



# Dr. M.G.R

## EDUCATIONAL AND RESEARCH INSTITUTE

(Deemed to be University with Graded Autonomy Status)

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# HISTORY

- CSF Discovered – Domenico Catugno 1764
- CSF Circulation – F Magendie 1825
- First spinal analgesia - J Leonard Corning 1885
- First planned spinal analgesia – August Bier (16<sup>th</sup> August 1898)



# August Bier 1885









# INDICATIONS

Surgeries of lower limbs, perineum, pelvis, abdomen

It is ideal in

- Renal failure – onset is rapid, spread is greater by two or three segments, duration is shorter
- Cardiac disease
- Liver disease
- Obstetric anaesthesia



# INDICATIONS

- Elderly patients
- Diabetes mellitus



# CONTRAINDICATIONS

## **ABSOLUTE**

- Patient refusal
- Infection at the site of injection
- Increased intracranial pressure
- Hypovolemia
- Shock – haemorrhagic, septic
- Septicemia
- Severe aortic and mitral stenosis
- Coagulopathies



# CONTRAINDICATIONS

## RELATIVE

- Spinal cord and peripheral nerve diseases-  
poliomyelitis, multiple sclerosis,  
demyelinating diseases
- Brain tumors, CNS syphilis, meningitis
- Severe anemia
- Uncontrolled hypertension
- Valvular heart diseases
- Anticoagulant therapy



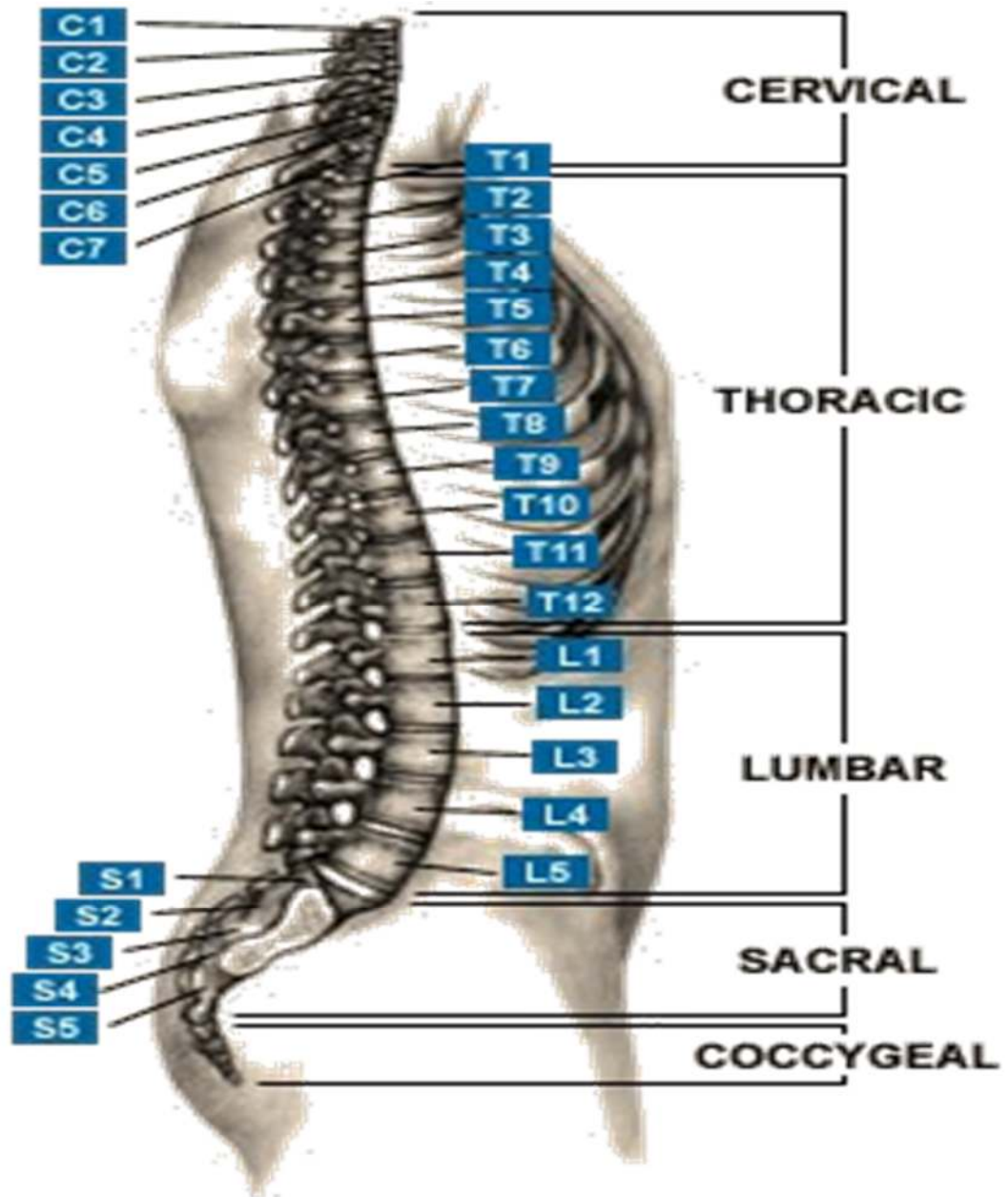
# CONTRAINDICATIONS

## RELATIVE

- Spinal congenital anomalies
- Acquired spinal anomalies
- Post-traumatic vertebral injuries
- Prior back surgery at the site of injection
- Metastatic lesions in the vertebral column
- Intestinal obstruction
- Obstructed hernia
- Mentally disturbed patients
- Uncooperative and apprehensive patients

