Diagnosis in oral surgery

By

Dr. Ahmed Talib

Oral & maxillofacial surgeon

C.A.B.M.S

Oral diagnosis is the art of using scientific knowledge to identify the oral disease and also to distinguish one disease from another. The diagnostic process involve the following step:

1- History taking.

2- Clinical examination.

3- Investigation.

4- Professional diagnosis.

5- Definitive diagnosis.

6- Treatment plan.

7- follow up.

HISTORY

Taking an accurate case history is the most important step in the diagnosis of the medical and surgical condition. Objective of taking history:

- To provide dentist with information that may be necessary for making diagnosis.
- To establish good relationship with the patient.
- To provide dentist with past and present medical and dental history.
- To provide information about patient systemic health.
- It serve as legal document.

During taking the history:

- Dentist should encourage his patient to describe his symptoms in his own word.
- Avoid leading questions.
- Don’t depend on diagnosis of previous dentist.
- Suitable time should be given to the patient.
- Clear summary of patient complain should be recorded in case sheet,

❖***Component of patient history:***

1- personal history.

2- chief complain.

3- history of present illness.

4- past dental history.

5- medical history and systemic review.

6- family history.

7- personal and social habits.

1- Patient history:

- Include full name of the patient age, sex, address, telephone no., occupation.

-This information aid in diagnosis since some medical problems have tendency to occur in particular age,sex and race.

-occupation may be associated with particular disease or influence the type of therapy.

2- chief complain:

- Is usually the reason of patient visit.
- Chief complain is the best stated in the patient own word in brief summary of problems,e.g(pain,sweelling,ulcer, parasthesia, numbness, clicking, bleeding).
- Patient complain of several symptoms should be listed.

3- History of present illness:

- The patient tell the story in his fashion.
- The patient should able to give you history which reliable and his statement can be relied upon.
- If the patient come with chief complain (pain), detail history should be taken:

- The duration of pain

- Any incident which may play some part in the etiology of pain.
- Record the duration length of pain.

- Site of pain.
- Any radiation of the pain:

Pain may be felt in site or area remote from the causative lesion, e.g(pain of pericornitis radiated to the ear.

- Characteristic of pain:

The pain may be described as mild, sharp and severe, throbbing or continuous, intermitted, and lancinating. e.g(acute pulpitis, pain is throbbing sharp and severe)

- Time of pain:

Pulpal pain waken the patient at night, periodontal pain worse at meal time.

- Any factor precipitate the pain:

-Pulpal pain precipitated by thermal stimuli(hot, cold).

-periodontal pain precipitate biting or chewing.

- The presence of other symptoms:

Swelling started after 2 days of pain, pus or parasthesia of the affected area.

- Relieving factors

4-Past dental history

- Frequency of previous visit.
- Any difficulties or complications, e.g(bleeding, fainting).
- Determination of availability of past dental or oral radiograph.

5-Medical history and systemic review:

Include review of past and present illness or disease.

- The presence of many disease that modify treatment plan.
- Diagnosis of various conditions that has oral manifestation(AIDS,LEUKEMIA).

The past medical history include the followings:-

A-previous illness or disease(heart attack, cerebrovascular accident, diabetes mellitus)

B-childhood disease(congenital heart disease).

C-hospitalization.

D-Operations.

E-Injuries to the head and neck.

F-Drug allergy.

Systemic review

- Review of systems lead to concentration on the sign and symptoms related to that system which dictate us for more investigations or medical consultation.
- Systems review include(cardiovascular, respiratory, C.N.S, genito urinary , muscular skeletal.endocrine)
- Vital signs(blood pressure,pulse rate,temperature, respiratory rate).
- Sign:abnormal presentation detectable by clinician, e.g(swelling,ulcer).
- Symptom:subjective problem that patient describe it, e.g(pain, parasthesia).

6- Family history:

- Reveal valuable information about disease occur in families, e.g(hemophilia, asthma, congenital anomalies such as cleft lip and palate).

7- Personal or social habits:

Smoking, addiction.

clinical
nation

- Diagnostic instruments include:

1-dental mirror

2-dental probe

3-twizer

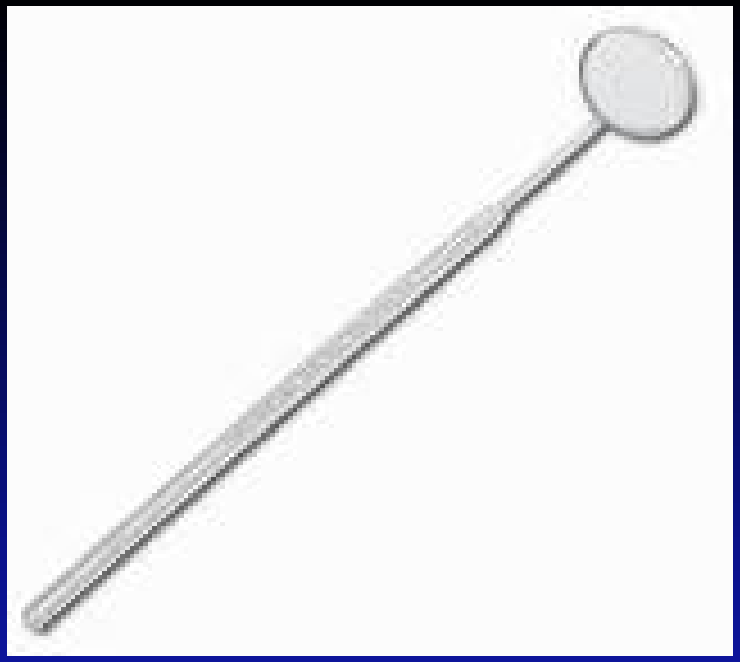
in clinical practice ex. Of pt. involve 4 routine procedures:

*inspection

*palpation

*percussion

*auscultation



Inspection

1-facial appearance

2-skin color

3-eye

4-swelling

{cyanosis bluish,jaundice ,pale anemia}

[cornea scarring, scleral bleeding, eye lid ptosis,]

Palpation

1-use finger tip to feel for tender spots, lumps, fluctuant swelling, mobile teeth.

