draped



Find the L4 spinous process at the level of iliac crests



Palpate a suitable interspace distal to this level.



Infiltrate 2% Lidocaine subcutaneously



A field block



Identify the two spinal processes, penetrate the skin and slowly advance the tip of the needle at about  $10^\circ$  cephalad

## Measure the opening pressure

- Normal opening pressure ranges from 10 to 100 mm H<sub>2</sub>O in young children and 60 to 200 mm H<sub>2</sub>O after eight years of age

CSF volume of **1ml obtained in 3 tubes.**

- Neonate, 2ml in total can be safely removed.
- Older child 3 to 6 ml can be sampled (child's size)

**TUBE 1**

- bacteriology: Gram stain, culture and sensitivity, acid-fast bacilli, fungal cultures and stains

**TUBE 2**

- biochemistry: glucose, protein, and electrophoresis

**TUBE 3**

- Hematology: cell count with differential

**Tube 4**

- SPECIAL STUDIES :VDRL(neurosyphilis),  
• India ink (Cryptococcus neoformans).

# Normal values

TEST	RANGE
<b>Pressure:</b>	70 - 180 mm H <sub>2</sub> O
<b>Appearance:</b>	clear, colourless
<b>CSF_total_protein:</b>	15 - 60 mg/100 mL
<b>Gamma globulin:</b>	3 - 12% of the total_protein
<b>CSF_glucose</b>	50 - 80 mg/100 mL (or greater than 2/3 of blood sugar level)
<b>CSF_cell_count:</b>	0 - 5 white blood cells (all mononuclear), and no RBC
<b>Chloride:</b>	110 - 125 mEq/L

Decreased  
CSF pressure

- complete subarachnoid blockage, leakage of spinal fluid, severe dehydration, circulatory collapse.

Increased CSF  
pressure

- CHF, cerebral edema, subarachnoid hemorrhage, meningeal inflammation, meningitis, hydrocephalus, or pseudotumor cerebri.

Glucose

- Low glucose -infections; lymphomas; leukemia; meningoencephalitic mumps; or hypoglycemia.
- level of less than 30% + low CSF lactate levels = CSF glucose transporter deficiency also known as **DE VIVO DISEASE**.

cells

- (monocytes can be normal) the presence of granulocytes is always an abnormal finding.
- A large number of granulocytes often heralds bacterial meningitis. White cells can also indicate reaction to repeated lumbar punctures, reactions to prior injections of medicines or dyes, central nervous system hemorrhage, leukemia, recent epileptic seizure, or a metastatic tumor.

blood

- **ERYTHROPHAGOCYTOSIS** signifies haemorrhage into the CSF that preceded the lumbar puncture. Therefore, when erythrocytes are detected in the CSF sample, intracranial haemorrhage and haemorrhagic herpetic encephalitis.

