TOPIC: ANAESTHESIA AND ITS TYPES

The term Anaesthesia was given by Oliver Wendell Holmes

Temporary and reversible sedative loss of sensations is called as anaesthesia

It may include

Narcosis

Amnesia

Analgesia

Muscle relaxation

Anaesthesiology

- **It is a branch of medical science which is concerned with techniques and drugs by which patient can be sedative and his reflections are abolished temporarily for doing surgical procedures and diagnostic procedures.**

Types of Anaesthesia

Anaesthesia is mainly classified into 2 types

- General Anaesthesia
- Conductional Anaesthesia

General Anaesthesia :

- Patient is wholly sedated and the patient becomes totally unconscious .
- General anaesthesia is achieved by administrating a combination of inhalational and IV Anaesthetic agents to the patient
- Inhalational Anaesthetic agents are administered into the patients body through inhalational route by masks and tubes.
- IV Anaesthetic agents are given to the patient by making an IV line

General Anaesthesia protocol :

PREMEDICATION

1. Benzodiazepines
    - Patients are pre-medicated with diazepam or Midazolam night before surgery
    - To induce good sleep and produce amnesia
2. Opioids

- Fentanyl or Tramadol is given just before induction
- To Produce analgesia and blunt reflex response to intubation

3. Anticolergenics
   Glycopyrrolate

4. Antiemetic
   - Ondensteron
   - Metoclopromide

5. Preoxygenation
   - This is very important in GA .
   - Preoxygenation is done for 3 minutes because 99% of denitogenation takes place in 3 minutes

INDUCTION

Because of ultra fast action induction is done with iv sodium thiopentone or propofol

MUSCLE RELAXATION FOR INTUBATION

- Theoretically because of rapid onset and short duration suxamethonium(succinylcholine) is the ideal agent for intubation but because of the side effects its use is only restricted to rapid sequence or difficult intubation
- In normal circumstances patients are generally intubated with non depolarisers

INTUBATION

- Done with cuffed ETT
- Position of the tube is verified by auscultation and capnography
- Tube is fixed with adhesive
- Once position is confirmed start IPPV (intermittent positive pressure ventilation)

MAINTENANCE OF ANAESTHESIA

Maintained with

- Oxygen(minimum 33%)
- Nitrous oxide(66%)
- Inhalational agents
- Non depolarizing muscle relaxant

REVERSAL

- Non depolarizing muscle blockade is reversed with neostigmine+ glycopyrrolate

EXTUBATION

- Extubation is done after thorough suctioning of oral cavity

CONDUCTIONAL ANAESTHESIA:

- It is the anaesthesia in which only a particular part of the body is anaesthetized and rest of the body remains consciousness.
- In conductional anaesthesia local anaesthetic drugs are applied a particular regions/part of the body by different techniques to alter the pain and unconcious that region.

TYPES OF CONDUCTIONAL ANAESTHESIA

1. SPINAL ANAESTHESIA
2. EPIDURAL ANAESTHESIA
3. CAUDAL ANAESTHESIA
4. REGIONAL ANAESTHESIA
5. LOCAL ANAESTHESIA
6. TOPICAL ANAESTHESIA

1. SPINAL ANAESTHESIA:

- Also called subarachnoid block ,intrathecal block
- It is the most commonly used anaesthetic technique

INDICATIONS:

- Orthopaedic surgery of lower limb and pelvis
- General surgery: all pelvic and perineal surgeries,hernia,appendix,
- Gynaecology and obstetrics: all uterine surgeries like TAH,cervical surgeries,LSCS,tubectomy,ovarian surgeries.
- Urology: bladder,ureteric stone, prostate surgery
- Surgeries of upper abdomen like pyelolithotomy and eve cholecystectomy can be performed in spinal anaesthesia by giving head down(trendelenburg) tilt

PROCEDURE:

- Spinal anaesthesia is usually given in lateral position or sitting position(possible in prone position also)
- Approach may be midline(most commonly used),lateral(paramedian)
- After cleaning and draping lumbar puncture is done in desired space (usually l3-l4 or l4-l5) and the local anaesthetic drug is injected after confirming the free flow of CSF.