2-palpation gives information about texture, dimension, consistency, temperature & functional events.

3-regarding to **dentistry probing**: is the palpation with an instrument &is the most important diagnostic technique. The teeth are probed to examine periodontal sulcus depth and caries.

Percussion

Is the technique of striking the tissue with finger or and instument e.g handle of the mirror

Auscultation

It is the act or process of listening for sounds within the body

Clinical examination

-Extra oral examination

-Intra oral examination

Extra oral examination

-Examination Of the head: include TMJ(clicking,pain,crepitation), lymph nodes, submandibular and parotid glands, bone of skulls, sinuses, ear, eye, and perioral tissues.

-Examination Of the neck: include thyroid glands, cervical lymph nodes, the neck also inspected for midline and lateral swelling.

Intra oral examination

-Evaluation of saliva, lips, labial and buccal mucosa, mucobuccal folds, floor of mouth ,tongue, hard and soft palate, oropharynx , muscle of mastication

- Mouth opening,teeth, gingiva, ducts of the parotid and submandibular glands.

- Type of occlusion

-Gingiva: gingival hypertrophy(phenytoin, leukemia, bleeding tendecy), abnormal pigmentation, periodontium(homogenous stippling mucosa, healthy gingival sulcus depth 1-2 mm without bleeding).

-Lips:the lips must be pale, pink, homogenous in color.common abnormalities include(ulcer,mucocele, rouge surface).

-Saliva:decrease in saliva(xerostomia) is either temporary due to dehydration or anxiety or permanent due to medical diseases like diabetes and chronic renal failure while increase in salivary secretion mostly due to psychiatric problem.

-Opening of the mouth:normal mouth opening is 35-45mm or 3 fingers inserted vertically to the person's mouth.

-Tongue and floor of mouth: presence of swelling or ulceration or loss of papilla.

-Teeth: presence,absence, mobility of teeth, retained roots,retained deciduous teeth,malposed teeth,

Investigation

-**Laboratory investigation**(hematological, blood chemistry, culture and sensitivity tests).

-**Aspiration** : *pus indicate inflammatory process like abscess or infected cyst.

*yellow fluid indicate cystic lesion.

*blood indicate vascular lesion.

-**Vitality test: - cold application like ethylchloride application.**

Hot application like hot gutta percha. -

- electric pulp tester. -

Diagnosis

Is the process of evaluating patient health as well as the resulting opinion formulated by clinician diagnostic method.

- Diagnostic decision: the clinician formulate opinion concerning the nature of unusual finding which is explanation of patient status that is more consistent with available information.

Treatment plan

Documented plan that describe the patient's condition that will be needed, detailing the treatment to be provided and expected outcome, and expected duration of treatment prescribed by clinician.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Local anesthesia in oral surgery

Many dental operations and procedures such as extraction , major oral surgery and often cavity preparation are both painful and prolonged and nowadays all these procedures are performed without pain by the using of local anesthesia.

- **Local anesthesia (L.A):** could be defined as a loss of sensation in a circumscribed area of the body caused by a depression of excitation In nerve ending or Inhibition of the conduction process in peripheral nerves . An important feature of local anesthesia is that it produces this loss of sensation without inducing loss of consciousness. In this one major area, local anesthesia differs dramatically from general anesthesia.

Many methods are used to induce local anesthesia

1- Mechanical trauma (compression of tissues)

2- Low temperature

3- Anoxia

4- Chemical irritants

5- Neurolytic agents such as alcohol and phenol

6- Chemical agents such as local anesthetics

-However, only those methods or substances that induce a transient and completely reversible state of anesthesia have application in clinical practice

Following are those properties of local anesthetic solution:

1- It should not be irritating to the tissue to which it is applied.

2 -It should not cause any permanent alteration of nerve structure.

3- Its systemic toxicity should be low.

4- It must be effective regardless of whether it is injected into the tissue or is applied locally to mucous membranes.

5 -The time of onset of anesthesia should be as short as possible.

6 -The duration of action must be long enough to permit completion of the procedure yet not so long as to require an extended recovery.

Terminology

Pain: - unpleasant physical sensation experienced followed the application of noxious stimuli; although the supporting tissues of the teeth can themselves give rise to pain most of the nerve endings in the periodontal membrane are properioceptive.

- **Anesthesia:** - means loss or abolition of all modalities of sensation which includes pain and touch.
- **Analgesia:** means loss of pain sensation only.
- **Parasthesia:** - means altered sensation (tingling sensation} and this may occur when a damaged nerve is regeneration or when a local anesthesia is either starting to work or its effect is wearing off.

The effect of a local anesthetics on nerve fiber has been shown to be dependent on : -

1- The duration of exposure of local anesthesia.

2- Concentration.

3- Volume of the solution.

Relative analgesia:- is a sedation technique in which the patient remains conscious but mental relaxation is induced by inhalation of a mixture nitrous oxide, oxygen and air. local anesthesia used when necessary.

Depolararizatson : - when a stimulus excites a nerve this will lead to an increase in permeability of the membrane to Na ions ,the rapid influx of Na ions to the interior of the nerve will cause depolarization of the nerve membrane from the resting level to its firing threshold .

Uses of local anesthesia:

a- diagnostic uses

- administration of (t. A) can be a useful way of finding the source of patients pain an example of this is the pain of pulpitis which can be very difficult for both the patient and the dentist to isolate because of its tendency to be referred to other parts of the mouth or face, so (L. A) can distinguish between maxillary and mandibular sources, and even between individual upper teeth provided they are not immediately adjacent ,another example is a patient with myofacial pain who is convinced that an upper tooth is causing the problem (L. A) may help this patient and the surgeon in this situation to eliminate the tooth as the cause of pain and may thus avoid its un necessary treatment.

