



6- Acute Pain management

Objectives

- Defines the acute pain and calcification.
- Discuss the assessment of acute pain.
- Describe the management of acute pain.

Color Index:

- Main Text
- 41 Doctor's notes
- 39 Doctor's notes
- Reference

- Important
- Golden notes
- Extra

Editing file

Case discussion

Introduction to acute pain

Pain

- Definition: It's an unpleasant sensory and / or emotional experience associated with actual or potential tissue damage or described in terms of such damage."INTERNATIONAL ASSOCIATION OF STUDY OF PAIN 19793"
- Pain is subjective and difficult to quantify.
- The management of pain is a multidisciplinary team effort involving physicians, psychologists, nurses, and physical therapists.

Goal of pain treatment: Post operative pain

Improve quality of the patient life

Reduce morbidity and mortality.

Cost effective for both hospital and patients.

Facilitate rapid recovery & return to full function.

Allow early discharge from hospital.

Classification of pain:

According to pathophysiology	• Nociceptive: Due to activation and sensitization of peripheral nociceptors		• Neuropathic: Due to injury or acquired abnormalities of peripheral OR central nervous system	
According to etiology	Post operative pain		Cancer pain.	
According to duration Most important	Acute Less than 3 months		Chronic More than 3 months	
According to type of organ affected	Toothache	Earache	Headache	Low backache

Acute pain

Acute pain

- **Caused by noxious stimulation due to:** injury, a disease process or abnormal function of muscle or viscera.
- Usually associated with autonomic response as well (tachycardia, blood pressure, diaphoresis, pallor, mydriasis (pupil dilation)).
- It is nearly always nociceptive. It is easy to localize and limit the tissue damage. **can point the area of pain**.

Types of acute pain:

★ Important: possible exam question

Type	Somatic		Visceral	
Subtypes	Superficial Well localized pain	Deep	Visceral: True localized or Referred	Parietal: Localized or Referred
Origin	Nociceptive input from skin, subcutaneous tissue and mucous membranes	Arise from deep tissue like: Muscles, Tendons and Bones	Due to disease process, abnormal function of internal organ or its covering, e.g. Parietal pleura, Pericardium or Peritoneum.	
Nature of pain	<ul style="list-style-type: none"> • Well localized • Described as sharp, pricking, burning and throbbing 	<ul style="list-style-type: none"> • Dull aching and is less well localized It's well localized but when we compare it with the superficial pain it's less localized • Intensity and Duration of stimulus affects the degree of localization 	<ul style="list-style-type: none"> • Start Dull, diffuse and in midline then localize to the area affected. Ex: ptn with acute pain which started at midline then goes to the lower right > appendix • Frequently associated with abnormal sympathetic activity releasing all of the following chemical substances: norepinephrine histamine serotonin causing nausea, vomiting, sweating and changes in HR (tachycardia) & high BP. 	<ul style="list-style-type: none"> • Sharp, often described as stabbing sensation (Usually with breathing) • either localized to the area around the organ or referred to a distant site Ex: MI ptn may present with chest pain or shoulder pain or jaw pain <p>Both Somatic & Visceral pain travel along the same pathways. Pain stimuli arising from the viscera is perceived as somatic in origin. This can be confused by the brain and is often described as referred pain.</p>
Golden notes	-	Fractures = severe pain, rapid onset and has identical causal relationships	Visceral pain = severe ill defined associated with nausea and vomiting	

Acute pain

Systemic responses to acute pain:

Efferent limb of the pain pathway is: **sympathetic nervous system, and endocrine system.**



Cardiovascular

- Tachycardia.
- **Hypertension.**
- Increased systemic vascular resistance.

If the pt is ASA I then he will tolerate these changes but if he's ASA II or III then he may develop complications postoperatively due to tachycardia, HTN and high systemic vascular resistance which are: MI, ischemia, stroke and hemorrhage (hematoma)



Respiratory

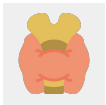
- Increased oxygen demand and consumption.
- Increased minute volume.
- Splinting and decreased chest excursion.
- Atelectasis, increased shunting, hypoxemia.
- Reduced vital capacity, retention of secretions and chest infection.



GI and urinary

- Increased sympathetic tone.
- Decreased motility, ileus and urinary retention.
- Hypersecretion of stomach.
- Increased chance of aspiration. Increase the chance of pneumonia
- Abdominal distension leads to decreased chest excursion.

closed sphincter will increase the abdominal pressure along with the stomach secretions which may cause aspiration > pneumonia



Endocrine

- Increase secretion of all stress hormones: Catecholamine, Cortisol & Glucagon.
- Decreased secretion of Insulin and testosterone.

If a patient is having diabetes this will lead to hyperglycemia, reduced immunity, prolonged healing period, higher infections rate & septicemia leading to prolonged hospital stay.



Hematological

- Increased platelet adhesiveness.
- Reduced fibrinolysis.
- Hypercoagulability.

A patient in pain who can't be mobilized out of his bed will have increased chance of getting DVT which in turn may get complicated with PE



Immune

- Leukocytosis.
- Lymphopenia.
- Depression of reticuloendothelial system.

any disturbance in the immune system will increase the chances of infection



General sense of well-being

- Anxiety, Sleep disturbances. Due to the pain
- Depression.