SITE OF ACTION OF LOCAL ANAESTHETIC:

- Local anaesthetic mainly acts on spinal nerves and dorsal ganglia but a small concentration can be detected in substance of spinal cord.

DRUGS USED IN SPINAL ANAESTHESIA:

Commonly used drugs in India are xylocaine (lignocaine), and Bupivacaine (sensoricaine).

A. LOCAL ANAESTHETICS

1. Xylocaine:

- Concentration used is 5%. The solution used for spinal is hyperbaric(or heavy) that means its specific gravity is more than that of CSF.
- IT is made hyperbaric by addition of 7.5% dextrose. Hyperbaric solution tries to settle down because its specific gravity is more than that of CSF.
- Specific gravity of hyperbaric xylocaine is 1.0333 and CSF is 1.004

2. BUPIVACAINE

- Concentration used is 0.5% and it is made hyperbaric by addition of 8% dextrose.
- Specific gravity is 1.0278.

3.TETRACAINE:

- Concentration used is 1% and made hyperbaric by addition of 5% dextrose.
- Specific gravity is 1.0203

4. PROCAINE:

- Concentration used is 10% and it is made hyperbaric by addition of 5% dextrose
- Specific gravity is 1.0203

B. OPIOIDS:

- A small dose of fentanyl (20-25 mg) improves the sensory effect of spinal block without increasing the risk of significant respiratory depression therefore used routinely in many centres.
- Morphine (0.25 mg) can be used as an alternative but because of risk of respiratory depression is not preferred.

SPINAL NEEDLES

These are Dura cutting and Duraseparating

1. DURA CUTTING

- Quincke-babcock and Greene needle.

- Incidence of PDPH is high with these needles but these needles are cheaper

2. DURA SEPERATING

- The commonly available types are **WHITCRE,SPORTE AND PITKIN**
- As these needles only separates the Dura fibres

COMPLICATIONS OF SPINAL ANAESTHESIA:

INTRAOPERATIVE COMPLICATIONS:

1. Hypotension: this is the most common complication. Mild hypotension do occur in almost all patients and significant hypotension (systolic BP < 90 mmhg) may be seen in up to 1/3rd of the patients.

   TREATMENT

   Preloading with 1-1.5 litres of crystalloids or 500 ml of colloid

- Head down position
- Fluids
- Vasopressors: mephenteramine,metraminol,ephedrine(2-6mg),epinephrine
- Inotropes : (dopamine,dobutamine)
- Oxygen inhalational(to prevent hypoxia from hypotension)

2. BRADYCARDIA

- Bradycardia after spinal anaesthesia is quite common (incidence around 10%)
- TREATMENT: IV Atropine

3. APNEA:

- it is usually because of severe hypotension,high or total spinal
- Managed with IPPV WITH BAG AND MASK VENTILATION

4. Nausea and vomiting

- Treat hypotension
- Oxygenation
- Antiemetics

5. Cardaic arrest:
   it can be because of:

- Severe hypotension
- Total spinal/high spinal

- Anaphylaxis
- Treat with immediately CPR

6. BROKEN NEEDLE:
   Attempt theremoval at once if not possible gets a portable X-ray and call for neurosurgeon
7. Pain during injection
8. BLOODY TAP:

Bleeding after spinal usually occurs due to puncture of epidural vein. The needle should be withdrawn and reinserted.

8. HIGH SPINAL/Total spinal:

High spinal means spinal above desired level causing problems to the patient

Above cervical is called as very high or total spinal.

POSTOPERATIVE COMPLICATIONS:

1. URINARY RETENSION:

   It is due to blockade of S2,3,4 Catheterization may be required

2. PDPH(POST DURAL PUNCTURE HEADACHE)

It is low pressure headache due to seepage of CSF from Dural rent(hole) created by spinal needle

The loss may be around 10ml/hr

It is usually present 12-14 hrs after operation

Treatment

- Use small gauge needles
- Use duraseparating needles
- Ask patients to lie in supine position
- analgesics
- Intravenous fluids(15ml/kg/hr) or oral fluids 3 litres/day. The aim of adequate hydration is to increase the CSF production.
- Desmopressin : it is antidiuretic and retain fluids in body

EPIDURAL BLOOD PATCH

10-20 ml of autologous blood is given in the same epidural space in which spinal is given blood will clot and seal the rent.