B- Therapeutic uses:

- (L. A) can in themselves constitute part of a treatment for painful surgical conditions, for example the use of block technique to eliminate the pain of dry socket can be helpful to the management of this very painful condition particularly in the first few days.
- Blocks of the inferior dental nerve, mental nerve ,or infraorbital nerve can also be used for the treatment of trigeminal neuralgia when pain breakthrough.

c- preoperative uses

the provision of pain - free operative surgery is by far the most common use of (L . A) and provides effective and safe method for almost all outpatient dentoalveolar oral surgical procedures, it can in conjunction with sedation techniques allow more difficult procedures to be carried out with out the additional risks of general anesthesia and this is particularly of value in patients with significant cardio - vascular or air way diseases.

Additionally however, (L. A) Is often given to patients undergoing oral and maxillofacial surgery under general anesthesia this serves the following purposes

1-It reduce the depth of genera! anesthesia needed

2- It reduce the arrhythmia which are noted on electrocardiogram during the surgery when significant stimulation is taking place /this can be seen for example when a tooth is being elevated

3-It also provides local homeostasis to the operative site and provides immediate postoperative analgesia.

D- postoperative uses:

After surgery with either local or general anesthesia the continuing effect of the anesthesia is a most beneficial way of reducing patients discomfort ,it help to reduce or even eliminate the need for stronger systemic analgesic .

Indications of local anesthesia:-

Local anesthesia is indicated in almost all the dental procedures,

1-It is used to render the teeth and supporting tissue and structures insensitive to painful procedures .

2- It is used in oral surgery for extraction of teeth and fractured roots, and for all other surgical procedures as surgical removal of teeth, apicoectomy, incisions and drainage of localized abscesses, removal of cysts . ranula and salivary calculi, and for all other surgical procedures .

3- Local anesthesia is used also for the conservative treatment as for cavity preparation , crown and bridges abutment preparation , pulp treatments as root canal filling, pulpotomy or pulpectomy.

4- Local anesthesia is used for the surgical treatment of the periodontal diseases, deep scaling and prophylaxis treatment ,mucogingival surgical procedures . it is also used some time in prosthodontic treatment and some of the orthodontic treatments

Contraindications of local anesthesia

These can be divided into two groups :

1 Absolute contraindications such as

A - history of allergy to local anesthetic agent

- Local anesthetic agents belonging to the same chemical group should not be used however,local anesthetic agents in the different chemical group can be used . In case, a patient gives history of allergy to an amide local anesthetic agent , an ester local anesthetic local anesthetic agent can be used .

B-documented allergy to other constituents of the local anesthetic solution When the patient has a history of allergy to any of the constituents of the local anesthetic solution the solution containing the constituent should be avoided , an alternate solution should be used , if possible .

2 -Relative contraindications :

A - fear and apprehension : where the patient is uncooperative or refuse for the local anesthesia.

B - presence of acute Inflammation or suppurative infection at the site of insertion of the needle where their will be increase chances for the spread of infection with the passages of the needle from the abscess area to the deeper tissue.

C - infant or small children : these patients lack reasoning and understanding

D- mentally retarded patients : these patients are unable to cooperate .

E -patient with significant medical disease as cardiovascular disease ,hepatic dysfunction , renal dysfunction , and clinical hyperthyroidism .

F - restricted mouth opening : when the patient cannot open his mouth sufficiently, in situations such as trismus, also in partial or complete ankylosis of the temporomandibular joint.

H - major surgical procedures .

Advantages of focal anesthesia

1- No special preparation of the patient is needed

2- No complicated apparatus or bulky gas cylinders are needed

3- There is no risk of respiratory obstruction

4- Anesthesia fasts for at least an hour

5- The patient remains a wake and cooperative and need no after care

6- Seriously ill patient such as those with heart disease can usually tolerate local anesthesia without any risk .

7- An anesthetist and other additional trained personnel not required .

8- Technique is not difficult to master,

9- Percentage of failure is small.

10- No additional expense to the patient

Disadvantages of focal anesthesia

No true disadvantages to the use of local anesthesia when the patient Is normal and there is no contraindications to its use so in every instance when satisfactory anesthesia can be *achieved* and the patient is cooperative, local anesthesia is the method of choice.

Thank you

Pharmacology of local anesthesia

L.A contains primarily the local anesthetic and also the other ingredients which are as follows :

- local anesthetic drug
- vasoconstrictor drug
- preservative for the vasoconstrictor
- Ringers solution
- distilled water
- general preservative

Local anesthetic drugs (agents):

Local anesthetics are drugs which upon topical application or local injection cause reversible loss of sensory perception , especially of pain in a restricted area of the body , it provides pain control during dental therapy , it interrupts propagation of impulse preventing it from reaching the brain .

Properties of an ideal local anesthetic agent

A - potency and reliability : - the first requirement of such a substance is that when administered correctly and in adequate dosage it consistently produces effective local anesthesia .

B - reversibility of action : - the action of any drugs used to obtain local anesthesia must be completely reversible within a predictable time .

C - safety : - all local anesthetic agent must have a wide margin of safety from the poisonous side-effects which are collectively known as toxicity.

D - lack of irritation : - no injury to or irritation of the tissues should result from the injection of a local anesthetic agent. For this reason local anesthetic solutions should be isotonic and have a PH compatible with that of the tissues.