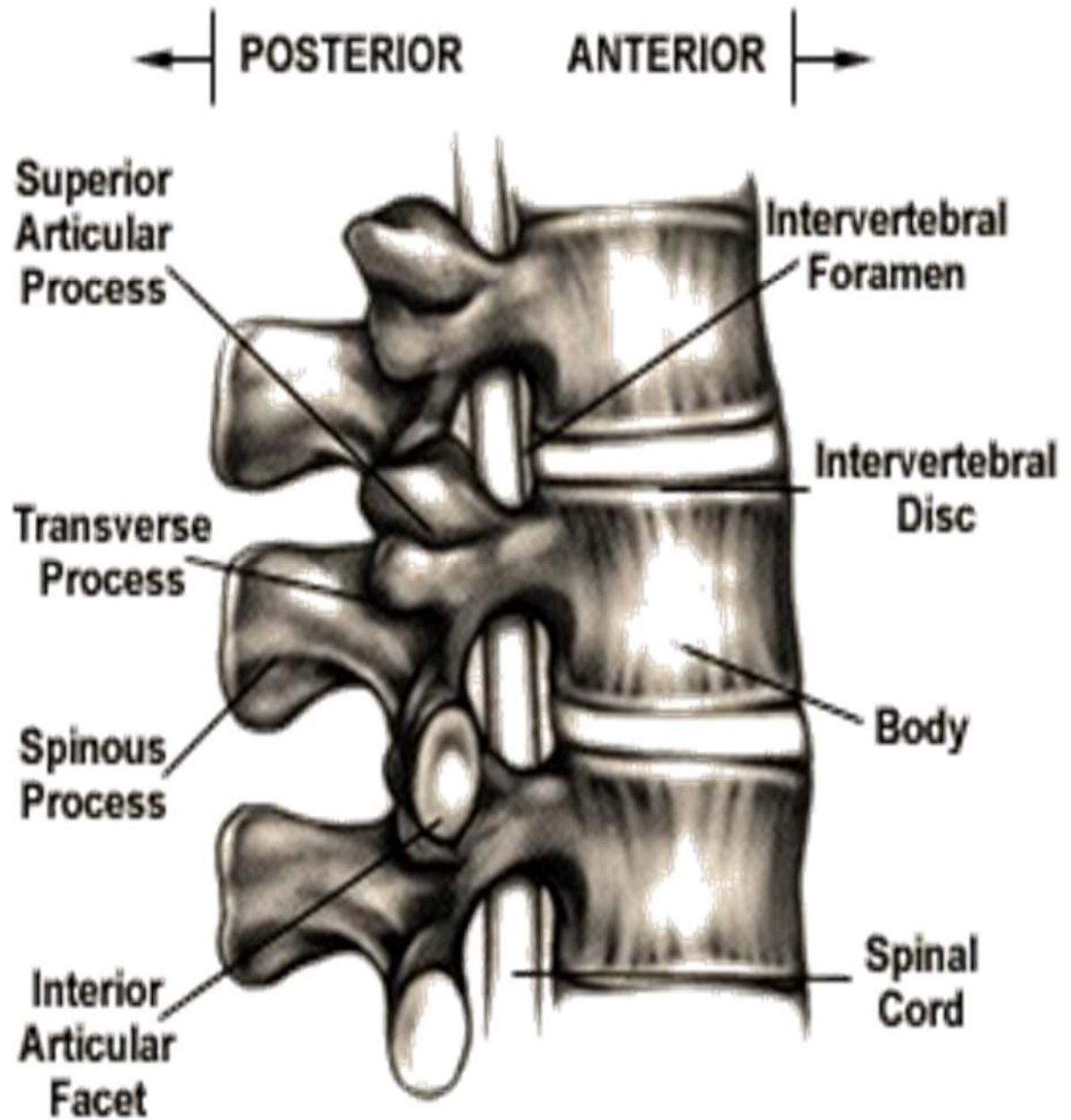


# ANATOMY





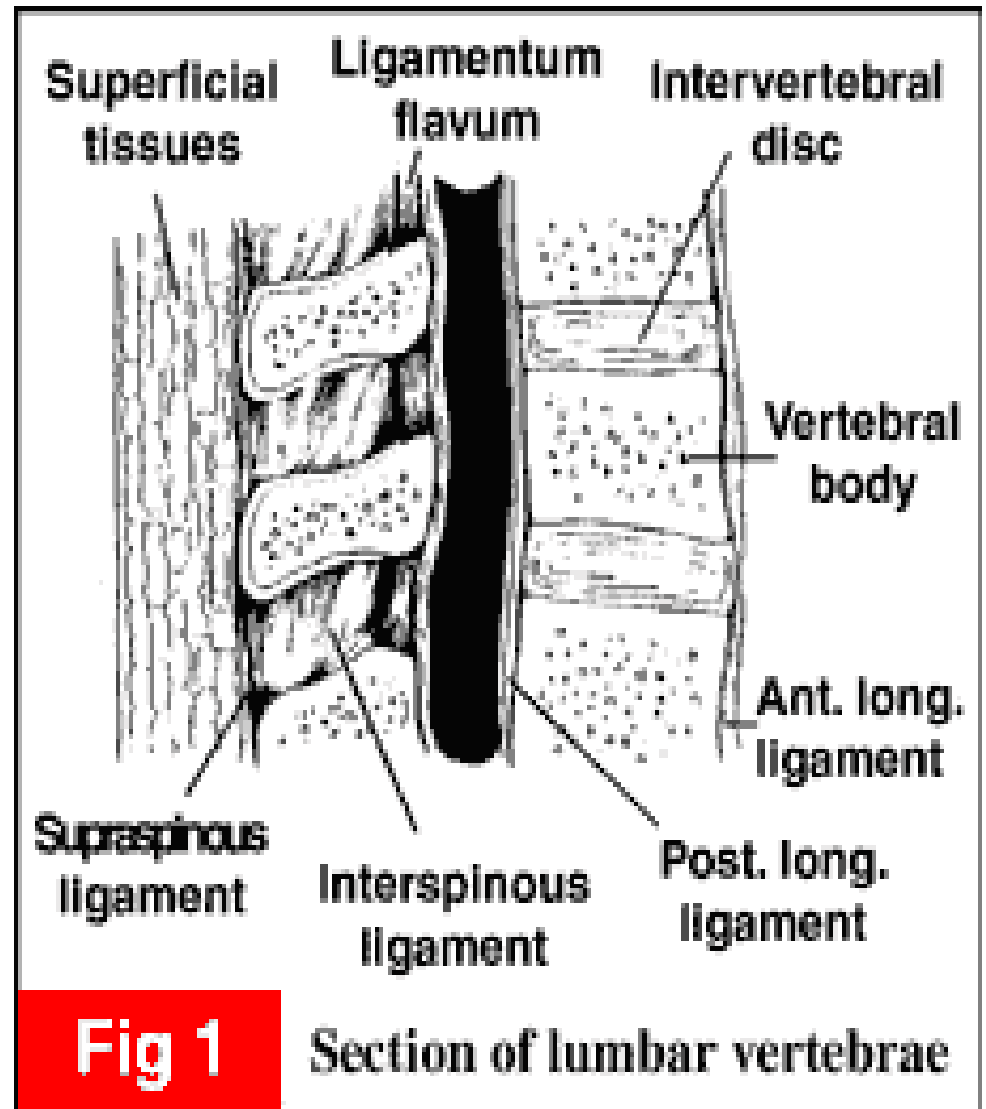
# ANATOMY





# ANATOMY

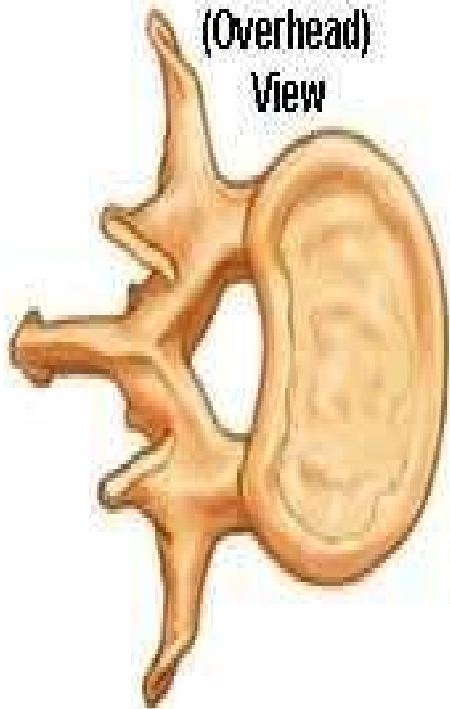
- Skin.
- Subcutaneous fat
- Supraspinous ligament.
- Interspinous ligament.
- Ligamentum flavum.
- Epidural space.
- Dura.
- Subarachnoid space.





# Lumbar Vertebrae

Axial  
(Overhead)  
View

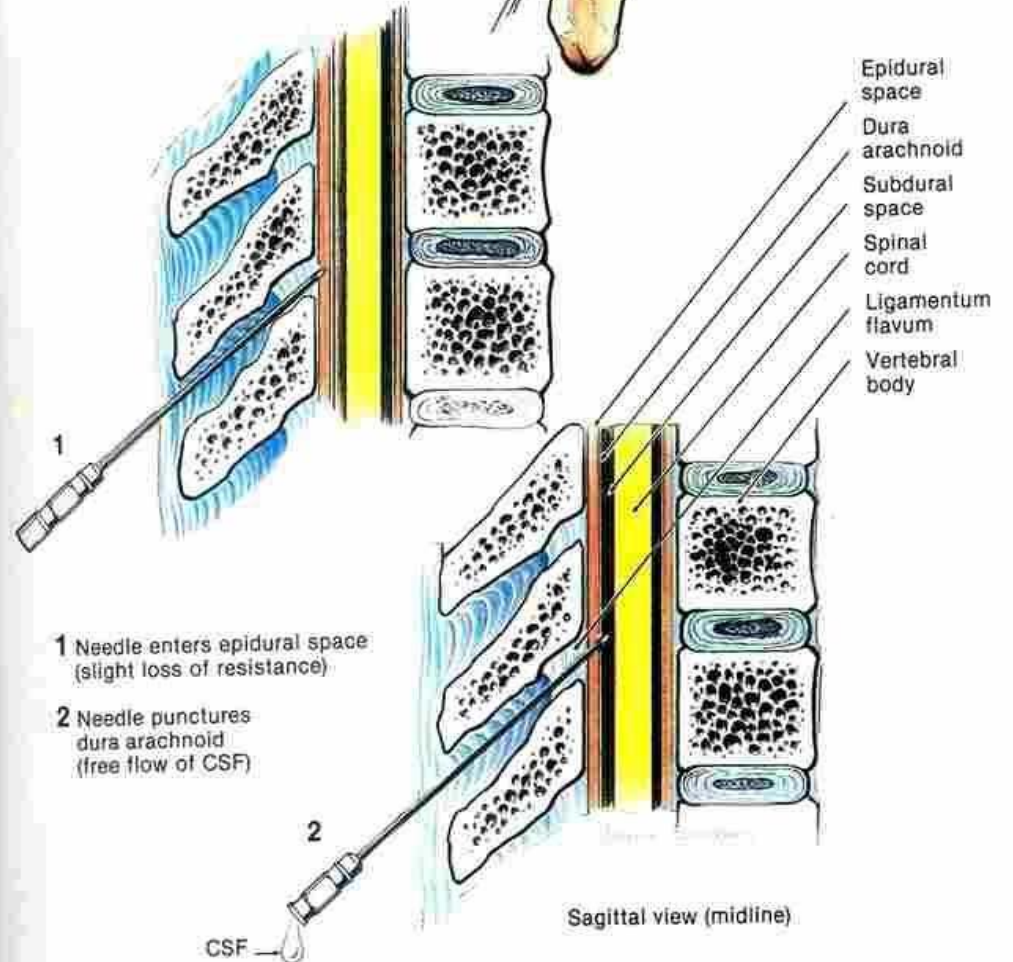
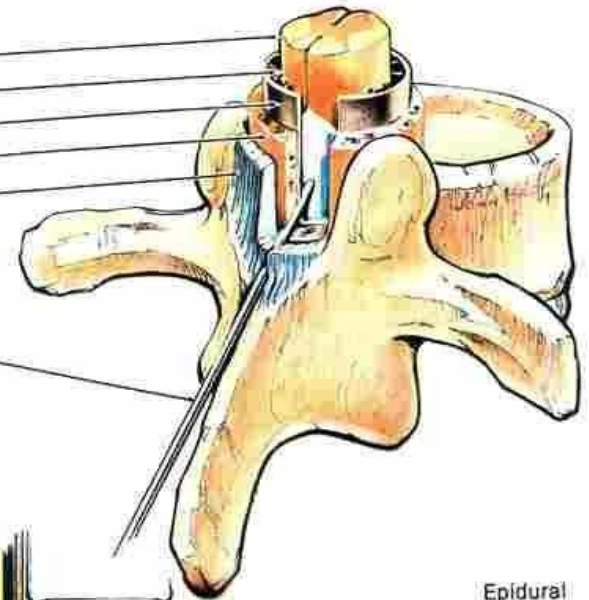


Lateral  
(Side)  
View



Spinal cord  
Subdural space  
Dura arachnoid  
Epidural space  
Ligamentum flavum

3/4-in, 22-gauge  
spinal needle



1 Needle enters epidural space  
(slight loss of resistance)

2 Needle punctures  
dura arachnoid  
(free flow of CSF)

CSF

Sagittal view (midline)



