



Welcome back!

This is chapter 3.

On pain management: Which is super important:

- unrelieved pain leads to numerous:
 - increases sympathetic outflow and PVR
 - \wedge myocardial oxygen demand & \wedge CO₂ production
 - \wedge coagulability
 - decreases gastric motility and immune function

These are the questions we'll be answering for this chapter:

1. Describe the steps in the afferent pain pathway?
2. Differentiate between acute and chronic pain?
3. List options for pain management at various steps in pain perception?
4. Describe the different methods of assessing pain for all ages?
5. List 4 side effects of NSAIDs, what factors increase risk of GI bleeding?
6. What is the mechanism of action of local anesthetics? What are the two classes?
7. What is the toxic dose of Lidocaine and bupivacaine? What are expected toxicities? How are they treated?
8. List 6 techniques for reducing pain of injection of local anesthetic.
9. List one topical anesthetic for intact skin, mucous membranes, and open skin
10. What is the dose of sucrose in a neonate for anesthesia?

1. Describe the steps in the afferent pain pathway

- a sensory input enters the dorsal root ganglion (visceral, muscle, bone, cutaneous) and **CROSSES** over before ascending the brainstem at which point it enters the thalamus and is interpreted by the cortex
 - remember that position and vibration sensation remain **IPSI**LATERAL
- **pain modulation** involves:
 - nociceptors,
 - inflammatory mediators (substance P)
 - AND can lead to chronic central and cognitive sensitization
 - which is affected by opiates at the Mu receptors and norepinephrine
 - as well as
 - emotions,
 - experience,
 - past exposure to pain,
 - and mood!
- the endorphin system modulates responses to pain and stress by producing three types of opioids (Mu, delta, K Δ) that have analgesic effects and modulate against stress : this is diminished by chronic pain and supplementary opiates
- **BOTTOM** line: the pain pathway is complex



2. Differentiate between acute and chronic pain

- “prolonged pain that lasts beyond the ordinary duration of time that an insult or injury to the body needs to heal”
- definitions range from: > 3 - 6 months of persistent pain not directly related to malignancy

chronic pain leads to a prolonged stress response which negatively affects the rest of the body.

- limits the activities that may improve healing
- psychological effects are profound

3. Describe your pain assessment tool for all ages from neonates to geriatrics

- infant: FLACC scale
 - face legs activity cry and consolability score 0-10
- infant - preschool
 - FACES scale
- verbal children - up to 11 yrs
 - visual analog
- > 11 yrs
 - numerical rating scale
 - descriptive scale
- adults
 - NRS-numerical rating scale
- elderly - or non verbal children
 - behaviour observation scales
 - Non verbal cues
 - vocalizations
 - movement
 - atypical features

4. List 8 options for pain management at various steps in pain perception

- See Figure 3-6
 - We need to treat pain in multiple different points:
 - try to visualize the path of a painful stimulus through the nervous system,
 - there are at least four points that we can address when treating pain:
 - **1) Pain detection**
 - local anesthetics/nerve blocks, topical NSAIDS - which decrease nociceptor stimulation
 - **2) Pain transmission**
 - opiates, tylenol, gabapentin, TCA
 - **3) Pain expression**
 - narcotics, benzo's, antipsychotics,
 - sedatives, NO,
 - **4) pain modulation**
 - TENS
 - Massage,
 - acupuncture
 - distraction



- hypnosis

9) List 4 side effects of NSAIDS, what factors increase risk of GI bleeding + RF?

- GI bleeding, renal failure, anaphylaxis/TENS/SJS, platelet dysfunction
- people at highest risk for NSAID-associated reactions/complications:
 - dehydration, hypovolemia, impaired renal fxn
 - Liver disease, renal disease, on ACEI or ARBs,
 - elders,
 - Asthmatics
 - women in the 3rd trimester (closure of ductus arteriosus)
 - people with hx of PUD or GI bleeding
 - those taking warfarin

11) What is the mechanism of action of local anesthetics?

mech. of action

- more effective in unmyelinated fibers
 - therefore block sensory neurons, without affecting motor neurons
- reversibly block Na channels of the lipid membrane thereby blocking depolarization
- the ionized form is what penetrates the lipid axon membrane (this is limited in acidic environments such as abscesses)

What are the two classes?