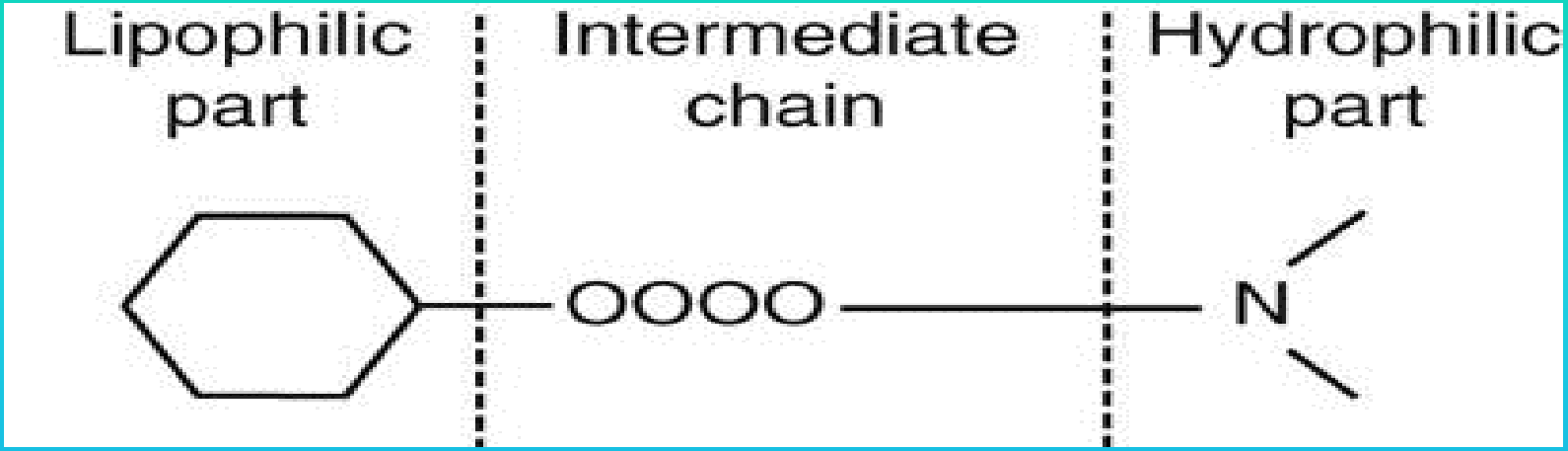
E-Rapidity of onset :The pKa of local anesthetic determine it's speed of action.The closer pKa of local anesthetic is to the PH of tissue(7.4), the more rapid the onset.

F - duration of effect: the degree of protein binding of local anesthetic agent determine the duration of anesthetic.A greater degree of protein binding at the receptor site will create a longer duration of anesthetic.bupivacaine, tetracaine and etidocaine are all highly protein bound, they are long-acting local anesthetic. Vasoconstrictors will also determine the duration of L.A.

G- penetration of mucous membrane : - ideally the drug should have the property of penetrating mucous membrane.

H-**sterility**

Classification of local anesthetics



on the basis of chemical structure-- 1 •

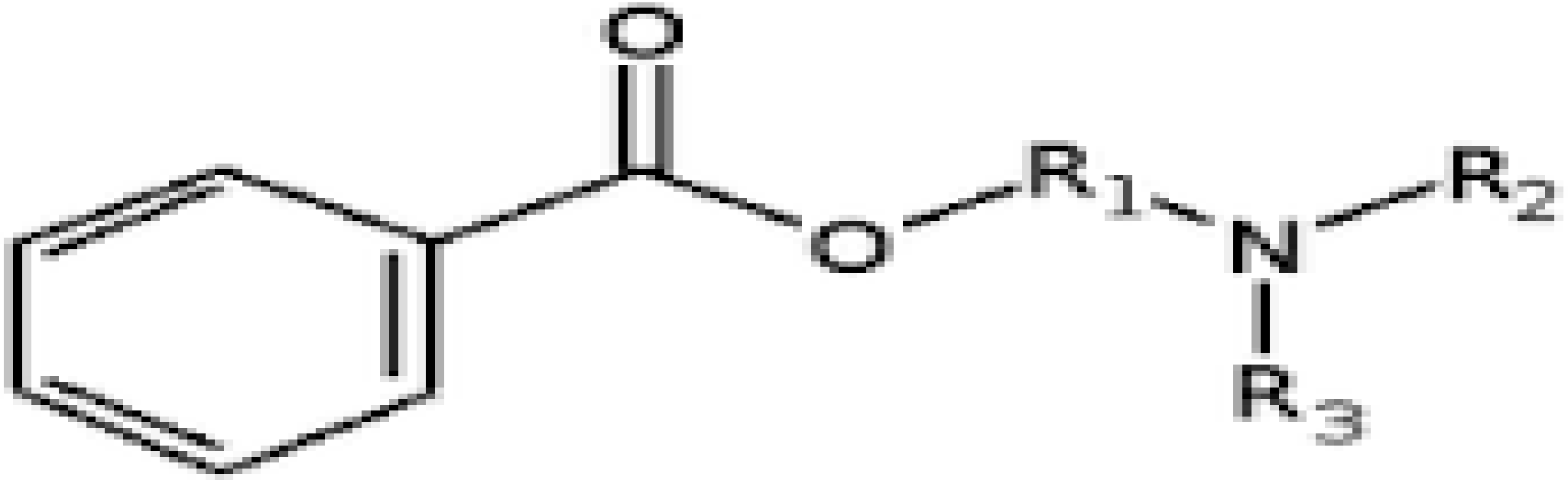
a - Ester b – Amide

on the basis of duration of action-- 2

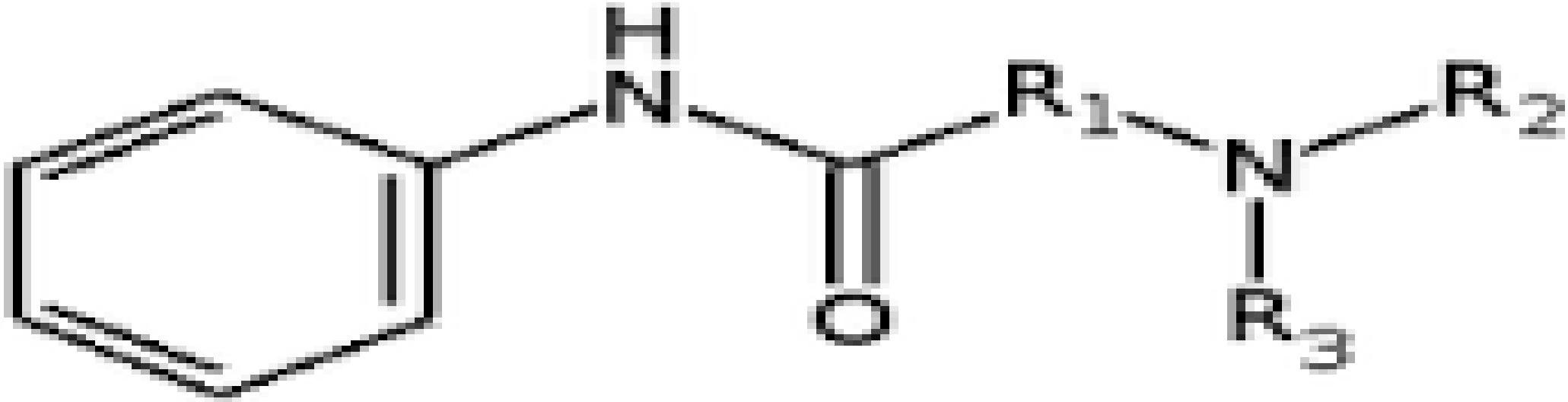
- a - short -acting as articaine , lidocaine , prilocaine b - long acting as bupivacaine.