Acute and Chronic pain

Pattern of referred pain:

Lungs	T2 – T6
Heart	T1 – T4
Aorta	T1 – L2
Esophagus	T3 – T8
Pancreas & Spleen	T5 – T10
Stomach, liver and gall bladder	T6 – T9
Adrenals	T6 – L1
Small intestine	T6 – T9
Colon	T10 – L1
Ureters	T10 – T12
Uterus	T11 – T12
Bladder and prostate	S2 – S4
Urethra & Rectum	S2 – S4
Kidneys, Ovaries & Testis	T10 – L1

In case of heart attack referred pain can be felt in epigastric, left arm, left jaw, left shoulder or the back. And this is because of convergence of the nerves at the spinal cord level

- Acute pain plays a useful positive physiological role by providing a warning of tissue damage. So post op when you ask where the pain is the patient will point to it (pin-point it), Postoperative pain is a type of “Acute Pain”.

Chronic pain:

Chronic pain is defined as that which persists beyond the usual course of an acute disease or after a reasonable time for healing to occur. The new definition of chronic pain depends on the lesion and what type of surgery, if healing process exceeds the normal periods it's chronic.

Period varies between 6 or > months in most definitions. Mainly we give time for persistent postoperative pain 1-2 months, if it exceeds 3-6 months this will be considered as a chronic pain

Chronic pain may be nociceptive, neuropathic, or a combination of both.

They have prominent sleep and mood disturbances. Need psychiatric intervention

Patients with chronic pain often have an absent neuroendocrine stress response. Usually HR, BP and blood sugar will all be normal in chronic pain patient while the patient is feeling severe pain. Neural and endocrine systems will not give us a protective sign that the pain is present. That's why they label most of chronic pain patients as addictive while they're not.

Acute and Chronic pain

Acute pain	Chronic pain
Caused by external or internal injury or damage.	Uncoupled from the causative event
Can be easily located	Lasts longer than expected Becomes a disease in its own right
Its intensity correlates with the triggering stimulus	It's intensity no longer correlates with a causal stimulus
Has a distinct warning and protective function	Has lost its warning and protective function
	Is a special therapeutic challenge that requires interdisciplinary procedures

Factors to consider in choosing a pain scale

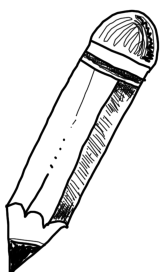
 **Age of patient**

 **Physical condition**

 **Level of consciousness**

 **Mental status**

 **Ability to communicate**

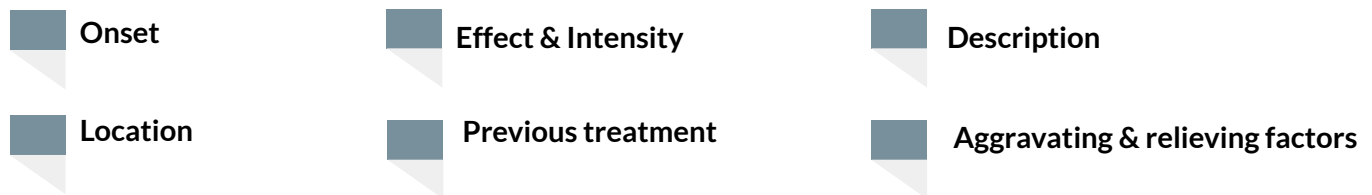


Doodle something

Acute and Chronic pain

Pain assessment

- Ask your patients about their pain; The postoperative patient might be a little bit sedated after the anesthesia and maybe in a severe pain so he will not tolerate to answer these questions



Measurement tools

- provide a valuable means of overcoming this problem.

1-Color scales & Faces scales

Children between 3-8 (age range is IMP)

- Usually have a word for pain
- Can articulate more detail about the presence and location of pain; less able to comment on quality or intensity



2-Visual analogue scale & Descriptive and Numerical intensity scale

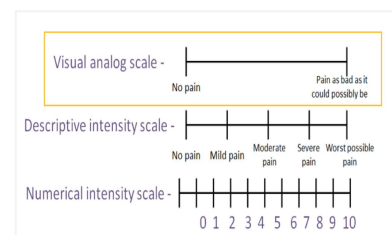
Children older than 8 and Adults

Use the standard visual analog scale

Ask the patient to rate their pain intensity on a scale of 0 to 10. Some patients are unable to do this with only verbal instructions, but may be able to look at a number scale and point to the number that describes the intensity of the pain.

Numerical intensity scale is the most commonly used, for Adults

0= no pain at all, 1-3= mild pain, 4-6= moderate pain, 7-9 = severe pain, 10= worst pain ever

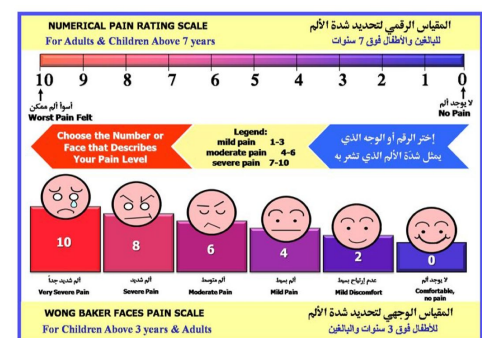


3-The WONG BAKER FACES scale

Used in pediatric and when there is a language barrier, this card is used here at KKHU.

We let the Pt choose which face represents his/her feeling.

- Ask patient to point to the faces that matches their feelings.
- The number used to record the score.
- Used in patients with language barriers or with kids.
- 0-No pain and 10-Severe pain.
- User friendly.
- Easy to explain to patient.
- Compact to carry
- Could be used as three scales because it combines:
- Facial expression.
- Numbers.
- Words.



4-FLACC scale (for neonates):

5- McGill Pain Questionnaire (widely used)

Scale from 0 to 5 From None to Severe Pain for children or adults who understand numerical relationships.

consists of three major measures

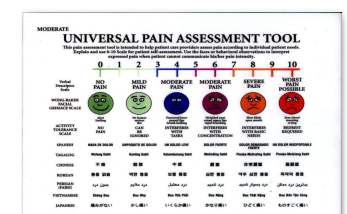
1- What Does Your Pain Feel Like?

