Diagnosis Sheet no.: 6

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Local Anesthesia

Definitions:

Local anesthesia:

A loss of sensation in circumscribed (localized) area of the body caused by a depression of excitation in nerve endings or inhibition of the conduction process in peripheral nerves.

Anesthesia: [An: lack / esthesia: sensation]

Total loss of sensation including touch, pressure, heat and pain.

Analgesia:

Loss of pain sensation only.

Paresthesia: alter sensation (ex; the patient feel numbness in certain area)

Dysesthesia: painful sensation

Hypoesthesia: reduced sensation.

**It's important to differentiate between them.

History:

-Various methods of inducing L.A are:

- 1. Mechanical trauma.
- 2. Lowtemperature (freezing)
- 3. Anoxia.
- 4. Chemical irritation.
- 5. Neurolytic agents. [Alcohol and phenol]
- 6. Chemical agents.[L.A]>> in the beginning of the 20 century

-LA: > 100 years

- LA solution is simple and predictable.
- LA made dentistry possible.
- Patients judge you by pain or the lack of it (most important thing)

-pain control:

*Remove the stimulus: instrumentation!

*Interrupt transmission of the signal to the CNS.

Ideal LA agent:

- 1. Potency and reliability.
- 2. Reversibility (not permanent)
- 3. Safety(no side effects)
- 4. Lack of irritation.
- 5. Rapidity of onset.
- Duration of effect it depends on procedures(if short >> short acting LA ,, if long>> long acting LA)
- 7. Sterility; to not be infectious.
- 8. Adequate shelf life, to be stored for long time.

LA Cartridge:

- LA agent
- Vasoconstrictor
- Reducing agent
- Preservative
- Fungicide
- Carrier solution;

(Isotonic, sterile, non-toxic solution with a PH that is comparable to tissue's PH.)

Local Anesthetic agent's pharmacology

"We will take them in details next semester :D"

- Molecular structure:
 - Hydrophobic component
 - Hydrophilic component

	Septocaine®	
1	t	t
Aluminum Cap with Rubber Diaphragm	Glass Cartridge	Rubber Stopper

- Ester or amide cross linking chain
- Amide LA are most common used
- Ester based: Procaine, Cocaine(No longer used in dentistry due to allergy and toxicity!)

**changing the hydrophilic/hydrophobic ratio affects characteristics such potency, duration, toxicity, and rate of degradation.

Onset of anesthesia

Depend on:

- Speed of penetration.
- Proximity of injection to nerves (the closer to the nerve, the faster the onset)
- Diameter of nerves (the larger the diameter, the slower the onset); so mental block is faster than IV block.

Duration of anesthesia

- Depend on:
- Diffusion away from the area
- Number of blood vessels in the area(effect of inflammation in increasing the number of blood vessels, then the clearance of LA is faster so its short duration)
- Concentration of LA(the more concentrated LA , the longer the duration of it)
- Lignocaine, Prilocaine: 2-3 hours (most common used)
- Articaine: 1 hour (short acting)
- Bupivacaine: 8-10 hours (long acting).

The Vasoconstrictor

- Adrenaline or Felipressin.
- Effects:
- Increase duration (by decreasing the clearance)
- Increase potency
- Decrease systemic toxicity
- Decrease bleeding.

Reducing Agent

- Sodium metabisulphite
- Prevents the oxidation of the vasoconstrictor.
- Some types of LA don't have vasoconstrictor so it won't have reducing agent.

Preservative

- Rarely used (to prolong shelf life)
- Can cause allergy for LA solutions!
- Methy paraben or caprylhydrocuprienotoxin

Fungicide

To stay the solution sterile.

Thymol is occasionally used.

Carrier

Which dissolve the components

Modified Ringer's lactate solution.

Instruments:

1. Cartridges: (which contain LA solution)

There is information written on it, it's important to be able to read them like: (type of LA, concentration, if it contains vasoconstrictor or not, and date of expiry)

- Glass or polypropylene (plastic).
- Standard size 1.8-2.2 ml
- Rubber diaphragm at one end(where the needle is enter) and rubber bungat the other end (where the syringe is push).
- Bung designed for aspiration.