on the basis of occurrence in nature-- 3

- a - naturally occurring e.g. cocaine
- b - synthetic compound e.g. procaine , lidocaine.



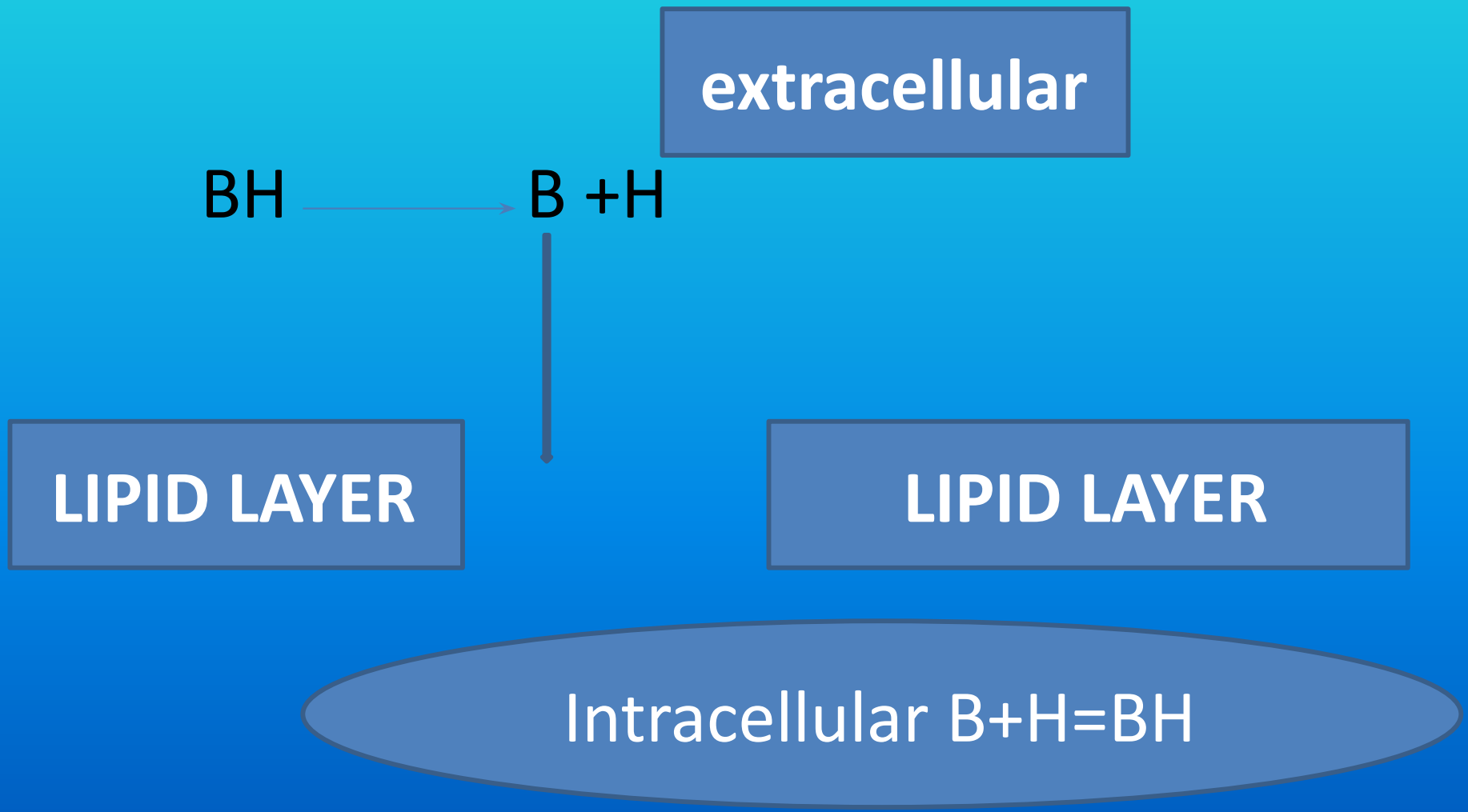
Aminoester



Aminoamide

Mechanism of action of L.A

- BH(+):ionized form ⟶ H2O Soluble.
- B:unionized form ⟶ free base lipid soluble.



If an acidic tissue infection exists then the un-ionized form may be neutralize. The base form is necessary for passage of the anesthetic into the nerve membrane. Inflammatory exudate also enhance nerve conduction, making the blockage of nerve impulses more difficult.

- The ester type includes the following
  - procaine
  - chloroprocaine
  - propoxycaine
  - cocaine
  - Benzocaine
- THE amide types include the following
  - lidocaine
  - prilocaine
  - articaine
  - bupivcaine
  - etidocaine

Pharmacokinetic of local anesthesia

Distribution; -

Once absorbed into the blood local anesthetics are distributed throughout the body to all tissues . the blood level of local anesthetic is influenced by the following factors;

A - Rate at which the drug is absorbed into the cardiovascular system.

B - Rate of distribution of the drug from the vascular compartment to the tissue (more rapid in healthy patients than in those who are medically compromised as congestive heart failure patients)

C - Elimination of the drug through the metabolic or excretory pathways

Metabolism

Amide L.A are metabolized mainly by liver(microsomal enzymes), where as ester types are metabolized by the plasma(pseudocholinesterase).