2- How Does Your Pain Change with Time?

3- How Strong is Your Pain?

★ Important: possible exam question

Behavioral Observation Pain Rating Scale			
Categories	0	1	2
Face	No particular expression or smile; disinterested	Occasional grimace or frown, withdrawn	Frequent to constant frown, clenched jaw, quivering chin
Legs	No position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tensing	Arched, rigid, or jerking
Cry	No crying (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touchings, hugging	Difficult to console or comfort



Pain management

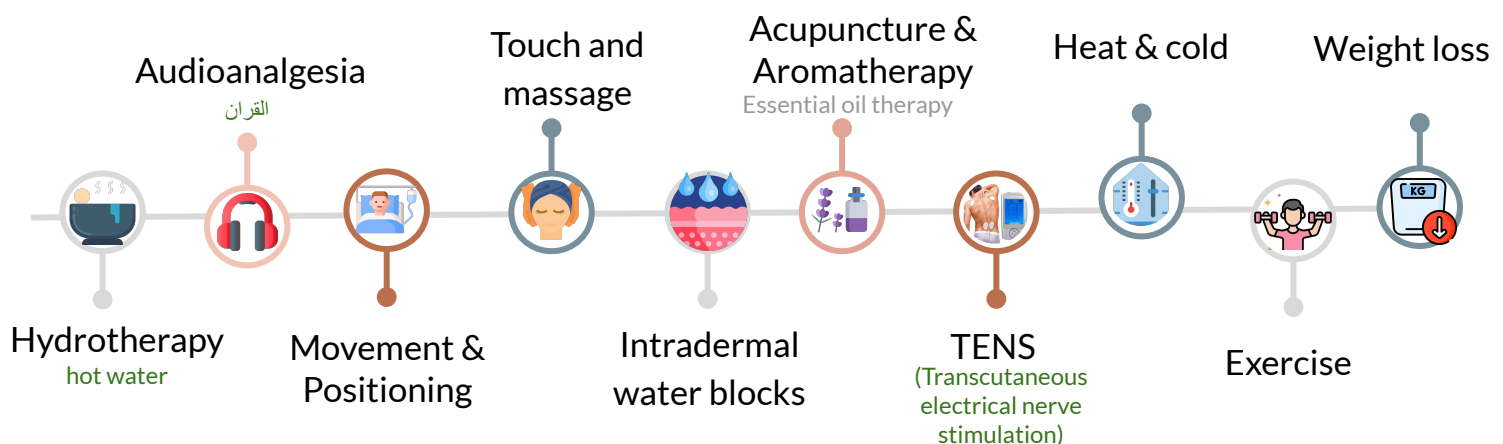
- Pain management continues to be a challenge.
- PCA (patient-controlled analgesia) & epidural analgesia are advances in analgesia that may assist nurse with this challenge.
- Pain management can be evaluated in terms of its ability to meet 2 main goals:
 - To relieve postoperative pain.
 - To relieve patient of inhibition of respiratory movement without sedation.

Pharmacology of pain management:

There are many different techniques, non-pharmacological & pharmacological, both **regional** and **non-regional** to provide **post op analgesia**.

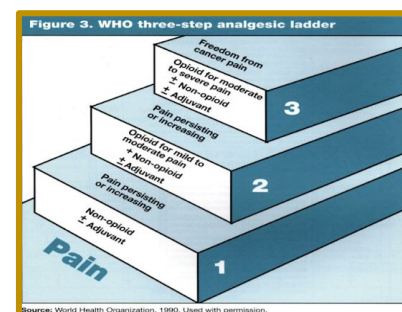
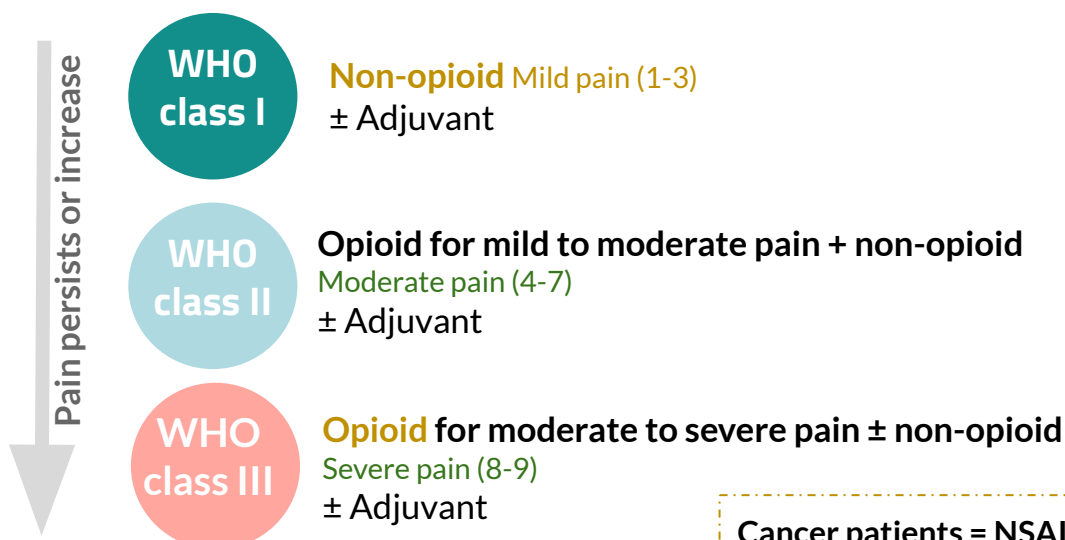
★ Important: possible exam question

1- Non Pharmacological approaches to relieve pain and prevent suffering:



2- Pharmacological: all of them are medications even the adjuvant therapy

WHO Ladder: an essential principle in using medications to manage pain and to individualize the regimen to the patient.