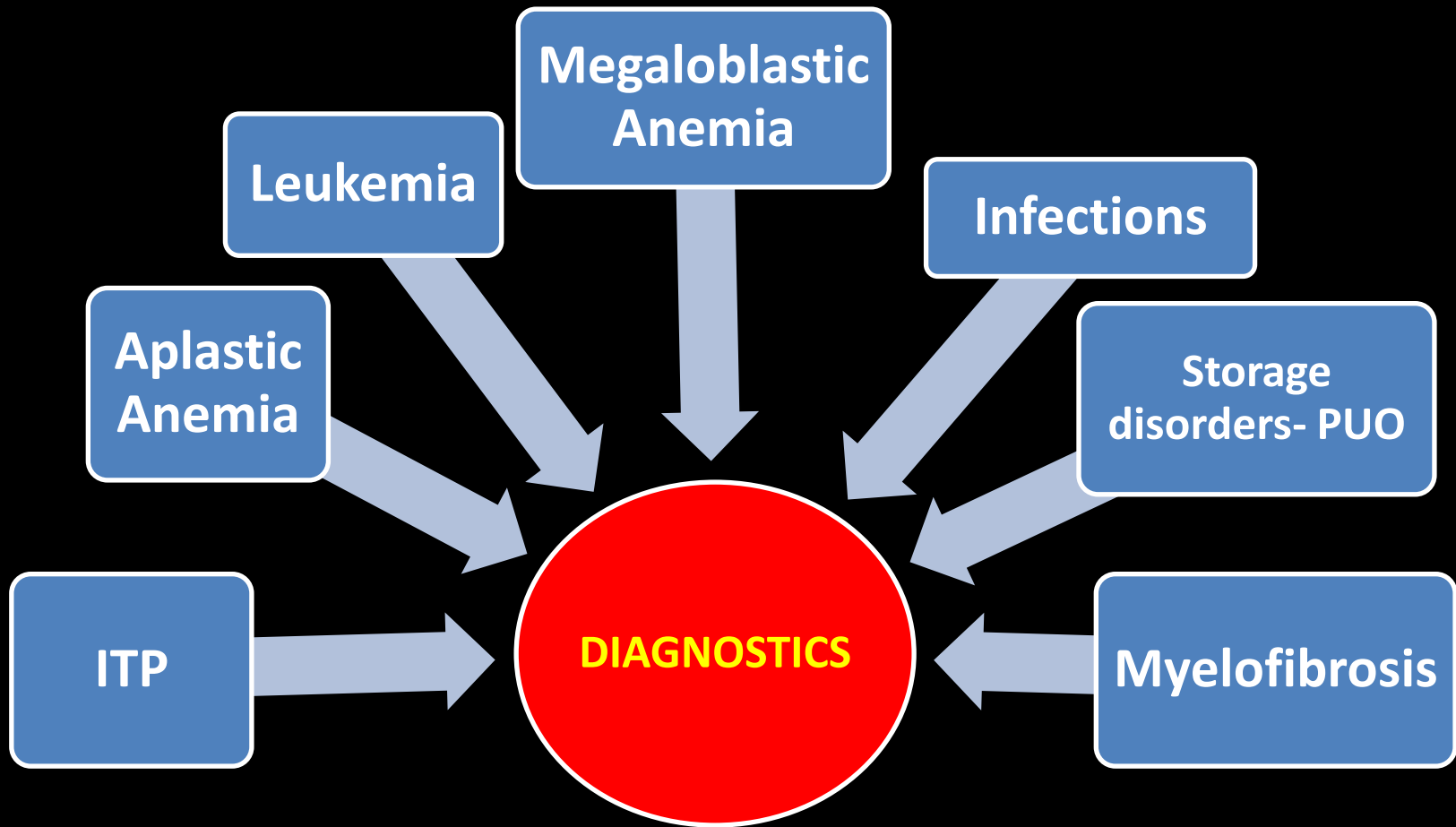
TESTS	INFERENCE
Increased levels of glutamine	hepatic encephalopathies, Reye's syndrome, hepatic coma, cirrhosis and hypercapnia.
Increased levels of lactate	cancer of the CNS, multiple sclerosis, heritable mitochondrial disease, low blood pressure, respiratory alkalosis, idiopathic seizures, traumatic brain injury, cerebral ischemia, brain abscess, hydrocephalus, hypocapnia or bacterial meningitis.
lactate dehydrogenase	distinguish meningitides of bacterial origin, which are often associated with high levels of the enzyme, from those of viral origin in which the enzyme is low or absent.
Changes in total protein	pathologically increased permeability of the blood-cerebrospinal fluid barrier, obstructions of CSF circulation, meningitis, neurosyphilis, brain abscesses, subarachnoid hemorrhage, polio, collagen disease or Guillain-Barré syndrome, leakage of CSF, increases in intracranial pressure or hyperthyroidism. Very high levels of protein may indicate tuberculous meningitis or spinal block.
IgG synthetic rate	elevated in immune disorders such as multiple sclerosis, transverse myelitis, and neuromyelitis optica of Devic.
Ab-mediated tests for CSF	common bacterial pathogens, treponemal titers (neurosyphilis) and Lyme disease, Coccidioides antibody
India ink test	Cryptococcus neoformans, but the cryptococcal antigen (CrAg) test has a higher sensitivity.

# COMPLICATIONS :

- Herniation
- Cardiorespiratory compromise
- Pain
- Headache (36.5%)
- Bleeding
- Infection
- Subarachnoid epidermal cyst
- CSF leakage

# **BONE MARROW ASPIRATION**

# INDICATIONS :



- **Therapeutic :**
  - Bone Marrow Transplantation



# CONTRAINDICATIONS :

## HEMORRHAGIC DISORDERS

- Coagulation factor deficiencies (hemophilia)
- DIC
- Concomitant use of Anticoagulants.