Excretion

- The kidney are the primary organ for both the local anesthetics and its metabolites . esters appear in only very small concentration in the urine ; this is because they are hydrolyzed almost completely in the plasma .
- Amides are usually present in the urine ; this is because they are hydrolyzed almost completely in a greater percentage than the esters ,because of their more complex process of biotransformation , patients with significant renal impairment may be unable to eliminate the local anesthetic compound or its metabolites from the blood , resulting in slightly elevated blood levels and an increase potential for toxicity.

Selection of local anesthetic agent

the following factors are to be considered for the selection of particular agent

- Duration of action
- Need for control of post operative pain
- Physical and mental status of the patient
- concomitant medications

Duration of action : it is an important aspect, on the basis of duration of action local anesthetic agent can be grouped as

1- Ultra- short acting agents : where the duration of action is less than 30 min as

A-procaine without vasoconstrictor

B - 2 % lidocaine without vasoconstrictor

C -4% prilocaine without vasoconstrictor

2- short -acting agents : where the duration of action is 45 to 75 min(2% lidocaine with vasoconstrictor, 2 % mepivacaine with vasoconstrictor)

3- medium - acting agents : where the duration of action is 90 to 150 min as (4% prilocaine with vasoconstrictor).

- long acting agents : where the duration of action is 180 min or longer as(0.5% of bupivacaine).

Control of pain

Most of the oral surgical procedures result in varying amount of post operative pain . The local anesthetic agent serves as additional medication that sometimes eliminates the need for postoperative analgesia . The local anesthetic agents that have shown to produce longer duration of analgesia even after the other sensations have returned are bupivacaine and etidocaine .

Physical, Medical and Mental status of the patient

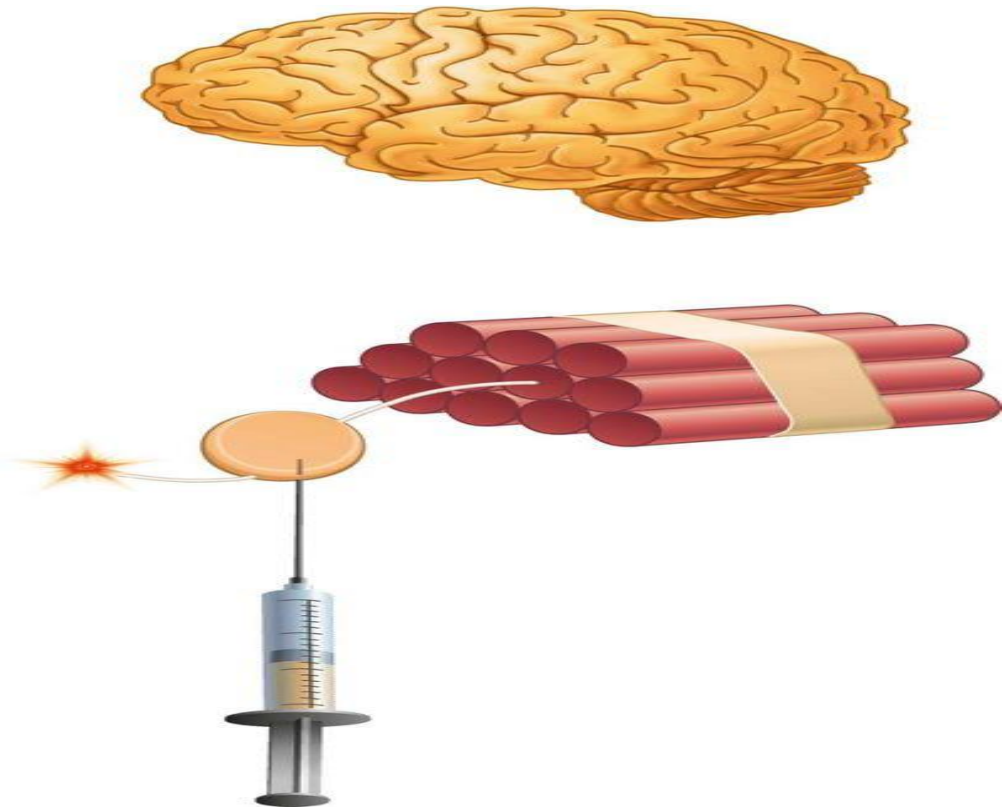
Any co- existing medical condition such as hypertension , diabetes should be considered , a patient with history of allergy to a specific local anesthetic agent ; or any other components used along with the local anesthetic agents should be considered . The mental status of the patient has to be evaluated ,as small children and mentally retarded patient may traumatize their lip , tongue or check's due to the effect of local anesthesia , hence for these reasons , the use of long acting local anesthetic agents is contraindicated in such patients

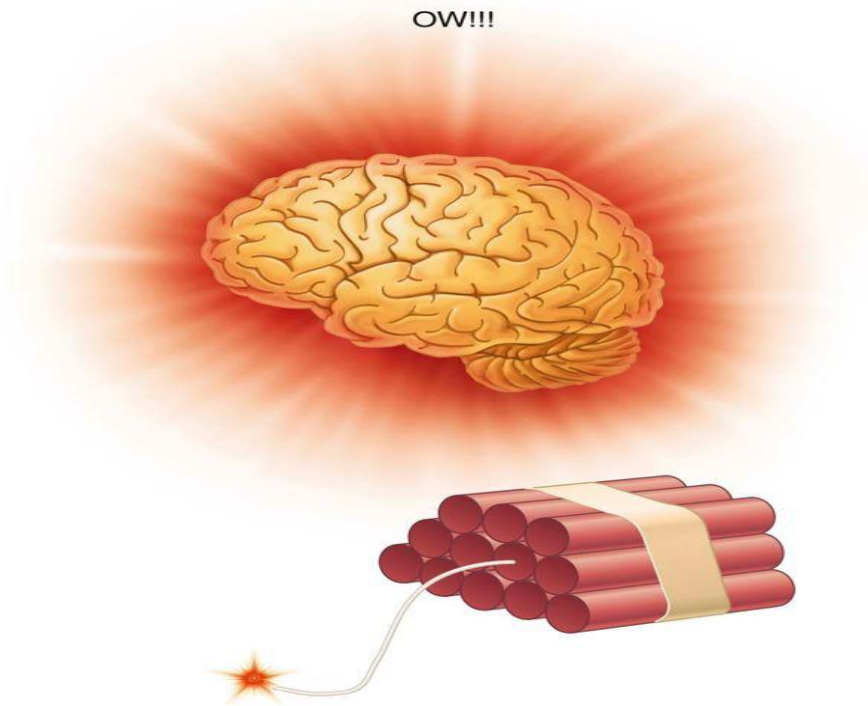
Concomitant medication

The use of vasoconstrictors is contraindicated in patients who are taking Monoamino- oxidase (MAO) inhibitor, tricyclic (TCA) antidepressants .