Cancer patients = NSAIDs + Opioid + Adjuvant

Pain management

Pharmacology of pain management:

	NON OPIOID	Weak Opioid	Strong Opioids
WHO classification	WHO Ladder I	WHO Ladder II	WHO Ladder III
Degree of pain	for mild pain	for moderate pain	for severe pain
Drugs	ASA Acetaminophen Paracetamol NSAIDs	Codeine, Hydrocodone, Oxycodone, Dihydrocodeine, Tramadol (Tramal).	Morphine Hydromorphone Methadone Pethidine Fentanyl Oxycodone
Adjuvant therapy	± Adjuvant	± Adjuvant	± Adjuvant

WHO Analgesic Guidelines

Oral medications whenever possible

Titrate the dose.

Dose “by the clock” – but always have “as needed” medications for breakthrough pain.

e.g., paracetamol is given every 6 or 8 hrs depending on the liver function tests, NSAIDs every 12 hrs

Use appropriate dosing intervals.

Be aware of relative potencies.

Treat side effects Common side effects of opioids: nausea and vomiting, constipation, respiratory depression, allergy from histamine release, hallucinations and over sedation and skin rashes(most common)

Pharmacological approach

- **Non-opioid:**
 - Acetaminophen, NSAIDs.
- **Opioid:**
 - Weak opioid: Tramal
 - Strong opioid: Morphine
- **Adjuvants therapy:** medication that can be used in any level of pain and help to lower it down
 - Anticonvulsant, Antidepressants, NMDA antagonists, Corticosteroids, Clonidine, Muscle relaxants, Local Anesthetics and Sedatives.

Pain management

Methods of acute post-op pain relief:

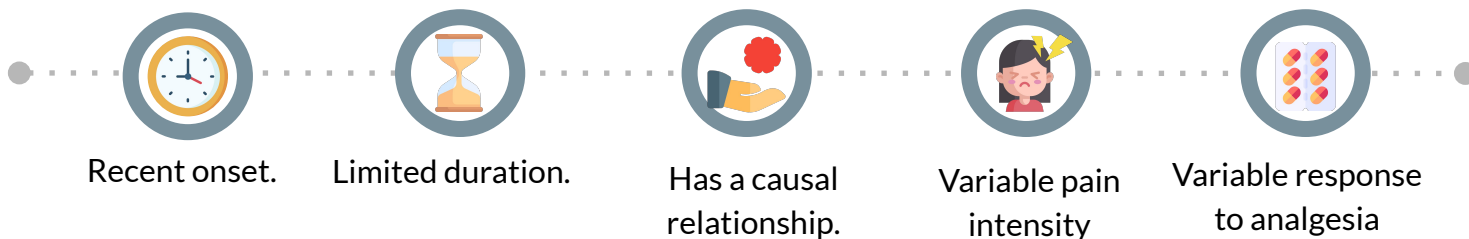
- Intramuscular
- Intravenous - Intermittent Bolus.
- Intravenous - Continuous Infusion (usually given in palliative treatment).
- **Patient Control Analgesia (PCA).**
- Epidural analgesia.
- Peripheral nerve block.

Infusion devices:

1. PCA (Patient Control Analgesia) the best

★ Important: possible exam question

Post-operative pain is a type of "Acute Pain":



PCA are modified infusion pumps (machine) that allow patients to **self administer** a small dose of **opioid** when pain is present, thus allowing patients to titrate their level of analgesia against the amount of pain they are experiencing. **Each time the patient presses it releases a small amount of morphine or fentanyl etc.. to control that pain. It could also be given as a continuous infusion.**

- PCA is based on the belief that patients are the best judges of their pain.
 - They should be allowed an active role in controlling their pain.
- That pain relief should be secured as quickly as possible.



Patient selection: ★ Important: possible exam question

- Patient should not be denied access to this modality simply because of age.
- Screen for cognitive and physical ability to manage their pain by using the PCA.
- Should have the understanding of pain relief, using the demand button and when to use the demand button.
- PCA not offered to confused patient, and those who become confused should have PCA discontinued.
- The same patient selection guidelines and consideration for the use of PCA apply to children.
- Important to remind parents and caregivers not to press the demand button..

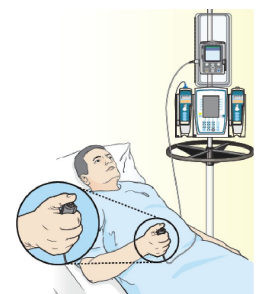


Figure 1. Using the PCA

Pain management

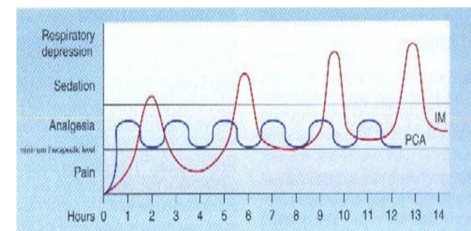
Patient control analgesia

The doctor read it fast and hinted to skip this paragraph

- PCA is well tolerated.
- Offer flexibility in dose size and dose interval in individual patients Usually we are using a standard parameter: 1 mg or 10 micro fentanyl in 6 minutes then we have to review our patient, if he is still in pain we can increase the dose or reduce the interval so the total amount per minute will be more. If the patient is over sedated or nauseated or complain of other adverse effects we can reduce the dose or prolong the interval.
- Therapeutic serum level can be reached relatively quickly because the drug is administered into the vascular system directly If it's administered intravenously it will reach the therapeutic serum level within 5 minutes while if it's administered intramuscularly, it will take (30 min -1 hr) while if it's administered orally, it will reach the therapeutic serum level after at least 1 hour .
- Patient can secure an early therapeutic serum level with loading doses titrated to individual pain needs.
- A steady state plasma level occurs because the elimination of the drug from the plasma is balanced by the patients self administered drug injection.
- PCA also eliminates the lag time between pain sensation and administration of analgesia.