# ANATOMY

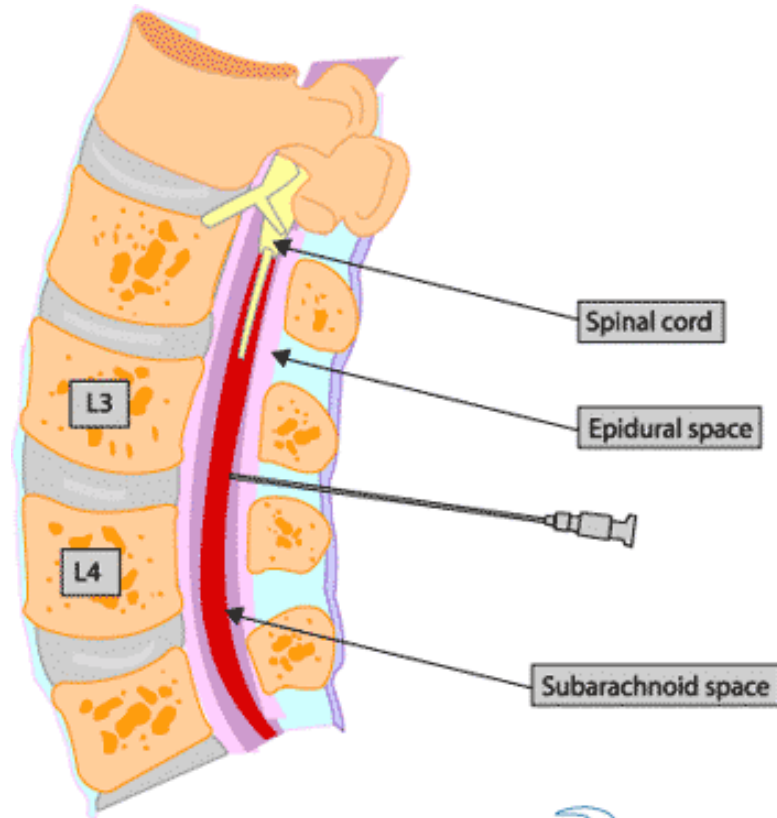
The spinal cord usually **ends at the level of L1 in adults and L3 in children.**

Dural puncture above these levels is associated with a slight **risk of damaging the spinal cord** and is best avoided.

**An important landmark to remember is that a line joining the top of the iliac crests is at L4 to L4/5**



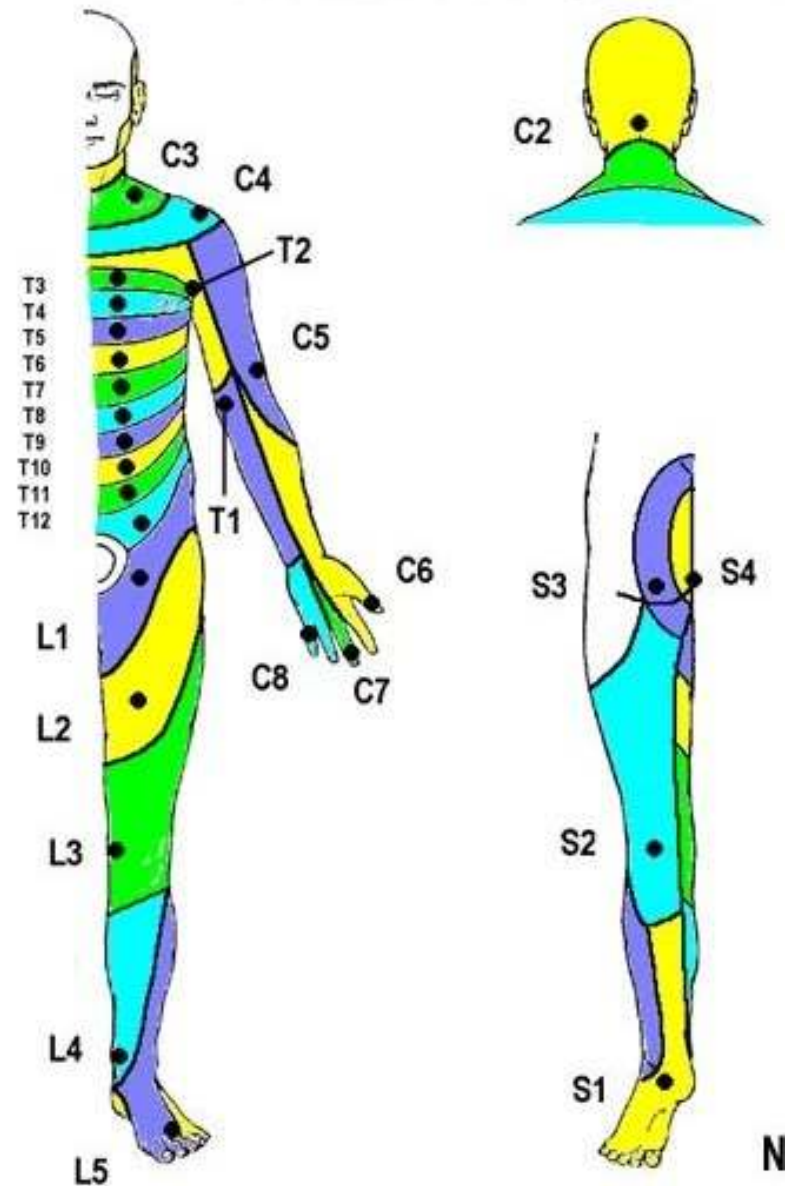
# Where Spinal Cord Ends





# DERMATOMAL LEVELS

- T10 – umbilicus
- T6 – xiphoid
- T4 – nipples
- T12, L1 – inguinal ligament , crest of ileum
- S2-S4 – perineum





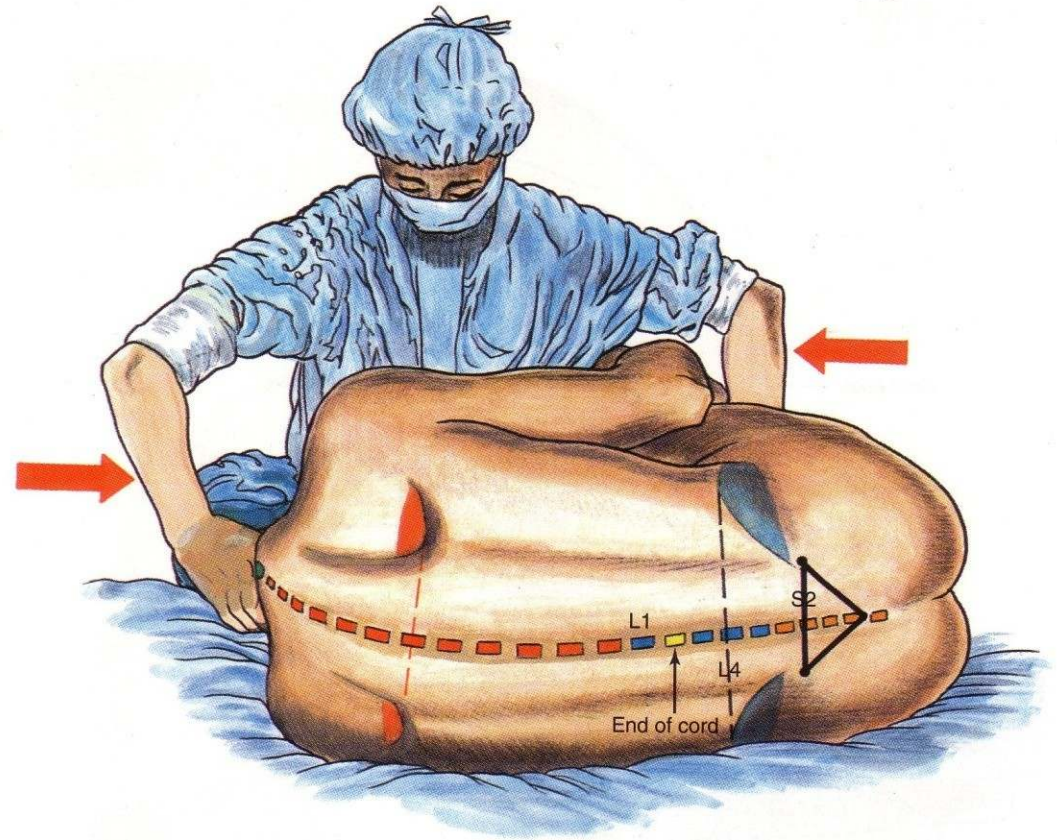
# PROCEDURE

- Preparation of the patient
- Pre-medication
  - Sedatives – benzodiazepines , opioids To decrease acid secretions – H2 blockers, proton pump inhibitors
- Monitors
- Intravenous line – preloading with fluids



# POSITIONS

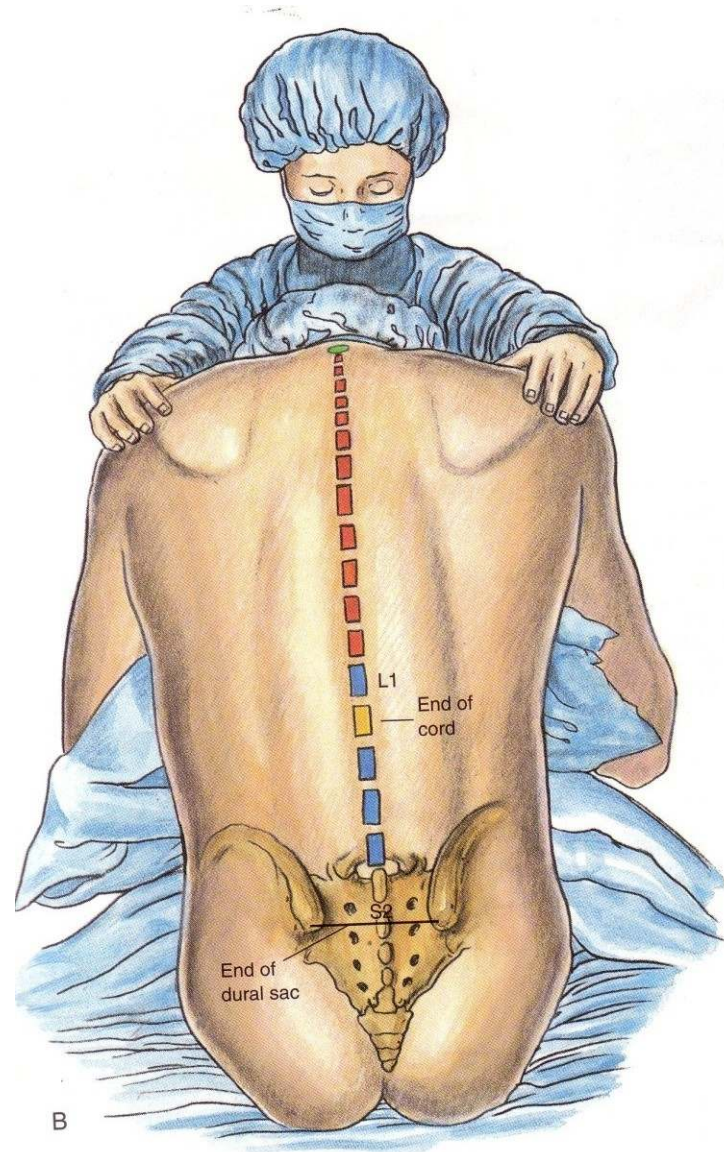
- Lateral flexed position
  - most commonly used
  - back parallel to edge of table
  - hips and knees flexed, neck and shoulder flexed towards knees
  - nose to knees