Thank you

Neurophysiology

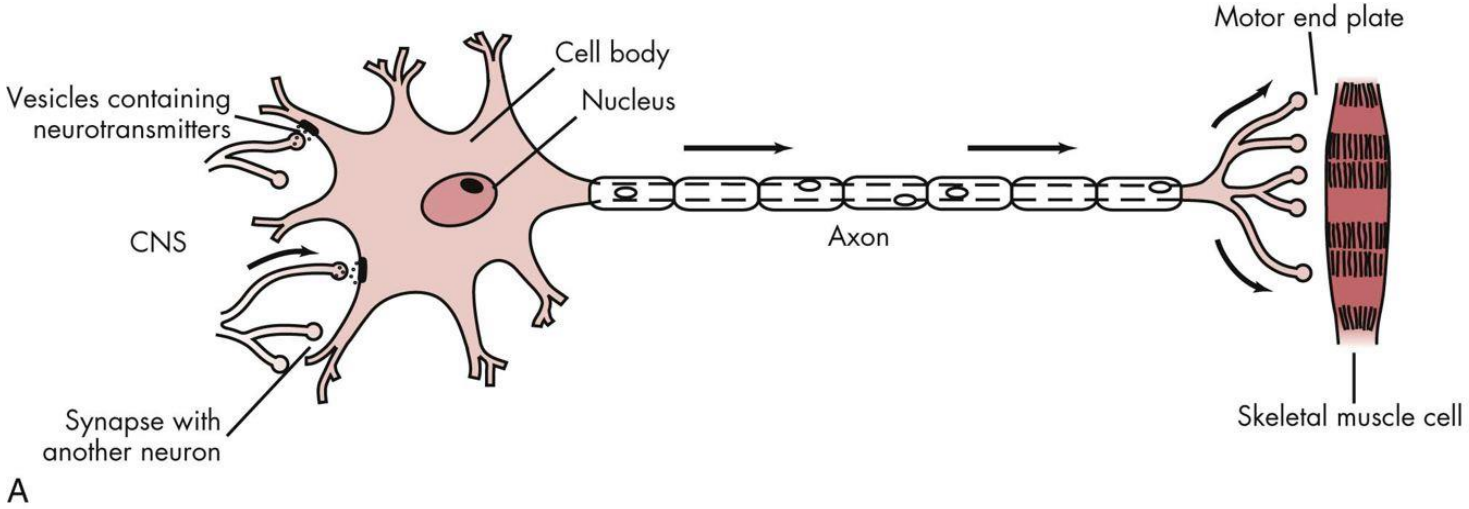


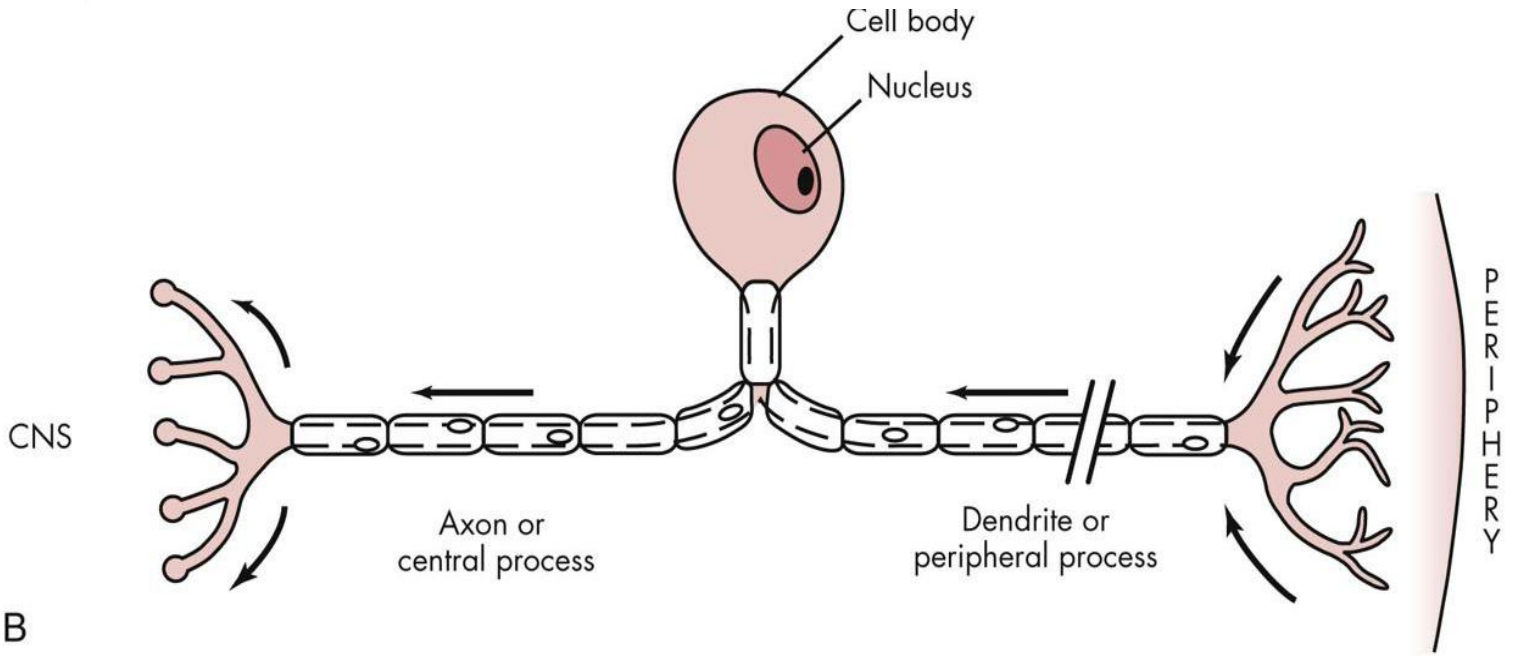


To understand the action of L.A, however, the reader must have knowledge with the fundamentals of nerve conduction. A review of the relevant characteristics and properties of nerve anatomy and physiology follows.