SADDLE BLOCK:

- It is the spinal given in sitting position and the patient remains seated for 5 minutes. Since most of the drug migrate downwards only sacral segments are blocked.
- Used for perianal surgeries like hemorrhoids,fistula ,fissure

2. EPIDURAL ANAESTHESIA:

- It is also called as peridural block

INDICATIONS

1. All surgeries which can be performed under spinal anaesthesia can be performed under epidural block. Plus upper abdominal surgeries, thoracic surgeries(under thoracic epidural) and even neck surgeries can be performed under cervical epidural
2. Mainly used for post operative pain management
3. For painless labour
4. To control chronic pain due to cancer
5. Blood patch for PDPH

EPIDURAL NEEDLES:

- The most commonly used needle for epidural is TUOHY`S NEEDLE
- It has blunt bevel with curve of 15-30 degree at tip. This curved tip is called as Huber tip.
- Other needles which can be used for epidural are **Weiss**(winged) and **Crawford** (straight blunt bevel with no curve)

TECHNIQUE:

- Like spinal it can be given in sitting and lateral position
- Usually epidural space is encountered at 4-5 cms from skin and it has a negative pressure

METHODS TO LOCATE EPIDURAL SPACE:

- Most commonly technique is loss of resistance technique. Once the needle is in epidural space (i.e. it pierces ligamentum flavum) there is sudden loss of resistance.
- Other technique like hanging drop technique (Gutierrez's sign). If a drop of saline is place on the hub it will be sucked in.

- Once the needle is confirmed in epidural space, a test dose of 2-3 ml lignocaine with adrenaline is given and if in 5 minutes there is no evidence of either spinal block(inability to move foot) or intravascular injection (tachycardia by adrenaline),further dose can be given.
- Epidural catheter is passed through the needle.3-4 cm of catheter should be in epidural space.
- A micron filter is attached to catheter to prevent contamination
- Onset of effect takes place in 15-20 minutes.
- Successful block is assessed by:

  Absence of knee jerk (westphal`s sign)

  Absence of pain by pin prick.

  Site of action of local anaesthetics:

- Anterior and posterior nerve root
- Mixed spinal nerves

  DRUGS USED FOR EPIDURAL ANAESTHESIA:

- LIGNOCAINE:(with or without adrenaline)1-2% concentration is used. usually 2 -3 ml is required for blocking 1 segment, so normally 15 -20 ml drug is required.
- BUPIVACAINE: 0.125% TO 0.5% depending whether used for sensory block or motor block.
- ROPIVACAINE:0.1% -1%
- Levobupivacaine:(0.125%-0.75%)
- PRILOCAINE:2-3%
- OPIOIDS:

  (A) MORPHINE:4-6 mg(diluted in 10 ml saline)Onset within 30 minutes. Effect lasts for 12-16 hrs.
  (B)FENTANYL: 100 mg (diluted in10 ml of saline) onset within 10 minutes. Effect lasts for 2-3 hrs.

  (C)TRAMADOL

  ADVANTAGES OF EPIDURAL OPIOIDS

- Only sensory block is produced(while with local anaesthetics there is the chances of motor blockade if high concentration is used)
- The effect of single dose(especially morphine) lasts long(12-16 hrs)
- No sympathetic block

DISADVANTAGES:

1. Respiratory depression

2. Urinary retention
3. Pruritus
4. Nausea and vomiting
5. Sedation

FENTANYL + BUPIVACAINE as continuous infusion through epidural catheter is most commonly used combination for post operative analgesia and painless labour.

FACTORS AFFECTING THE SPREAD (LEVEL):

- Volume of the drug:most important factor
- Age:old require less dose because volume of epidural space is less
- Gravity (patient`s position) does not effect level too much as in case of spinal.
- Intra abdominal tumours, pregnancy, less dose arerequired.
- Speed of injection: increases the level(has no effect in spinal)the rate of inj should be 0.5ml/sec
- Taller individuals require more dose
- High concentration drug will spread higher.