# POSITIONS

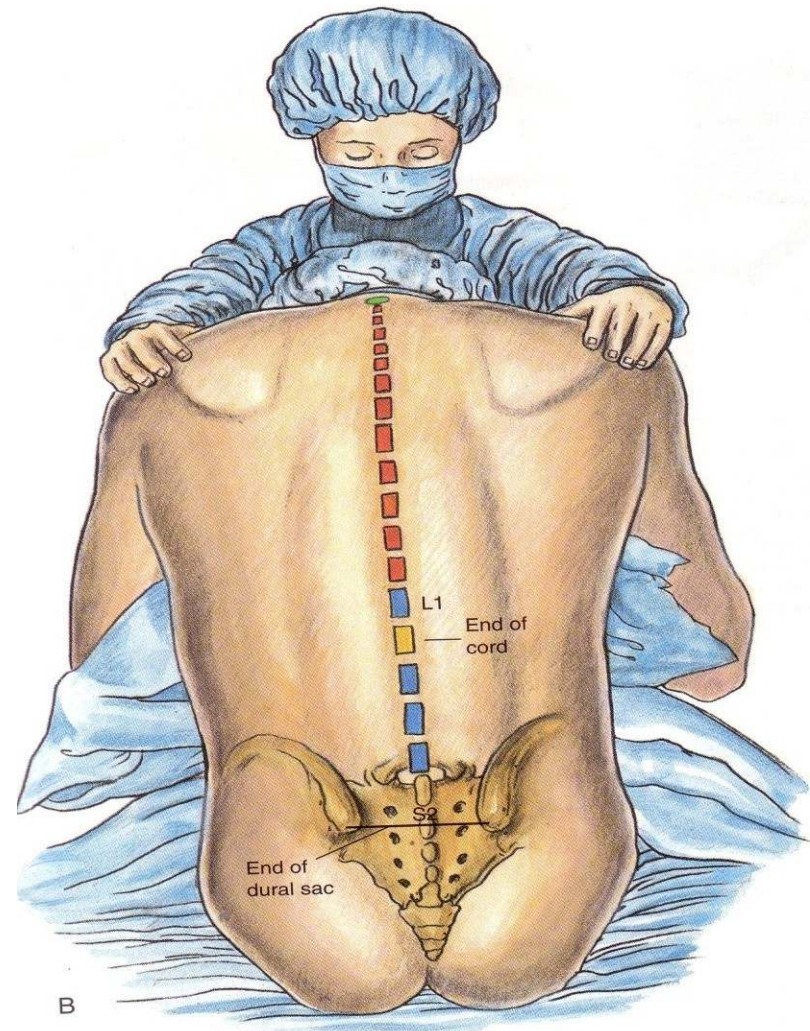
- Sitting position
  - for saddle block anaesthesia
  - obese patients, pregnant patients, patients with abnormal spinal curvatures





# POSITIONS

- Sitting position
  - patient should sit on the table with knees resting on the edge, legs hanging over the side and feet supported by a stool below





# POSITIONS

- Prone position
  - suitable for hypobaric techniques
  - patient should be in prone position with OT table flexed under his flanks, just above the iliac crests





# TECHNIQUE

- Hands and lower forearms scrubbed for at least 3 minutes
- Sterile gloves should be applied
- A large area of L-S spine from lower border of scapula to iliac crests should be painted using antiseptic solution
- Excess antiseptics removed after waiting for sufficient time for the antiseptic to act



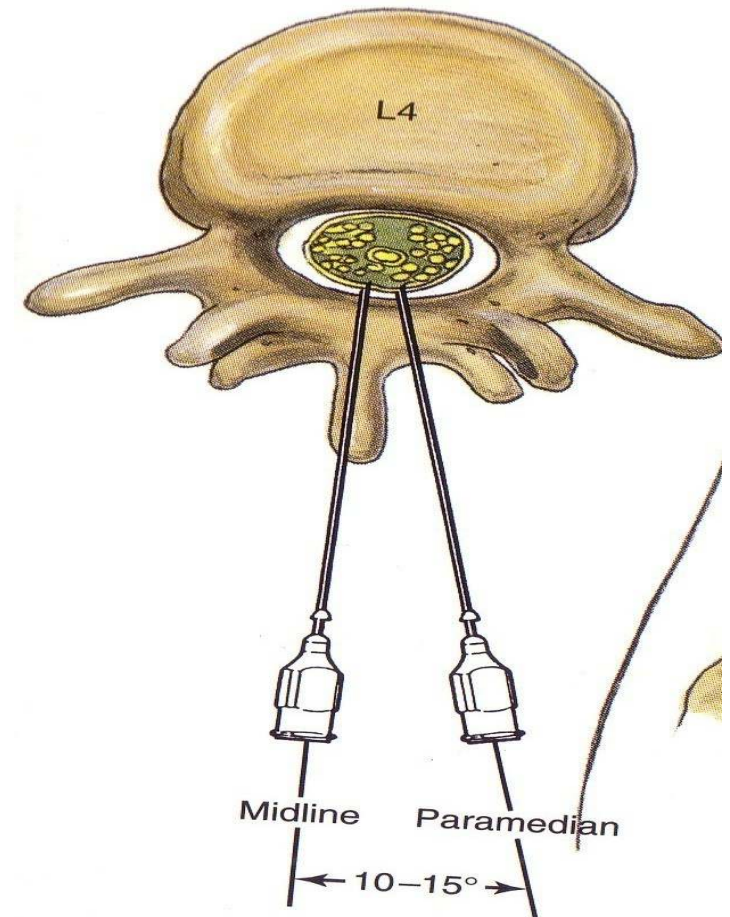
# TECHNIQUE

- Area is draped – view of T12 to S1 and laterally of quadratus lumborum muscles
- Selection of space – tuffier's line
- Raise a skin wheal with 2ml of 2% lignocaine solution after negative aspiration for blood



# TECHNIQUE

- Insert an introducer in the midline
- Uses -prevents deflection of spinal needle
- fine gauge needles can be used
  - decreases incidence of postpuncture headache
  - decreases infections
  - avoids skin fragments from entering





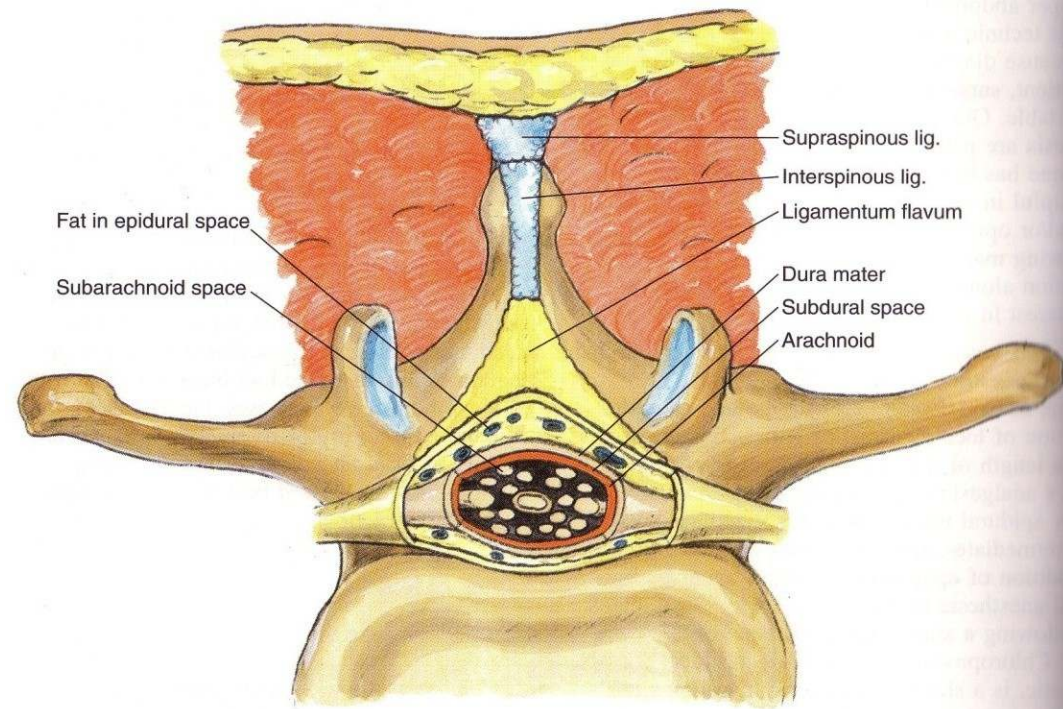
# TECHNIQUE

- Spinal needle is inserted with the stylet through the introducer
- Needle should be inserted in the midline and directed cranially at an angle of less than 50 degrees to the longitudinal axis of the vertebral column
- Bevel of the spinal needle should be kept parallel to the longitudinal axis of the spine
- Loss of resistances can be felt after puncturing ligamentum flavum and the duramater