IM vs IV PCA: Relationship of mode of delivery of analgesia to serum analgesic level

In IM doses the Patient will accumulate the drug in the body so Patient will enter into sedation > Respiratory distress Explanation: At 2h we will have a peak with little sedation, at 4h there is still some level but not enough to cover the pain so the patient will ask for another dose by this time. At 6h the patient will be given the same dose as he was given the first time (50mg or 100mg) with the previous accumulation the peak becomes higher. We have to consider patients with liver and kidney disease, they will have more accumulations and may develop adverse effects much sooner like respiratory depression. With PCA, There is usually a steady (balanced) plasma level due to small doses and intervals so the patient won't enter in sedation or RD it will be at analgesic level



What usually happens? Patient feels pain > calls the nurse > the nurse receives the order and screens > prepares the medications > given IM > drug is absorbed > patient is sedated but after 4h he will complain of pain once again and ask for the nurse (the cycle repeats) but with PCA the patient can just simply press the button

Benefits of PCA:

<ul style="list-style-type: none">• Decreased nursing time	<ul style="list-style-type: none">• Earlier ambulation.
<ul style="list-style-type: none">• Increased patient satisfaction, as PCA allows patient control over their pain.	<ul style="list-style-type: none">• Decreased overall pain scores reported by patients.
<ul style="list-style-type: none">• Used in a variety of medical and post-op surgical conditions.	<ul style="list-style-type: none">• Less anxiety & More autonomy regarding pain control
<ul style="list-style-type: none">• Decreased narcotic usage.	<ul style="list-style-type: none">• Increased compliance to post op care.
<ul style="list-style-type: none">• Decreased level of sedation.	<ul style="list-style-type: none">• Less anxiety & More autonomy regarding pain control

Pain management

Infusion devices: The doctor skipped the epidural because we will take it in other lecture

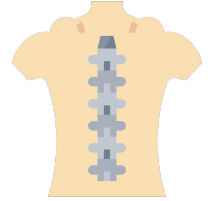
2. Epidural Anesthesia:

- EPIDURAL = administration of medication into epidural space.
- INTRATHECAL (spinal) = administration of medication into subarachnoid space.

OVERVIEW OF THE SPINAL ANATOMY:¹

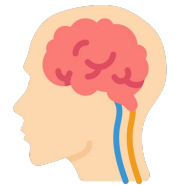
Spinal cord

- Located and protected within vertebral column
- Extends from the foramen magnum to lower border of L1 (adult) S2 (kids)
- SC taper to a fibrous band (conus medullaris)²
- Nerve root continue beyond the conus (cauda equina)²
- Surrounded by the meninges (dura, arachnoid & pia mater.)²








Epidural space: can be analgesic and anesthetic

- Potential space between the dura mater and ligamentum flavum
- Made up of vasculature, nerves, fat and lymphatic
- Extends from foramen magnum to the sacrococcygeal ligament



Benefits of epidural anesthesia:

-  Better pain control
-  Earlier ambulation
-  Improved Pulmonary Mechanics
-  Faster return of bowel function³
-  Decreased incidence of DVT³

Indications	Contraindications
<p>The objective of epidural analgesia is to relieve pain.</p> <ul style="list-style-type: none">-Major surgery-Trauma (#fractured ribs),-Palliative care (intractable pain),-Labour and Delivery⁴.- If patient can't tolerate GA	<p>Absolute:</p> <ul style="list-style-type: none">- Patient refusal- Infection/abscess near the injection site- Coagulation disorder- Spinal deformity⁵- increased ICP- Sepsis, severe Hypovolemia and hypotension- Known allergy to opioid or local anesthetic

1- Spinal anesthesia is anesthetic only, but epidural is anesthetic and analgesic according to the concentration and dosage of the medication that we used.

2- Dr said it's not that important

3- Because of the sympathetic block and parasympathetic stimulation.

4- For analgesia & anesthesia in case of C-section

5- Considered as a relative C.I. as it depends on the anesthetic expertise as well

Epidural anesthesia

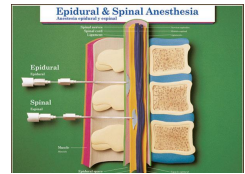
Insertion of epidural catheter ¹:

Step 1

Positioning of patient:

Patient assume a sitting or side-lying position with the back arched toward the physician.

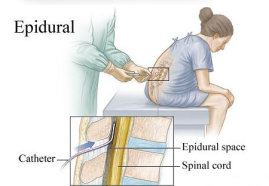
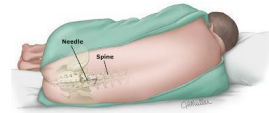
- This helps to spread the vertebrae apart



Step 2

The site is dependent upon the area of pain.