COMPLICATIONS OF EPIDURAL ANAESTHESIA:

INADEQUATE (PATCHY) BLOCK:

Epidural space has numerous fibrous bands so drug may not be equally distributed.LS and S1 segments are most difficult to be blocked because of their large size.

HYPOTENSION;

Hypotension is less as compared to spinal because action of drug is slow in epidural so body gets time to compensate.

APNEA: with higher blocks

TOTAL SPINAL:

Itoccurs, if by mistake,Dura is punctured by needle or catheter during injection

ADVANTAGES:

- Less hypotension and less hemodynamicalterations. So it is better choice than spinal for cardiac patients.
- No spinal headache
- Level of block can be changed by giving top up doses through the epidural catheter.
- Any duration surgery can be performed by giving top up doses of continuous infusion.

DISADVANTAGES:

- Expensive
- Technically difficult
- Chances of block failure and patchy block are high.
- High incidence of epidural haematoma and intravascular injection
- Total spinal can occur if the needle pierces Dura.

3. CAUDAL ANAESTHESIA :

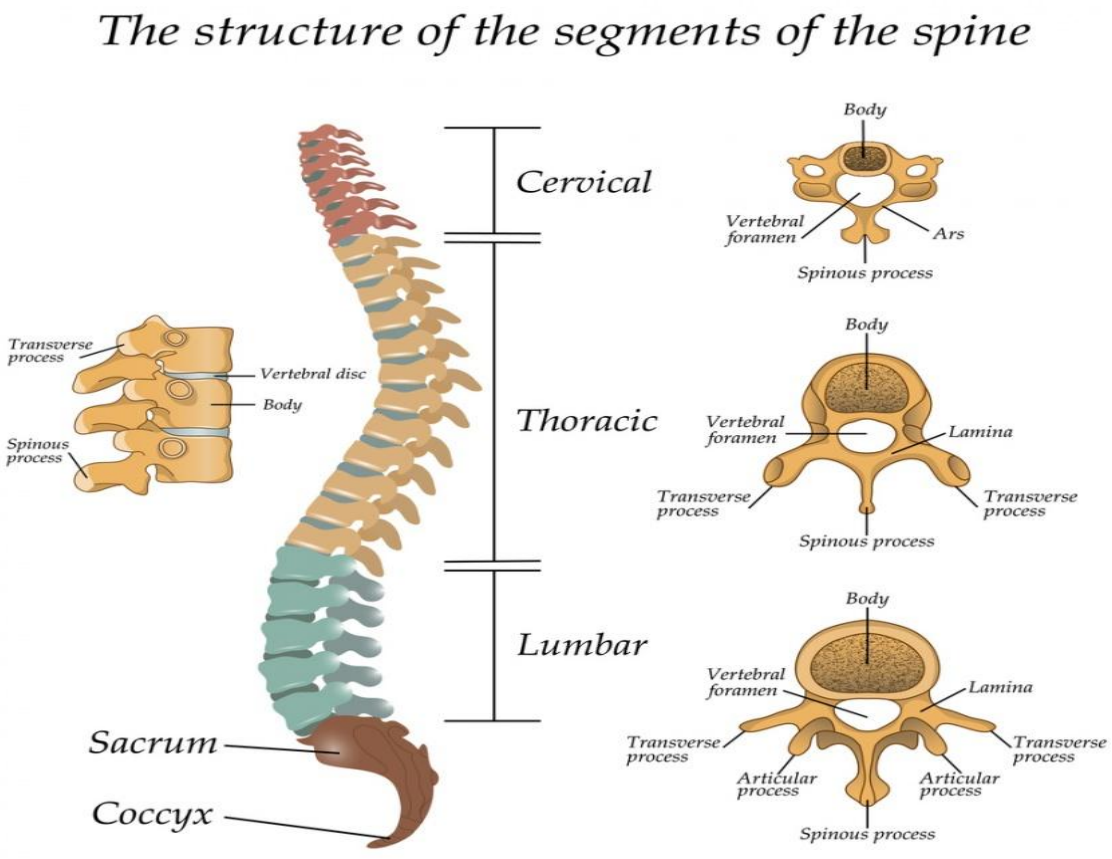
Anaesthesia produced by injection of local anaesthetic into the caudal canal,caudal anaesthesia is used to provide anaesthesia and analgesia(pain relief) below the umbilicus