# Layers traversed by the spinal needle (posterior to anterior)

- Skin
- Subcutaneous tissue
- Supraspinous ligament
- Interspinous ligament
- Ligamentum flavum
- Dura mater
- Sub dural space
- Arachnoidmater
- Subarachnoid space





# TECHNIQUE

- Remove stylet to observe free flow of CSF
- Attach 5 ml Luer Lok syringe containing anaesthetic mixture to the spinal needle
- Stabilize the spinal needle and attach the syringe by grasping the hub of spinal needle with thumb and index finger while propping the remaining fingers against the patient's back to provide support (bromage grip)



# TECHNIQUE

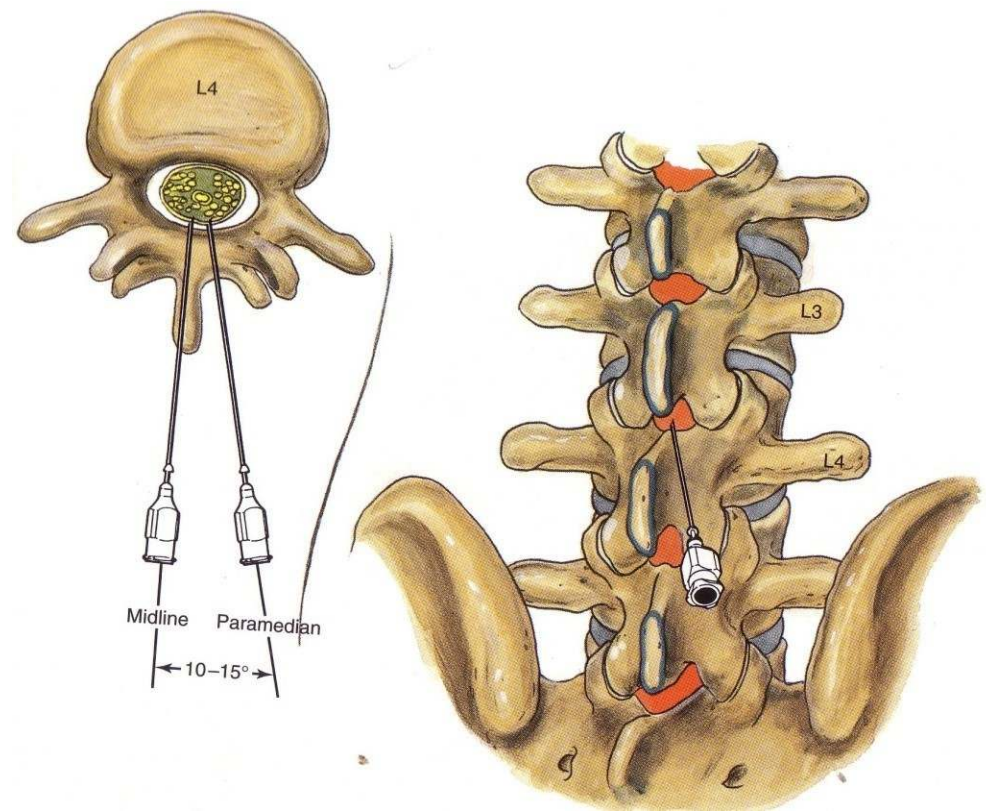
- Inject at the rate of 0.2ml/sec
- Aspirate small amount of spinal fluid to determine if the needle is still placed properly
- Remove spinal needle and introducer quickly and simultaneously



# TECHNIQUE

## Paramedian approach

- 1.5 cm lateral to midline
- Spinal needle is inserted at an angle of 25 degrees with the midline and without deviation cephalad or caudad





# TECHNIQUE

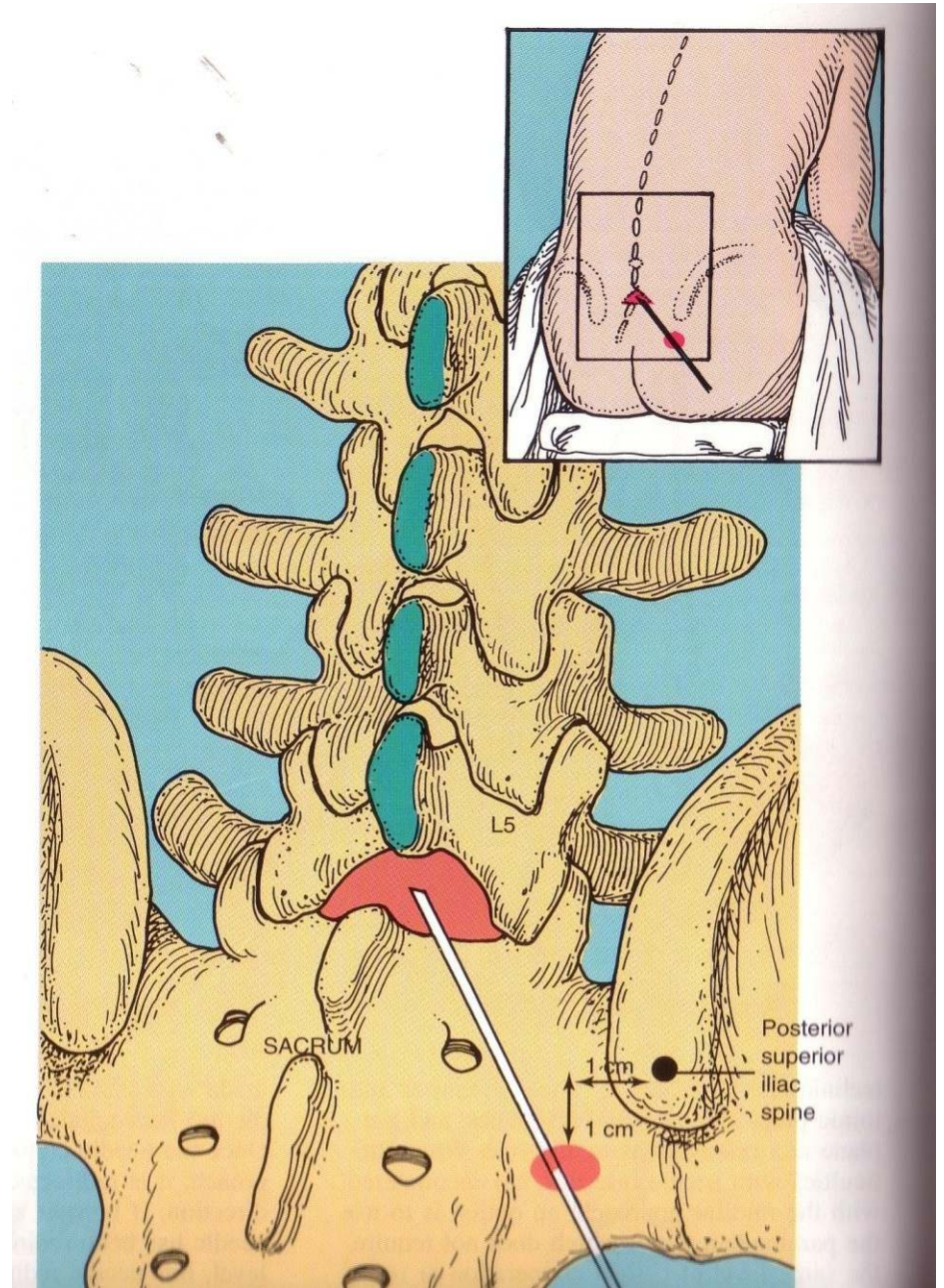
## Paramedian approach

- Needle lies lateral to supraspinous and interspinous ligaments and penetrates ligamentum flavum and duramater in the midline
- Useful in arthritis , deformed spine



# TAYLOR TECHNIQUE

- A 12 cm spinal needle is inserted 1 cm medially and 1 cm above the lowest prominence of posterior superior iliac spine
- Needle is directed upwards medially and forwards at an angle of 50 degrees