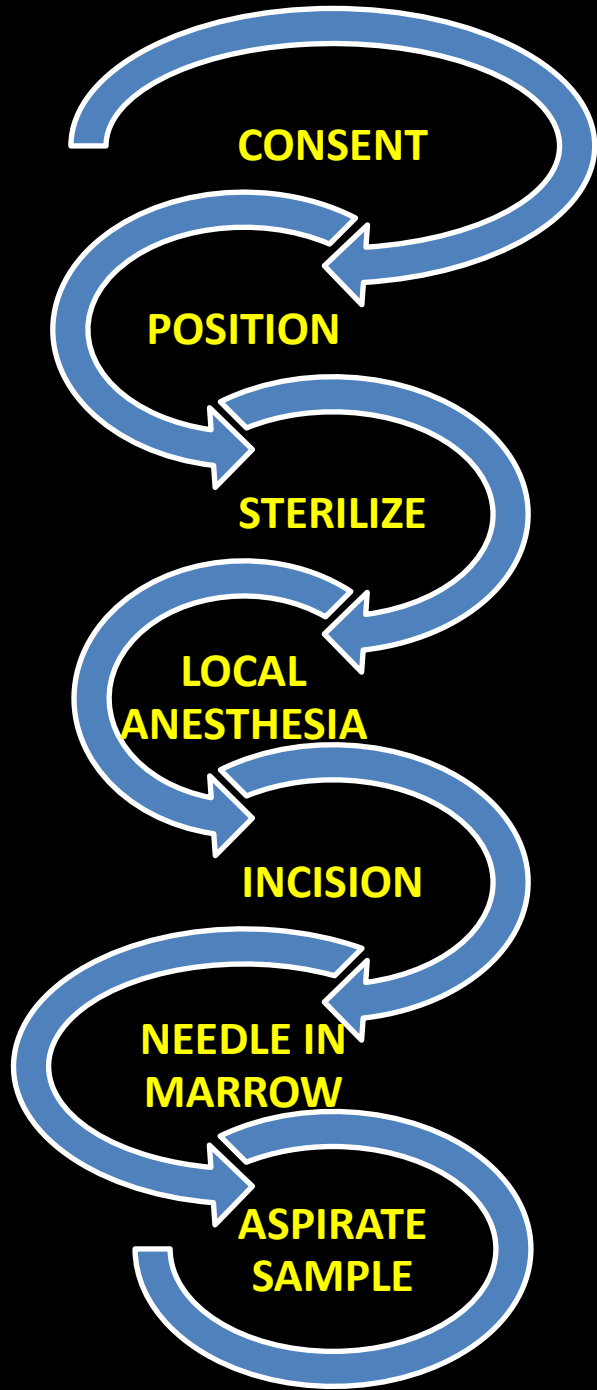
## SKIN

- Infection or
- Recent Radiation