Also known as caudal epidural anaesthesia

APPLIED ANATOMY:

5 sacral vertebrae fuse to form sacrum. The lamina of 5th sacral vertebrae (s0me time 4th also) fails to fuse posteriorly forming the sacral hiatus which is covered by sacrococcygeal membrane.

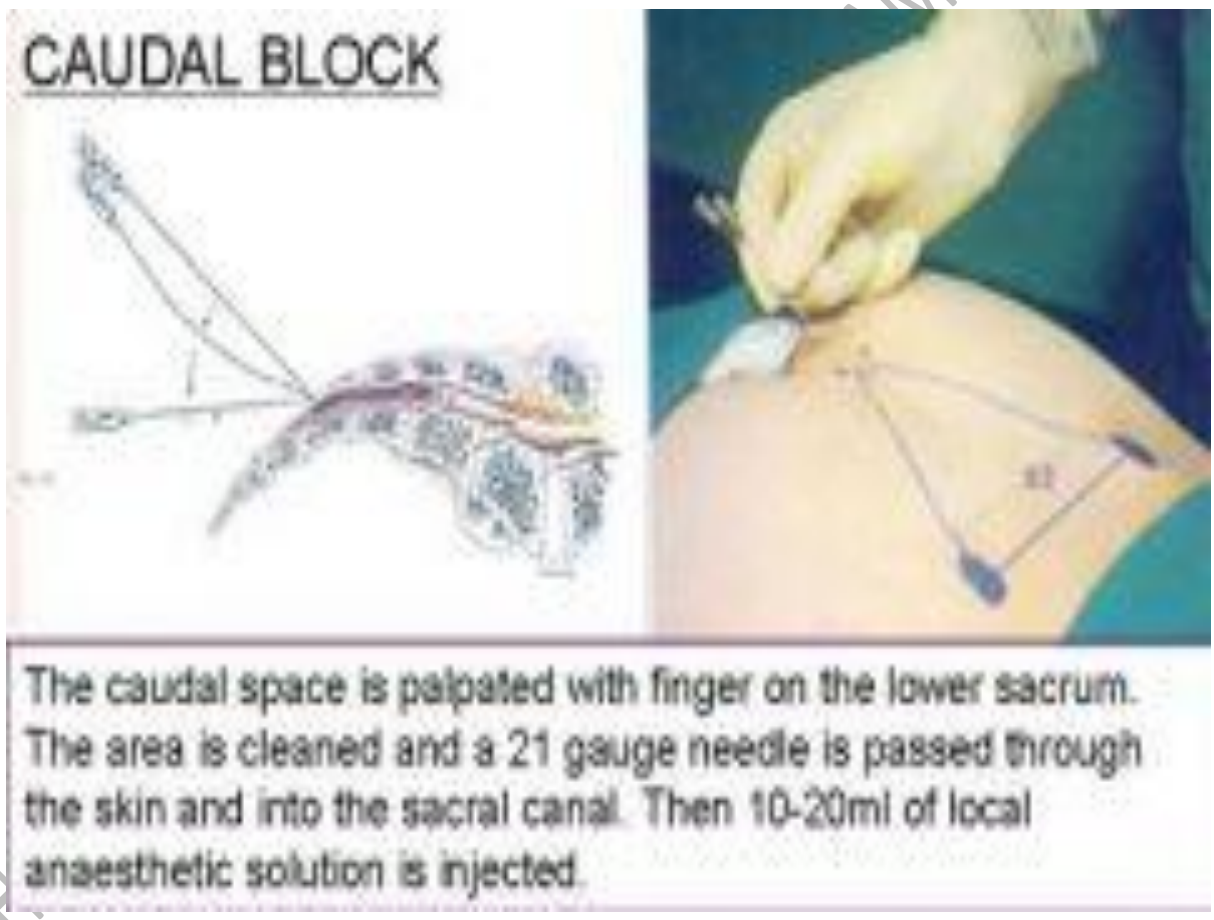
Sacral hiatus is absent in 10% of population