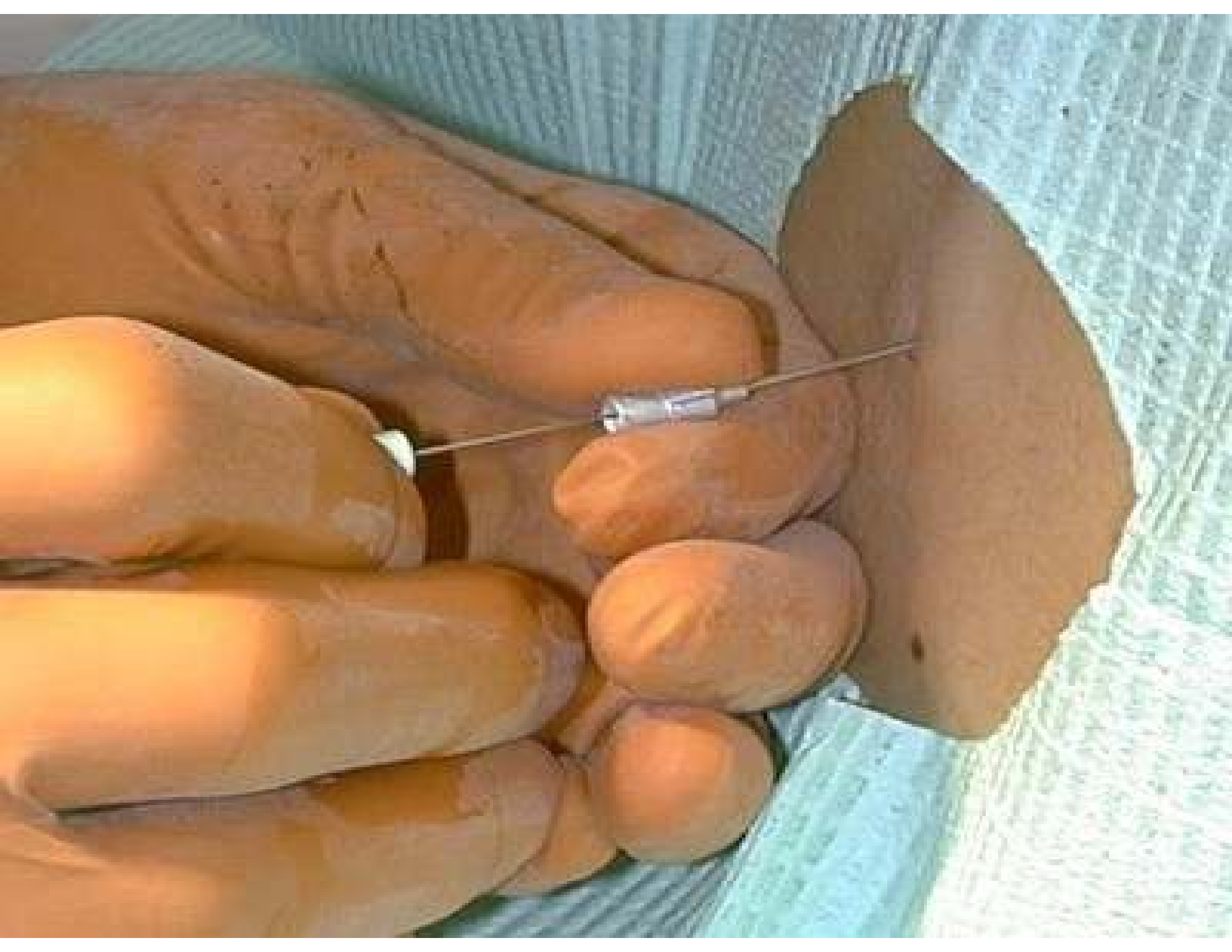
# TECHNIQUE

## Taylor technique

### Uses :

- Spinal fusion
- Arthritic spine
- Opisthotonus
- Skin infection in lumbar region

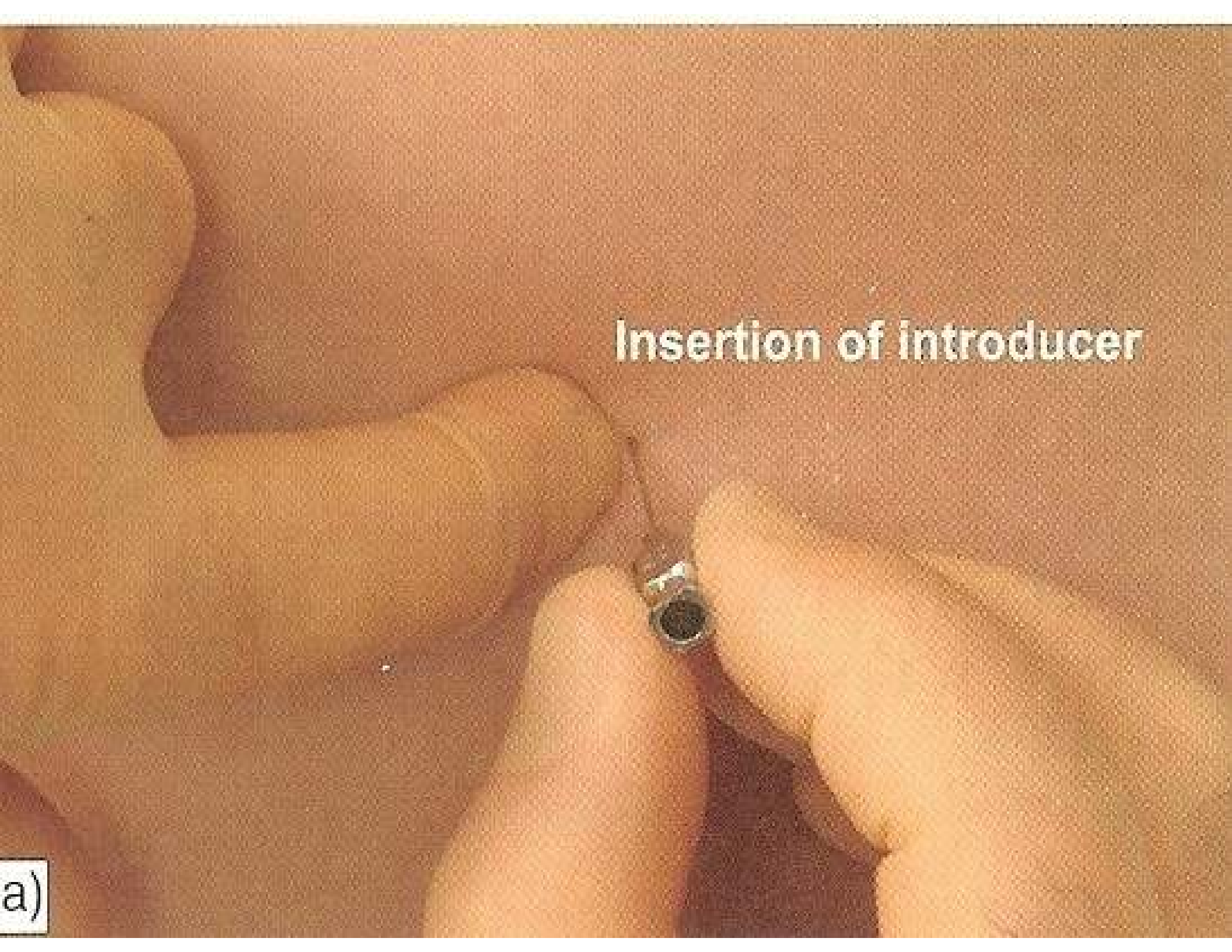






**Insertion of introducer**

a)



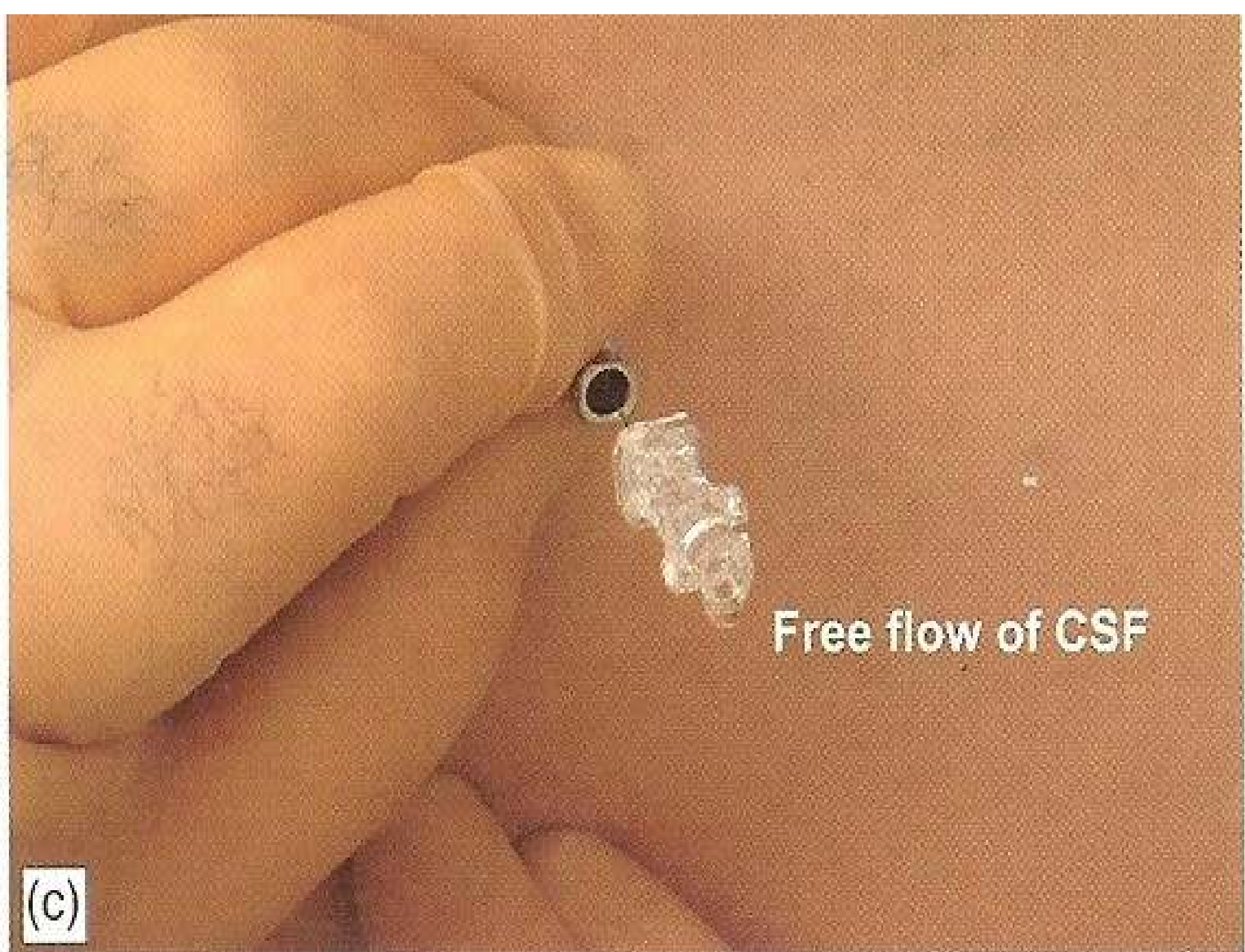


Passage of spinal needle



(b)