2. Needles:

Different designs, lengths and diameters.

- **Short**20 mm(for infiltration and mental nerve block)or **long**35 mm(for ID inferior dental nerve block) and **extra short** (for soft tissues)
- 27 or 30 gauge (the larger the gauge, the smaller the diameter)
- Stainless steel
- Beveled tips
- Disposable (single use) and pre-sterilized
- Covered with two-part sheath that is broken by twisting.
- 3. Syringes:
- A barrel and a plunger
- Metal
- Needle is fitted to one en placed in the barrel
- "aspirating" or "non-aspirating"
- The act of "aspirating" is reversing the syringe plunger in order to determine whether the needle tip is in a blood vessel or artery or vein. As a dentist, we want to avoid intravascular injections. When the aspiration is "positive" there will be blood drawn into the solution of the syringe. At that time, you attempt to "relocate" the needle, re-aspirate, and if negative, proceed with the injection of the solution.
- The **non-aspirating** can't do that and it is most commonly used 95% but actually the aspirating one is better and the one we should use it.

Techniques of anesthesia:

- Infiltration: in not localized area and without nerves
- Nerve block: when we block a certain and a known nerve

Preparation for the injection:

- The patient
- Surface anesthesia
- Injecting the local solution
- Waiting sufficient time for anesthesia
- Testing the anesthesia.







**The Dr showed a video, you can find it on the website.

#Nerve Block

Mandibular Anesthesia:

1) ID Block : "Most important one"

**Inferior alveolar nerve block (also termed inferior alveolar nerve anesthesia or inferior dental block)

*The patient on (supine or semi-supine position)

-position: on the lingual side of the ramus of the mandible.

-Used for mandibular posterior teeth.

-Technique:

* Place the thumb of the non-dominant hand on the external oblique ridge.

* Orient the syringe so that the barrel is in the opposite corner of the mouth angled between the first and second premolars.

Insert the needle 1 cm above the occlusive surface of the teeth in the triangle at the lingula. The lingula is a bony projection on the medial surface of the ramus 1 cm above the occlusive plain.

*Penetrate the mucosa at the level of the thumb until bone is contacted then give the anesthesia.

The goal is to insert the needle just superior and posterior to the lingula; if the needle is inserted too low, anesthesia does not occur.

Stop insertion when the needle strikes the bone but **not before**.

Withdraw the needle 1-2 mm. then Inject local anesthetic.

* We must touch the bone if we don't we may inject the anesthesia in the parotid gland and this lead to temporary facial palsy.

* Few drops to the lingual nerve (this will lead to anesthetize the lingual gingival and half of the tongue).

Because of its close proximity to the inferior alveolar nerve, the lingual nerve is usually also anesthetized with this technique.





2) Buccal nerve block :

- It anesthetizes the Buccal gingiva. small patch of skin on the face
- Site of injection: Buccal and distal to 3rd molar; at the end of the external oblique ridge.

3) Mental nerve block:

- Used for anteriors teeth and premolars
- It anesthetizes from premolars to midline.
- Site of injection: mental foramen is between the 2 premolars and this is the site of injection.
- Technique:
- Retract the tissues(cheek an lip).
- Put topical anesthesia
- Inject on the depth of the sulcus on premolars area.

Maxillary Anesthesia:

- 1) Posterior superior Alveolar nerve block
- Anesthetizes maxillary molar teeth.
- Site of injection: posterior and distal to upper 3rd molar.(posterolateral maxillary tuberosity)
- It need long needle

Usually in upper teeth we do infiltration (buccally under the apex of the tooth) but if we want to anesthetize all the posterior teeth in one injection we do PSA nerve block.