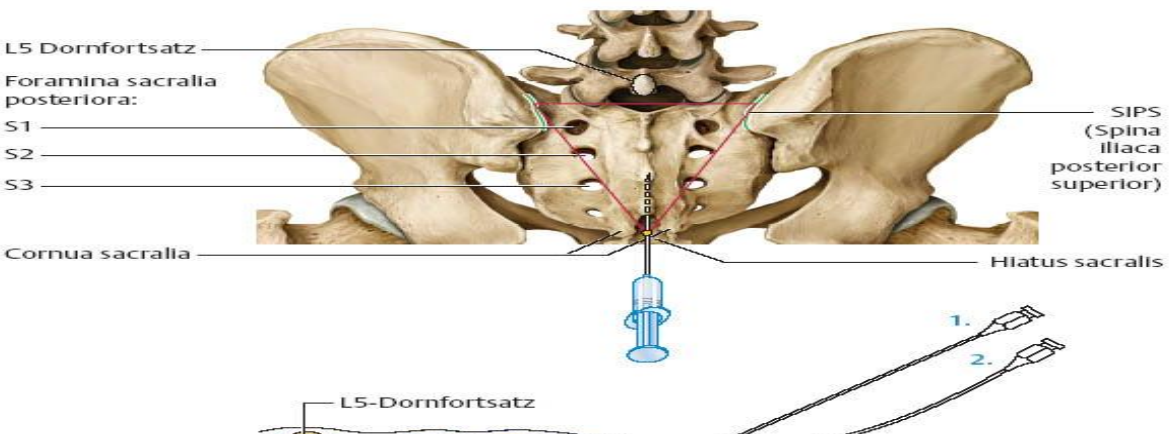


METHOD:

- Performed in lateral position with complete flexion or in prone position.
- Can be performed by simple hypodermic needle(20 or 22 gauge)
- Sacral canal is entered through sacral hiatus by piercing sacrococcygeal membrane and the drug is injected.
- Normally 12-15 ml of drug is injected
- **USES:**
- Mainly used in children for perianal surgeries, genitalsurgeries (like circumcision) urethral surgeries and for providing pain relief.

In children, it is easy to perform caudal block because sacral hiatus can be easily identified

- 



4. REGIONAL ANAESTHESIA:

- Regional anaesthesia is anaesthesia affecting only a large part of the body, such a limbs or the lower half of the body
- Regional anaesthesia can be divided into central and peripheral techniques

CENTRAL TECHNIQUE: includes spinal and epidural anaesthesia.

PERIPHERAL TECHNIQUE: it can further divided into plexus blocksuch as brachial plexus block and single nerve block.

- Regional anaesthesia can be performed as a single shot or with a continuous catheter through which medications is given over a prolonged period e.g. continuous peripheral nerve block.
- Regional anaesthesia can be provided by injecting local anaesthetics directly into the vein of an arm i.e. intravenous regional anaesthesia.

LOCAL ANAESTHESIA:

- Localanaesthesia is any technique to induce the absence of sensations in a specific part of the body
- Generally anaesthesia of a small part of the body such as tooth or an area of skin.
- Local anaesthesia refers to using a drug called an anaesthetic to temporary numb a small area of body.

TOPICAL ANAESTHESIA:

- A topical anaesthesia is a local anaesthetic that is used to numb the surface of the body part.
- They can be used to numb any area of the skin, inside of nose, ear or throat, the anus and the genital area
- Topical anaesthesia are available as creams,ointments,aerosols,sprays,lotions and jellies

USES :

- Used to relieve pain and itching caused by sunburn or other minor burns, insectbites, minor cuts and scratches
- Used in ophthalmology and optometry to the surface of the eye
- Used to numb the oral tissue before administrating the dental local anaesthesia.