Height of sensory block: **Lumbar-T4, Thoracic-T2**



Step 3

Fixing the catheter:

We can use epidural anywhere not only under the umbilicus unlike spinal anesthesia

Incision:	Thoracic	Upper abdomen	Lower abdomen	Pelvic	Lower extremity
Level:	T4-T6	T6-T8	T8-T10	T8-T10	L1-L4

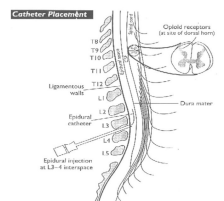


Hanging drop technique

During spinal anesthesia the landmark is to see the CSF running through freely, while in epidural we will use negative pressure or loss of resistance technique (using air or normal saline) to determine when we reach the epidural space. Another technique can be used called the technique of hanging drop during this technique the dr will keep one drop at the end of the tuohy needle then he will insert it and because of the negative pressure inside the epidural space this hanging drop will be sucked in once he enter the epidural space

Epidural catheters:

- Ideal Placement (adult) **10-12 cm** at the skin
- Epidural catheters have markings that indicate their length.
- usually 18 gauge marked needles whereas spinal is 27-29 gauge, we use thinner needles in spinal to avoid CSF leakage



There is a mark at the **tip** of the catheter,

The 1st single markup the catheter is **5cm**.

Double mark up the catheter is **10 cm**.

Triple mark on the catheter is **15 cm**.

Four marks together indicate **20cm**.



Epidural anesthesia

Epidural catheters:

→ A change in depth of the catheter indicates migration either into or out of the epidural space:



Catheter migration into a blood vessel in the epidural space or subarachnoid space

It causes toxicity or total spinal anesthesia

- Rapid onset LOC
- Decrease/loss of sensory or motor loss (marcain)
- Toxicity (LAST)
- Profound hypotension



Catheter migration out of the epidural space

causes bulge at the skin due to accumulation of drug at out of epidural space

- ineffective analgesia
- no analgesia
- drugs deposited into soft tissue.

Commonly used medications:

Opioids:

Fentanyl + Morphine: affect the pain transmission at the opioid receptors.

Local anesthesia (L.A.):

Bupivacaine (marcaine): inhibits the pain impulse transmission in the nerves with which it comes in contact.

Methods Of Administration:

• **Bolus** (Fentanyl, Duramorph).

• **Continuous Infusion** (Marcaine+Fentanyl).

All drugs administered epidural should be preservative free.

All epidural opioids should be diluted with normal saline prior to intermittent bolus administration.

Assessment of the block (FYI):

Motor Assessment

- Bromage Score



Bromage 3 (complete)

Unable to move feet or knees



Bromage 2 (almost complete)

Able to move feet only



Bromage 1 (partial)

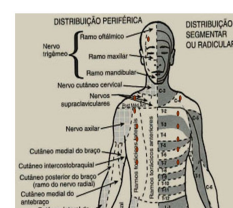
Just able to move knees



Bromage 0 (none)


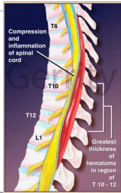
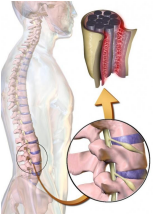
Sensory assessment:

- Use **ice** in the tip of a glove
- Start in **upper neck** and move **down** the **thorax** bilaterally, assessing all potential dermatomes
- Level of block is where intensity of cold changes or the cold sensation is absent
- assess the dermatomes **below the pelvis**



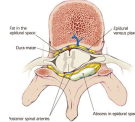
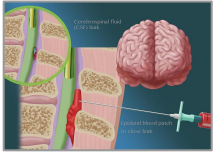
Epidural anesthesia

Complications of epidural anesthesia

Complication	Overview	Treatment
Bradycardia	Incidence: 10%	IV atropine
Hypotension	<ul style="list-style-type: none">• Most common complication• Due to sympathetic blockade	Head low position (15 degree) A. Fluids B. Ephedrine (vasopressor) C. Oxygen inhalation Prophylactic : preloading with 1-1.5 of crystalloid
Nausea & vomiting	Due to hypotension causing central hypoxia	<ul style="list-style-type: none">• Treat hypotension• Oxygenation• Antiemetic
Respiratory paralysis (apnea)	Usually because of severe hypotension leading to medullary ischemia or due to high or total spinal	Immediate Intermittent positive pressure ventilation (IPPV) is a technique used to provide short term ventilation via mouthpiece for the purpose of augmenting lung expansion 
Urinary retention	<ul style="list-style-type: none">• Most common postoperative complications• Due to blockade os S2,3,4	Catheterization
Epidural hematoma (traumatic spinal)	Can result in <ul style="list-style-type: none">• Spinal cord ischemia• Paraplegia• Anterior spinal artery syndrome Is an incomplete cord syndrome that predominantly affects the anterior 2/3 of the spinal cord, characteristically resulting in motor paralysis below the level of the lesion as well as the loss of pain & temperature at and below the level of the lesion• Before we get the Pt into anesthesia we first check if he/she is in an anticoagulant drugs or has coagulopathy to decrease the risk of hematoma 	
High spinal or total spinal ³	<ul style="list-style-type: none">• High spinal: spinal above the desired level causing problems to the patient• Total or very high spinal: too high spinal (above cervical) Happens when the epidural needle accidentally puncture the dura and enter the intrathecal space, treated as an ABC approach	Depend on the level of block 
Chronic adhesive arachnoiditis	Inflammatory insult to the arachnoid layer of the meninges that leads to fibrosis. As a sequel, the arachnoid becomes abnormally thick and adherent to the surrounding layers of pia and dura mater	