## BONE DISORDERS

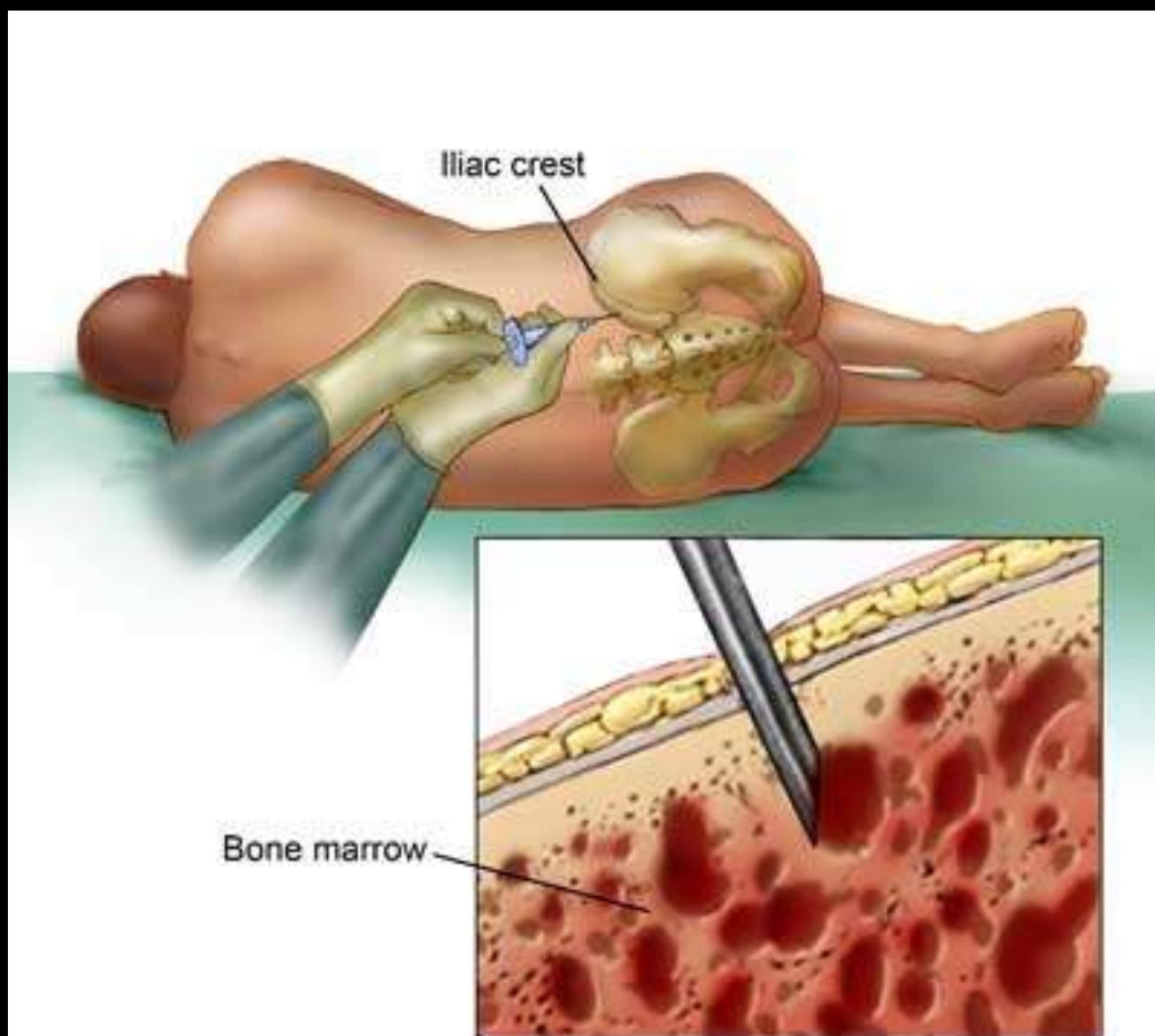
- Osteomyelitis
- Osteogenesis imperfecta.