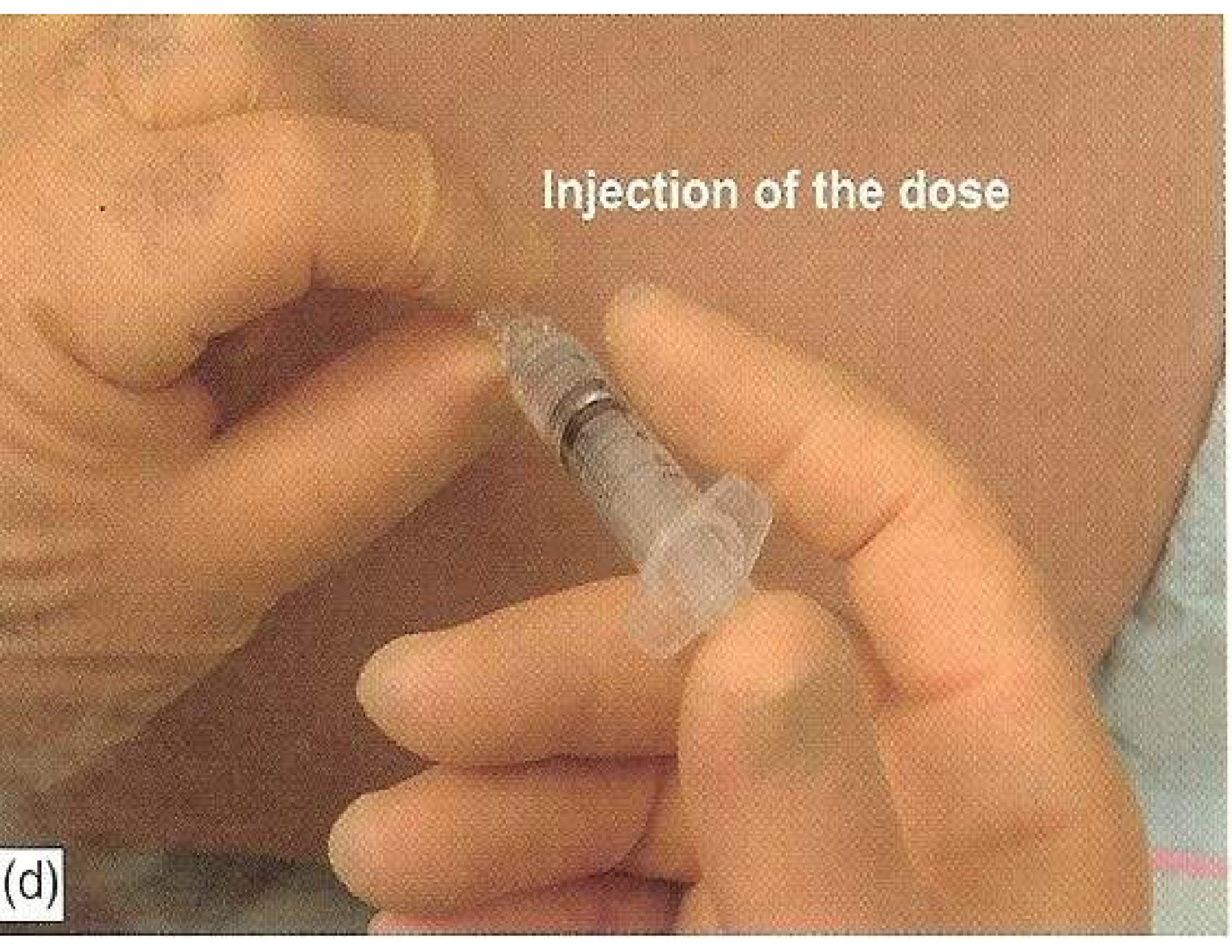
Free flow of CSF

(c)



Injection of the dose

(d)





# SPINAL NEEDLES

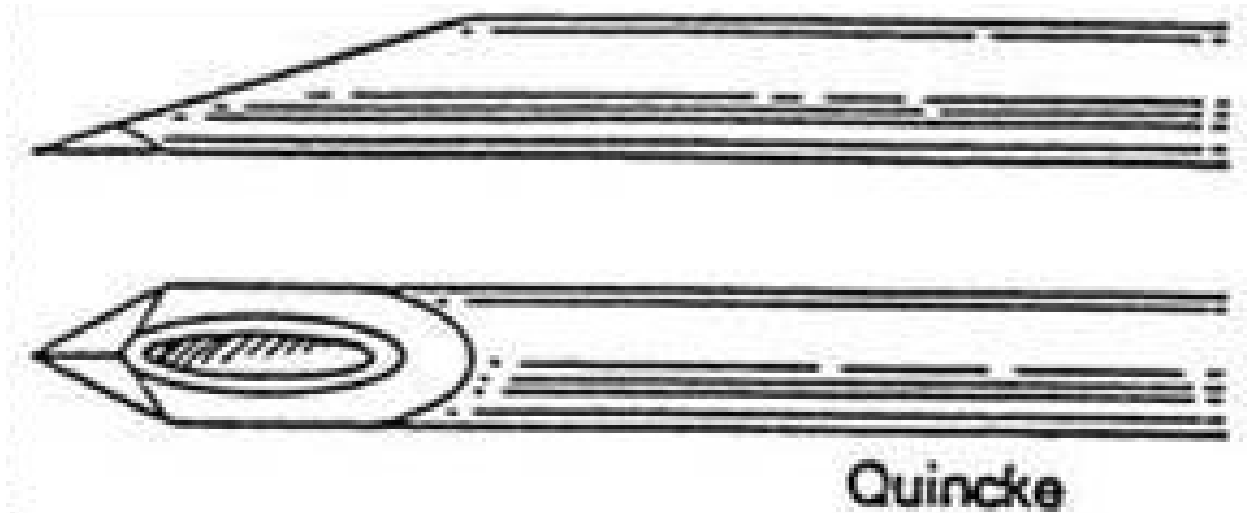
Three parts

- Hub
- Canula
- Stylet
- Point of the canula is beveled and has a sharp edge
- Lumenal sizes : 18 gauge to 30 gauge
- Length : 3.5 to 4 inches