Epidural anesthesia

Complications of epidural anesthesia

Complication	Overview	Treatment
Inadequate (patchy) block	<ul style="list-style-type: none"> Numerous fibrous bands in epidural space, so drug may not be equally distributed When we use the air to perform loss of resistance technique, sometimes it will enter the epidural space and form bubble inside which will block the anesthetic from reaching everywhere L5 & S1 segment are the most difficult to be blocked because of their large space 	
Epidural abscess	<p>When the patient is immunocompromised or the doctor who performed the procedure was unsterile</p> 	Neurosurgical intervention
Post Dural spinal headache	<ul style="list-style-type: none"> Low pressure due to seepage of CSF from hole created by spinal needle change hemodynamic of CSF Incidence decreased due to use of smaller gauge needle Clinical features: <ul style="list-style-type: none"> present after 12-24 hrs occipital but can be frontal Maybe associated with neck stiffness Pain increase on sitting, relieved on lying down 	<p>-Conservative: by giving fluids, caffeine, lying supine, paracetamol or ibuprofen, abdominal strap.</p> <p>-Epidural blood patch</p> 
Bloody tap	Usually occurs due to puncture of the epidural vein	Withdrawn and retained
Cauda equina syndrome	<ul style="list-style-type: none"> Due to direct injury to nerve fibers by trauma or by LA Usually seen with continuous spinal with small bore catheters Clinical features: <ul style="list-style-type: none"> Retention of urine Incontinence of urine Loss of sexual function Loss of sensation of perineal region 	
Cardiac arrest	<p>Causes:</p> <ul style="list-style-type: none"> Severe hypotension Total spinal/ very high spinal Local LA toxicity/ anaphylaxis 	Immediate start CPR
Local anesthetic systemic toxicity LAST	<p>Causes: intravascular injection and exceeding maximum safe dose</p> <p>Sx:</p> <ul style="list-style-type: none"> Tachycardia & HTN Wide QRS Tonic clonic seizure VF & cardiac arrest 	Stop the infusion

438 Notes (Dr Saleh):

Definition of pain:

The current International Association for the Study of Pain (IASP) defined pain as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage"

Components of pain:

1. Sensory: involvement of sensory nerve by trauma/injury
2. Emotional: emotional factors lead to underestimation (e.g. stress induced analgesia) or overestimation of pain
3. Actual tissue damage
4. Potential tissue damage: pathophysiological changes causing pain (e.g. migraine, spasms)

Classifications of pain:

1. According to duration
 - **Acute (post-operative pain):** pain of recent onset (few days or few hours) for limited duration proportional to the duration of injury (mild injury = few hours, moderate injury = few days, severe injury= one week to one month) not associated with nausea or vomiting.
 - Subacute: pain persisting for few days to few weeks after subsiding of procedure (e.g. c section pain)
 - Chronic pain: pain that persists after complete tissue healing.
1. According to pathophysiology
 - **Musculoskeletal** (AKA somatic, nociceptive): pain due to damage of soft tissue or bone or muscles. Pain is: sharp well localized, not referred, not associated with nausea or vomiting or haemodynamic changes and no sensory changes.
 - **Visceral pain** (e.g. MI, pelvic pain, liver, gallbladder, appendicitis): pain is colicky, poorly localized, referred, associated with nausea, vomiting and haemodynamic changes, but not sensory changes.
 - Neuropathic pain (of peripheral or central nervous system origin): **the only pain associated with sensory change** (e.g. diabetic neuropathy, trigeminal neuralgia)
 - Pain can also be mixed (2 or all 3 types together)

Assessment of pain:

- Unidimensional: numerical (mild: 1-3, moderate: 4-6, severe: 7-10), visual (**face expression - used for pediatric patients and patients with language barrier**),
- Multidimensional.

MCQs from the doctor (438)

Question 1: At what time frame following the postsurgical period does persistent postsurgical pain become defined as being “chronic pain”?

- A. 1 to 2 weeks
- B. 3 to 4 weeks
- C. 1 to 2 months
- D. 6 to 12 months

Question 2: Regarding the treatment of neuropathic pain, the correct statement is:

- A. Narcotics are the most effective and “FIRST-LINE” treatment option.
- B. It is optimally treated with multimodal therapy.
- C. Sympathetic blockade will eliminate all neuropathic pain.
- D. Spinal cord stimulator is not an effective therapy.

Question 3: End result of the surgical stress response include all of the following, except:

- A. Hyperglycemia.
- B. Poor wound healing.
- C. Positive nitrogen balance.
- D. Impaired immunocompetence.

Question 4: The circulating levels of which of the following hormones is not increased post operatively?

- A. Insulin.
- B. Glucagon.
- C. Antidiuretic hormone.
- D. Growth hormone.
- E. Cortisol.

Question 5: Which of the following is the earliest sign of Lidocaine toxicity from a high blood level ?

- A. Shivering.
- B. Nystagmus.
- C. Lightheadedness and dizziness.
- D. Tonic-clonic seizures.

Question 6: Which of the following concentrations of epinephrine corresponds to a 1:200,000 mixture?

- A. 0.5 MG/ML
- B. 5 MG/ML
- C. 50MG/ML
- D. 0.5 MG/ML

Explanation of answer for question 6= 1:200,000 MEANS 1 G/200,000 ML = 1000 MG/200,000 ML = 1 MG/200 ML = 1000 MG/200 ML = 10 MG/2 ML = 5 MG/ML

Question 7: The “snap” felt just before entering the epidural space represents passage through which ligament?

- A. Posterior longitudinal ligament.
- B. Ligamentum flavum.
- C. Supraspinous ligament.
- D. Intraspinal ligament

MCQs from the doctor (438)

Question 8: Neuropathic pain:

- A. Pain of central origin can be because of direct insult to nociceptive pathways.
- B. Complete lesion of dorsal roots causes severe neuropathic pain.
- C. Neuropathic pain due to injury to pns is more well characterised than due to central cause.
- D. Inflammatory pain is not associated with tactile allodynia, heat/cold hyperalgesia and spontaneous pain unlike neuropathic pain.