classes of local anesthetics

- Esters
 - procaine, tetracaine
 - unstable in solution
 - destroyed by plasma enzymes
- Amides
 - lidocaine, mepivacaine, bupivacaine, etc.
 - destroyed by enzymes in the liver

***12) What is the toxic dose of Lidocaine and bupivacaine?**

- toxic doses:
 - Lidocaine: 3-5 mg/kg / with epi: 7 mg/kg (double safe dose)
 - Mepivacaine: 8 mg/kg / with epi: 7 mg/kg (same as safe dose ?no clue why?)
 - Bupivacaine: 1.5 mg/kg / with epi: 3 mg/kg
 - not recommended in kids <12 yrs, or for intravenous analgesia
 - MORE cardiotoxic

What are expected toxicities?

local toxicity

- mostly due to the added local vasoconstrictor added to the local anesthetic



- epi mantra : avoid in penis, nose, fingers, toes.....not a lot of evidence for this

systemic toxicity

- occurs when enough exists in the body to produce sodium channel blockade in the **brain and heart**
- progressive symptoms:
 - think
 - *“lippster talks so much your headache rings in your ears and you go crazy, confused, start seizing and die”*
 - circumoral paresthesias /> dysarthria /> lightheadedness /> headache /> tinnitus /> decreased level of consciousness > confusion > seizures > coma > cardiac arrest/collapse

How are they treated?

- local toxicity
 - Therapy for extravasation (eg, warm compresses, phentolamine, nitroglycerin cream) should be initiated for localized vascular toxicity.
 - usually just wait it out
- systemic toxicity:
 - benzo's for seizures
 - ACLS guidelines
 - at high risk for cardiac arrest
 - maybe lipid emulsion
 - Lipid emulsion therapy is performed with a 20% solution.^[7] First, administer a bolus of 1.5 mL/kg over 1 minute.^[26, 6, 27, 1] Then convert to an infusion at a rate of 0.25 mL/kg/min for 20 minutes,^[6] 30-60 minutes,^[26] or until hemodynamic stability is restored.^[27] Once the patient attains hemodynamic stability, the infusion should be continued for at least 10 minutes longer.^[1]

from: <http://emedicine.medscape.com/article/1844551-treatment#d12>

13) List 6 techniques for reducing pain of injection of local anesthetic.

- buffering 1 ml of bicarbonate to 10 ml of lidocaine (1:10)
- *slowly injecting the anesthetic*
- *injection through the edges of the laceration*
- *warming the anesthetic*
- *application of topical anesthetic first*
- *counter irritation with pinching or distraction*

***14) List one topical anesthetic for intact skin, mucous membranes, and open skin**

- Intact: EMLA patch
 - contains 2 amide-type anesthetics for numbing a small area, [lidocaine](#) and prilocaine. It is used on normal, unbroken [skin](#) to prevent pain before certain procedures such as inserting a needle for injections or drawing [blood](#).
- MM: 2-4% lidocaine
- Open skin: LAT or LET
 - then don't contain any anesthetics that cause methemoglobinemia

15) What is the dose of sucrose in a neonate for anesthesia?



2-10 ml of 24% solution

Wise cracks corner:

- NSAID ceiling effect discussion
 - no benefit to increasing doses of ketorolac or ibuprofen for PAIN (there is a second higher anti-inflammatory ceiling effect).
 - NSAIDS at risk for severe GI side effects
 - ketorolac (24) >>> indomethacin (~3) > naproxen (2) > diclofenac > ibuprofen
 - 60 mg of ketorolac IM is not superior to 800 mg PO ibuprofen!!!
 - 400 mg ibuprofen = 800 mg ibuprofen!!
 - 15 mg ketorolac = 30 mg ketorolac
- Make sure kids get prescribed the proper dose (many kids are underdosed on their analgesics) - or try topical lido. for acute OM
- Don't forget about the many intranasal options. which can be looked up:
 - e.g. IN fentanyl at 1.5-2 mcg/kg
- ***a reported allergy to anesthetics is usually to the Preservatives used.***
 - true allergy is VERY rare
 - **PEARL**: in true allergies to amides, diphenhydramine may be used as a local nerve block
 - 50 mg/ml diluted to 5-10 ml
- Check out Rob Orman's podcast on Chronic pain: <http://blog.ercast.org/chronic-pain/>
- Check out my rounds talk on Kids in pain that we can post on our website.