# SPINAL NEEDLES

- Quincke Babcock needle





# SPINAL NEEDLES

- Whitacre needle

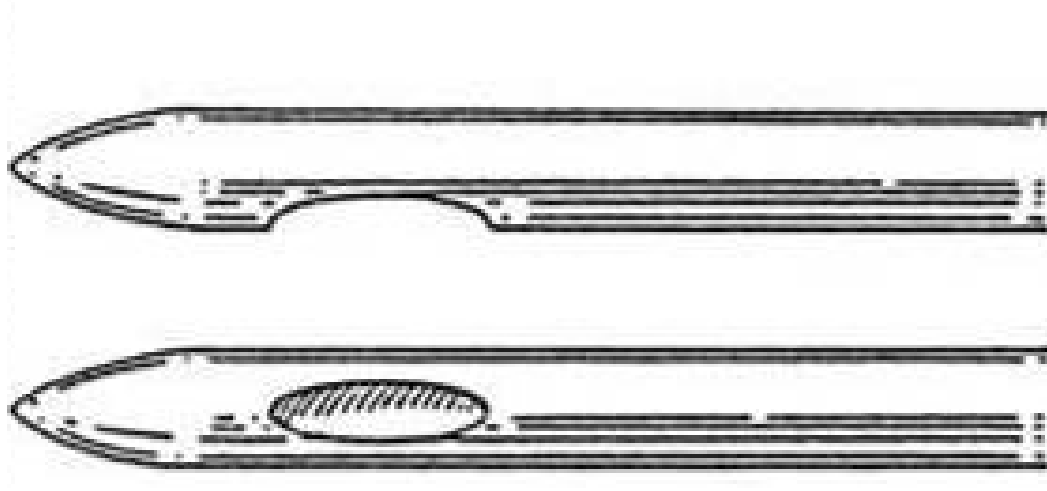


Whitacre



# SPINAL NEEDLES

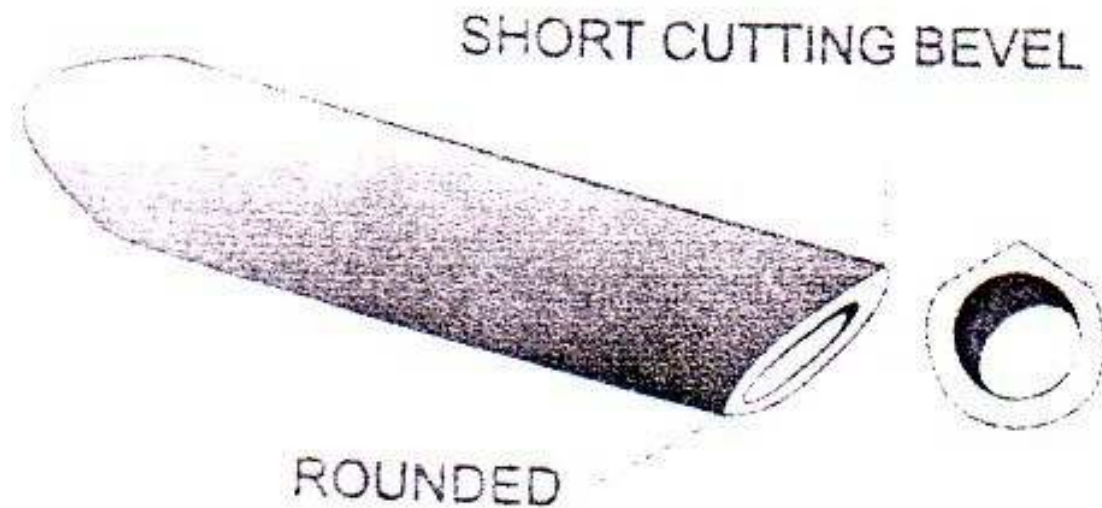
- Sprotte needle





# SPINAL NEEDLES

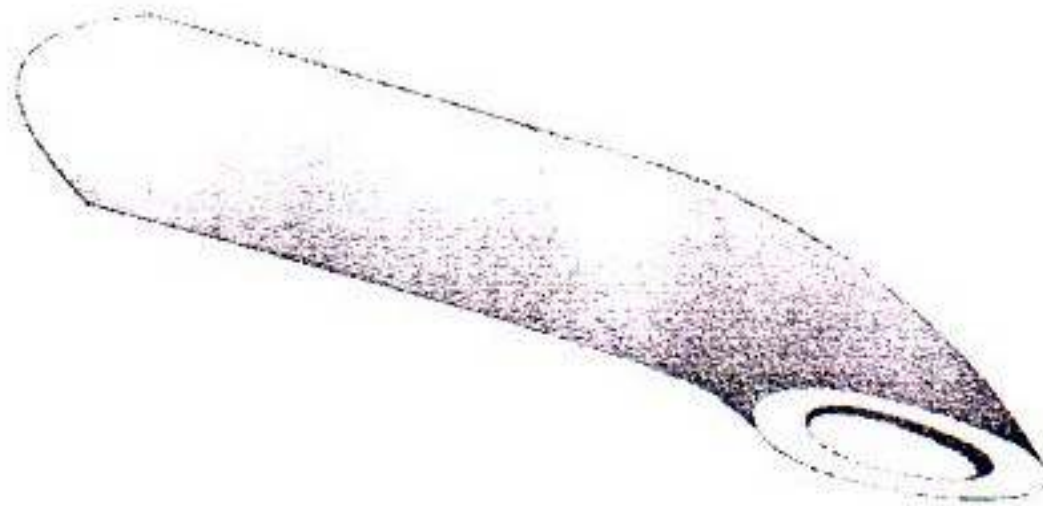
- Pitkin needle





# SPINAL NEEDLES

- Touhy needle



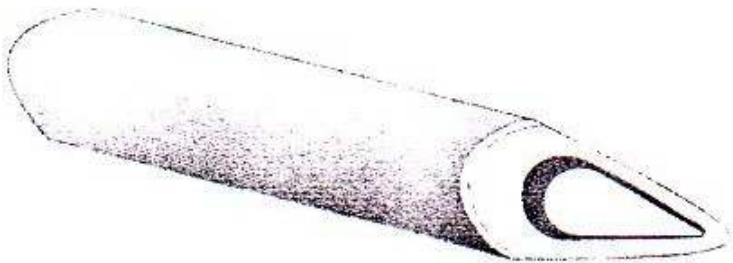


# SPINAL NEEDLES

- Greene needle



GREENE





# Drugs used in spinal anaesthesia

## Lidocaine

- Rapid onset of action , intermediate duration and low toxicity
- Disadvantages – Transient neurological symptoms



# Drugs used in spinal anaesthesia

## Bupivacaine

- Amide local anaesthetic
- Exhibits sensory/motor split
- Dose of 7.5mg – ambulatory surgery
- Low concentrations(0.1-0.125%) – postoperative analgesia



# Drugs used in spinal anaesthesia

## Ropivacaine

Compared to bupivacaine

- Longer onset of block to T10 (5 min vs 2 min)
- Lower median maximal block height ( T7 vs T5)
- Shorter regression of sensory block to T10 (55 min vs 110 min)
- Quicker mobilization (253 min vs 331 min )
- Less CNS and cardiac toxicity



# **Drugs used in spinal anaesthesia**

## **Levobupivacaine**

- Isolated (S) enantiomer of bupivacaine
- Similar to bupivacaine



# Spinal anaesthetic agents

Drug	preparation	Perineum, lower limbs (mg) dose	Lower abdomen (mg)dose	Upper abdomen (mg)dose	Duration (min)
procaine	10% solution	75	125	200	45
tetracaine	1% solution in 10% glucose	4-8	10-12	10-16	90-120
lidocaine	5% in 7.5% glucose	25-50	50-75	75-100	60-75
bupivacaine	0.75% in 8.25% dextrose	4-10	12-14	12-18	90-120
	0.5% in 8% dextrose	7.5 to 12.5	12.5-17.5	17.5-25	90-120
ropivacaine	0.2-1% solution	8-12	12-16	16-18	90-120



# ADJUVANTS USED

## Opioids

- Addition of opioids improves analgesic quality, prolongs sensory block, reduces local anaesthetic requirements, reduces duration of motor blockade and improves haemodynamic stability
- Fentanyl – 12.5 mcg
- Sufentanyl – 2.5 – 5 mcg
- Diamorphine – 0.3 mg
- Morphine – 0.1 – 0.2 mg



# ADJUVANTS USED

## Epinephrine

- Dose - 0.2 mg
- Decreases blood flow

## Clonidine

- Dose – 15 – 45 mcg
- Prolongs duration of sensory analgesia

## Neostigmine

- Dose – 5-100 mcg
- Inhibits breakdown of acetylcholine



# Factors affecting block height (postulated)

- Patient characteristics
  - Age
  - Height
  - Weight
  - Gender
  - Intra abdominal pressure
  - Anatomic configuration of spinal column
  - Position



# **Factors affecting block height (postulated)**

- Technique of injection
  - Site of injection
  - Direction of injection
  - Direction of the bevel
  - Use of barbotage
  - Rate of injection



# Factors Influencing Block Height

## Controllable factors

- Dose ( volume x concentration)
- Site of injection
- Baricity of local anaesthetic solution
- Posture of patient



# Factors influencing block height

Factors not controllable

- Volume of CSF
- Density of CSF



# LEVELS OF BLOCK

Sympathetic paralysis



Sensory block



Motor nerve blockade



# Testing For Levels Of Block

## Sensory level

- Pin prick using sterile needle
- Loss of touch is two dermatomes lower than pin prick

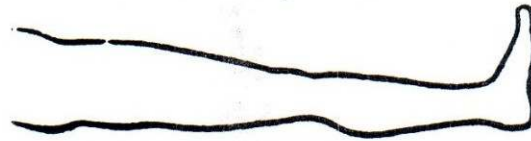


# Testing for levels of block

## Motor block

- Modified Bromage scale of onset of motor block

**I. COMPLETE  
BLOCK**



Unable to move  
feet or knees

**II. ALMOST  
COMPLETE**



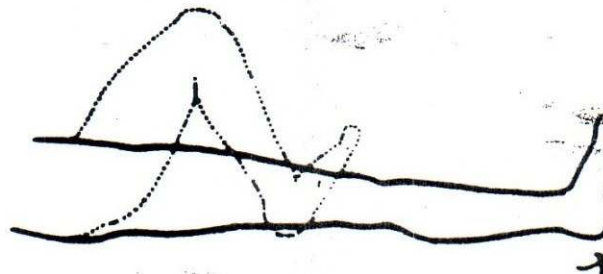
Able to move  
feet only or plantar flex  
big toe.

**III. PARTIAL**



Just able to flex  
move knees

**IV. NONE**



Full flexion of  
knees & feet and hip.  
and extend knee.



# COMPLICATIONS

## 1. Immediate complications

- Hypotension
- Bradycardia and Cardiac arrest.
- High and Total spinal block leading to respiratory arrest.
- Urinary retention.
- Epidural hematoma, Bleeding.



# COMPLICATIONS

## Late complications

- Post dural puncture headache (PDPH)
- Backache
- Nausea
- Focal neurological deficit
- Bacterial meningitis
- Sixth Cranial nerve palsy
- Urinary retention



# Treatment Of Complications

Hypotension is due to **vasodilation** and a functional **decrease in the effective circulating volume**.

## 1. Vasoconstrictor drugs

2. All hypotensive patients should be given **OXYGEN** by mask until the blood pressure is restored.

3. **Raising their legs** thus **increasing the return of venous blood to the heart**.



# Treatment Of Complications

**4. Increase the speed of the intravenous infusion** to maximum until the blood pressure is restored to acceptable levels.

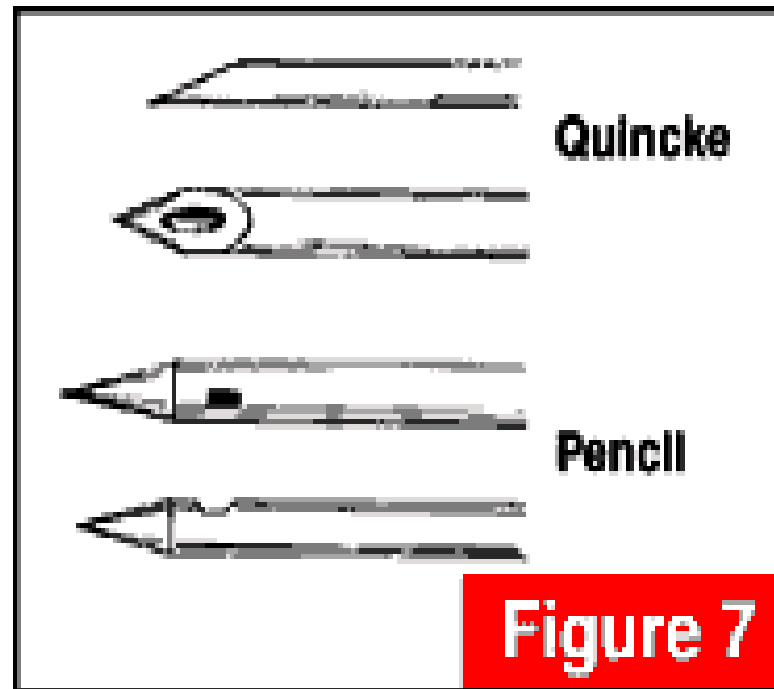
5. Treatment of bradycardia- give **atropine** intravenously.



# How to prevent Delayed Complication

- *Use Thin Spinal needles*
- *Sterile Precaution*





It is widely considered that **pencil-point needles (Whiteacre or Sprotte)** make a smaller hole in the dura and are associated with a lower incidence of headache (1%) than conventional **cutting-edged needles (Quincke)**



# Treatment of spinal headache

- ☐ Remain lying flat in bed as this relieves the pain
- ☐ They should be encouraged to drink freely or, if necessary, be given intravenous fluids to maintain adequate hydration.



# Treatment of spinal headache

- ❑ Simple analgesics such as paracetamol, aspirin or codeine may be helpful,
- ❑ Caffeine containing drinks such as coffee or Coca-Cola are often helpful.



# Treatment of spinal headache

☐ Prolonged or severe headaches may be treated with

- epidural blood patch performed by aseptically injecting 15-20ml of the patient's own blood into the epidural space.
- This then clots and seals the hole and prevents further leakage of CSF.





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