Question 9: Visual analogue scale (VAS):

- A. Consists of a 10 cm horizontal or vertical line with end points as “no pain” or “worst ever pain”.
- B. Has no major advantage over NRS (numerical rating scale) and VRS (verbal rating scale).
- C. Was developed to measure pain in pediatric age group patient.
- D. Standard VAS has no limitations.

Question 10: Pain in children?

- A. Vas can be reliably used in children >3 years of age.
- B. Wong_bakerface scale is designed to measure pain intensity in children aged 3–10 years.
- C. Girls >8 are more likely to complete pain diaries than boys for similar age group.
- D. Touching the affected area of painful stimulus can be seen as early as 2 years of age.

Question 11: Complications of opioids:

- A. Pruritus is seen more via oral route
- B. Pruritus is because of histamine release.
- C. Fentanyl does not have active metabolites so it causes more sedation.
- D. Respiratory depression may be delayed for as much as 48 h after neuraxial administration.

Question 12: During epidural placement using a midline approach, the epidural needle penetrate all the following anatomical layer, except:

- A. Ligamentum flavum
- B. Subarachnoid membrane
- C. Supraspinous ligament
- D. Intraspinal ligament

Question 13: The correct statement for human neuraxial anatomy is:

- A. Adult spinal cord ends at L2
- B. Spinal cord in children ends at L3
- C. The dural sac and subarachnoid space in adults end at S1
- D. The dural sac and subarachnoid space in children end at S2

Question 14: The principal site of action of local anesthesia placed into the epidural space is the:

- A. Spinal cord
- B. Nerve roots
- C. Epidural space
- D. Subarachnoid space

438 Notes (Dr Saleh):

Management of pain (pharmacological or regional):

Using analgesic ladder system:

- **Mild pain:** simple analgesia:
 - Paracetamol: has antipyretic properties
 - **NSAIDs** (e.g. voltaren): have anti-inflammatory properties. Side effects: Gastric, renal, coagulopathy (all due to inhibition of prostaglandins). NSAIDs contraindications: gastric, renal, bleeding tendencies (or procedures with major blood loss such as total hip replacement)
 - Don't give 2 NSAIDs together or by 2 different routes because they have ceiling effect (but you can give NSAID with paracetamol), and don't increase the dose if the initial dose is ineffective due to the ceiling effect -increasing the dose will increase the side effects without increasing the efficacy- (just go for a stronger analgesic).
- **Moderate pain:** simple analgesia + weak opioids (e.g. propoxyphene, tramadol, codeine)
 - propoxyphene - not used anymore due to cardiac side effects
 - Codeine is the best but it only comes oral and with paracetamol because it is a pro-drug.
- **Severe pain:** strong opioid, all administered in IV route:
 - Fentanyl
 - Morphine: pure agonist
 - Oxycodone
 - Pethidine: lowest incidence of respiratory depression but highest incidence of addiction, if you give it for 4-5 days and the patient becomes addicted, so it is better to avoid them (it has been removed from all international pain management guidelines).
- **All the steps are +/- adjuvant, examples of adjuvants :**
 - Anxiolytic if patient is anxious
 - Sedative/hypnotic if the patient has a strong emotional factor, unable to sleep.
 - Antispasmodic if the patient has visceral pain.
- **Addiction:** happens ONLY with strong opioids and has four components:
 - physical or psychological dependence
 - Drug seeking behavior
 - Pain relief with agonists
 - Pain aggravated with antagonist

Any dependence on other pain medications is only physical (stopping the drug causes physical symptoms such as tachycardia, hypertension or sleep disturbances) or psychological, not actual addiction.

439 Lecture Quiz

Question 1: Patients vary greatly in their requirement for postoperative analgesia. What is the best way to assess adequacy of pain relief?

- A. Measure the degree of tachycardia.
- B. Ask the patient to measure the pain.
- C. Assess the level of hypertension.
- D. Look for tachypnoea.
- E. Examine for wound splinting.

Question 2: Which of the following is associated with too much analgesia?

- A. Hypocarbia
- B. Agitation
- C. Depression of conscious level
- D. Deep vein thrombosis
- E. Small tidal volumes.

Question 3: Nonsteroidal anti-inflammatory drugs (NSAIDs) are often used as part of “multimodal” analgesic therapy; some of the potential advantages include all of the following, except:

- A. Decreases opioid requirements
- B. Can decrease postoperative pain intensity
- C. Indirect effect of decreasing opioid-related side effects
- D. Can improve wound healing

Question 4: A 67-year-old patient has had a total knee replacement. He is on morphine PCA for the management of postoperative pain. He has received a total of 40mg morphine in the recovery area and you are worried that he may develop an opioid overdose. Which of the following is the earliest sign of opioid overdose?

- A. Respiratory rate less than 8 per minute
- B. A fall in oxygen saturation
- C. Rapid shallow breathing
- D. Progressive rise in sedation level
- E. Uncontrolled vomiting

Question 5: A 62-year-old female patient is scheduled for right hip hemi-arthroplasty. She has a history of angina, hypertension, and chronic obstructive airway disease. She has been on home oxygen 2L/minute, 4-6 hours per day, for the last 6 months. Which one of the following conditions would be an absolute contraindication to spinal anaesthesia in this patient?

- A. Presence of urinary tract infection
- B. History of spina bifida occulta
- C. Previous spinal decompression at the L5-S1 level
- D. History of multiple sclerosis
- E. Patient refusal

Key Answers: 1- B/ 2-C / 3-D / 4-D/ 5-E



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