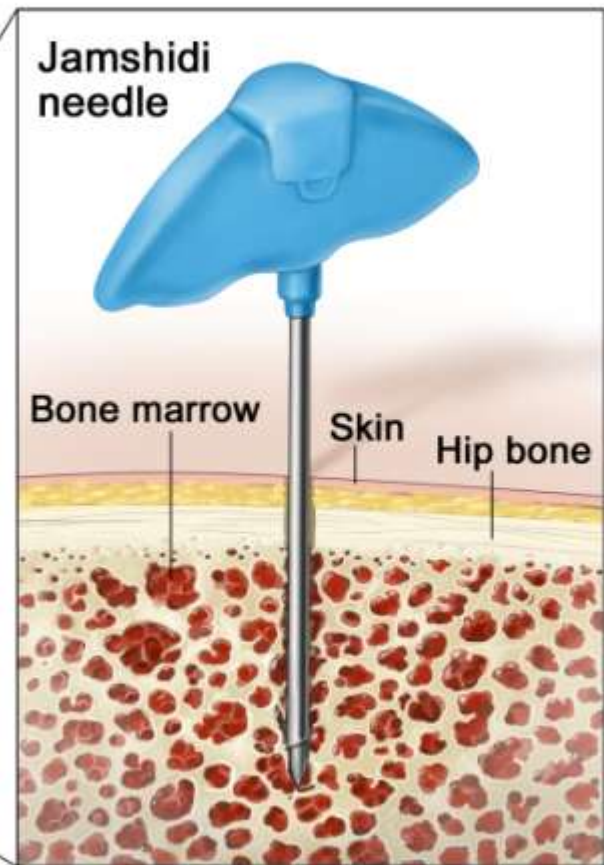
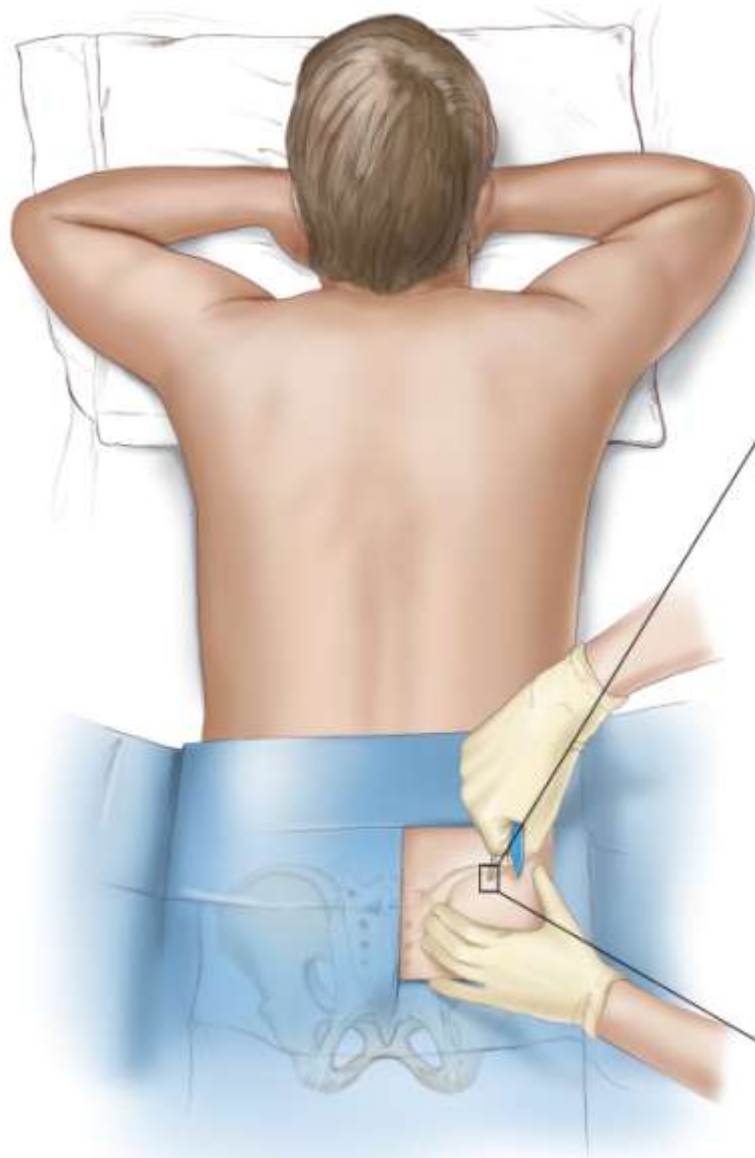




# PROCEDURE :

- Obtain **consent** from a parent or guardian.
- If the posterior iliac crest is the chosen site, patients are generally placed in the lateral decubitus **position** or the prone position
- **Sterilize** the site with the sterile solution
- Place a sterile drape over the site, and administer **local anesthesia**, letting it infiltrate the skin, soft tissues, and periosteum.
- After local anesthesia has taken effect, make an **incision** through which the bone marrow aspiration needle can be introduced .





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- If a guard is present, should be removed before starting bone marrow aspiration, to ensure adequate depth of penetration..

**NEEDLE  
PERPENDICULAR**  
to the bony  
prominence of  
the iliac crest.

**PERIOSTEUM  
PENETRATED,**  
advance the  
needle through  
the cortex and  
rotate the needle

Remove the  
stylet and  
**ASPIRATE**

1 ml of  
unadulterated  
**BONE  
MARROW**

presence of  
**BONY  
SPICULES.??**

# COMPLICATIONS :

- Hemorrhage
- Infection
- Persistent pain at the marrow site
- Retroperitoneal hematomas
- Trauma to neighboring structures and soft tissues