2) Middlesuperior Alveolar nerve block

- Anesthetizes the maxillary premolars with occasional overlap to the canine and first molar.
- 3) Anteriorsuperior Alveolar nerve block
- Anesthetizes the maxillary canine, the central and lateral incisors, and the mucosa above these teeth, with occasional crossover to the contralateral maxillary incisors.













4) Infraorbital nerve block

- Anesthetizes the lower eyelid, upper cheek, part of the nose, and upper lip

5) Greater palatine nerve block

- It anaesthetize half of the palate (the posterior two thirds of the hard palate from molars to canine).
- Site of injection: Few millimeters palatal to the 3rd molar

6) Nasopalatine nerve block or Incisive nerve block

 It anaesthetizes the anterior hard palate from canine to canine
Site of injection: on the incisive papilla (palatal between 2 upper centrals at the midline).

- It's useful for impacted canine and we need to do exposure for it or for extraction of upper an. Teeth.

- It's painful because the nerve is <u>superficial</u> positioned and quickly it get anesthetized.

- V shaped area.

*Palatine nerves block are painful, "the last 2 we mentioned" because soft tissues are thin so when we inject we do pressure and distention to the tissues and this is painful.

>>You have to know how to give LA for every nerve in details.

>>The dotted lines are further explanation from internet because the Dr didn't explain every thing [©]

#Infiltration

It is indicated whenever dental procedures are confined to a localized area in either the maxilla or mandible.

Technique:

- Retract the cheek.
- On the depth of the sulcus, orient the needle bevel toward the bone (in vertical direction or 45 degree with the long axis of the teeth).
- Slowly inject until you touch the bone then give anesthesia.









Needle stick Injuries (NSI):

*Notes to decrease these injuries:

- You have to deal with patients as if they all are infected.
- You have to hold the needle from hub (not from the tip) in order to put in the cartridge .
- After finishing from anesthesia :
- Never touch the cover of the needle but use the "single-scoop technique" as in the pictures here
- In the Sharp container you should get rid of needles and sharp instruments.
- You have to keep the needle closed until you reach the Sharp container.
- Other way for removing by using hand or needle holder/pliers, you dislodge the needle by unscrewing or pulling it off then discard immediately into a sharps container.
- In general anything sharp try not to touch it.
- In our hospital usually every month 4 dental students get injured.(2.5% of students per month)

*center for disease control prevention (CDC) that estimates that up to 500,00 percutaneous occupational injuries are taking place every year in the US, with approximately 1% from patients who tested positive for HIV (Cardoso et al., 2006)

*dental health care workers DCHWs are at high risk of injuries by sharps an, of these, the most common are due to needle sticks (slew et al., 2001)

*Dental students are generally considered at a higher risk of such hazards as compared with their medical counterparts who rarely undertake exposure-prone techniques undergraduates.

le contraction de la contracti

STEP 1 Place the cap on a flat surface, then remove your hand from the cap.



STEP 2 With one hand, hold the syringe and use the needle to 'scoop up' the cap.



STEP 3 When the cap covers the needle completely, use the other hand to secure the cap on the needle hub. Be careful to handle the cap at the bottom only. *seroconversion:

- HIV

- HBV

- HCV

*When injuries happen?

- During injecting local anesthesia 40%

- Recapping 40%

- Disposal of the needle and syringe.15%

(Armstrong et al., 2007)

The causes of injuries:

- Habit (when you used to use the wrong way and this is the most important one)
- Forgetfulness
- Influence of managers
- Perceptions that impede precautions and hinder performance
- 'it can happen to me'
- Ignorance of precaution

(Proteous et al., 2005)

*CONS and surgery clinics are the most ones that have NSI.

*4th year students are more susceptible to have NSI.

*prevention: student immunization (3 doses vaccine)

*Adequate safety-based clinical induction and training

*dissemination of safety protocols and guidelines and finally introduction of safer technologies that contribute to elimination or at least significant reduction of such incidents.

(اللَّهُمَّ إِنَّكَ عُفُوٌ كَرِيمٌ تُحِبُّ الْعَفْوَ فَاعْفُ عَنِّي)