The Neuron

The neuron, or nerve cell, is the structural unit of the nervous system. It is able to transmit messages between the central nervous system (CNS) and all parts of the body. There are two basic types of neuron : sensory (afferent) and motor (efferent).





Sensory neurons that are capable of transmitting the sensation of pain consist of three major portions. The *peripheral process* (also known as the *dendritic zone*), which is composed of an arborization of free nerve endings, is the most distal segment of the sensory neuron. These free nerve endings respond to stimulation produced in the tissues in which they lie, provoking an impulse that is transmitted centrally along the axon. The *axon* is a thin cable-like structure that may be quite long . At its mesial (or central) end is an arborization similar to that seen in the peripheral process. However, in this case the arborization forms synapses with various nuclei in the CNS to distribute incoming (sensory) impulses to their appropriate sites within the CNS for interpretation.

The *cell body* is the third part of the neuron. In the **sensory neuron** described here, the cell body is located at a distance from the axon, the main pathway of impulse transmission in this nerve.
The cell body of the sensory nerve therefore is not involved in the process of impulse transmission, its primary function being to **provide vital metabolic support** for the entire neuron.

Nerve cells that conduct impulses from the CNS toward the periphery are termed *motor neurons* and are structurally different from the sensory neurons just described in that their cell body is interposed between the axon and dendrites. In **motor neurons**, the cell body not only is an integral component of **the impulse transmission system but also provides metabolic support** for the cell. Near its termination, the axon branches with each branch, ending as a bulbous axon terminal (or button). Axon terminals synapse with muscle cells.

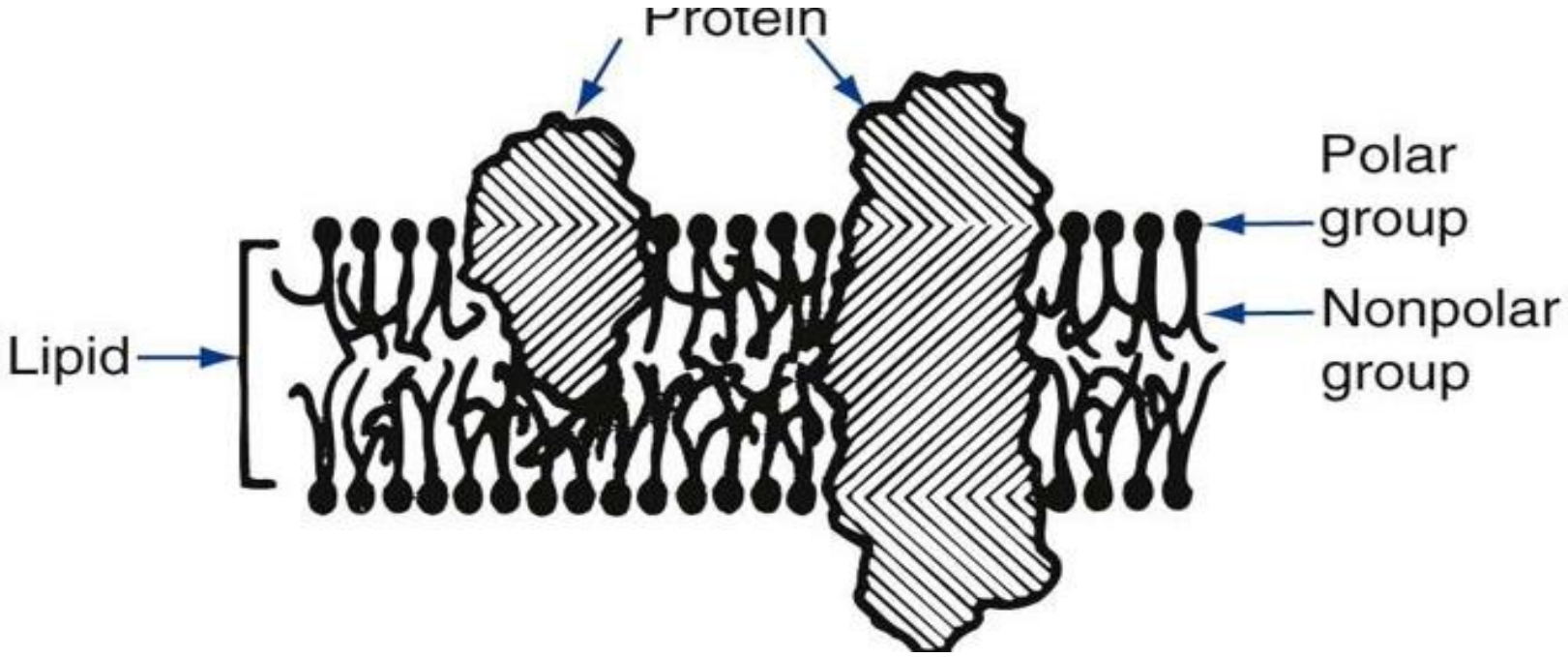
Function of nerve

The function of a nerve is to carry messages from one part of the body to another , these massages in the form of electrical action potentials are called impulses, action potentials are transient depolarization of the membrane that result from a brief increase in the permeability of the membrane to sodium , and usually from a delayed increase in the permeability to potassium . Impulses are initiated by chemical, thermal, mechanical , or electrical stimuli.

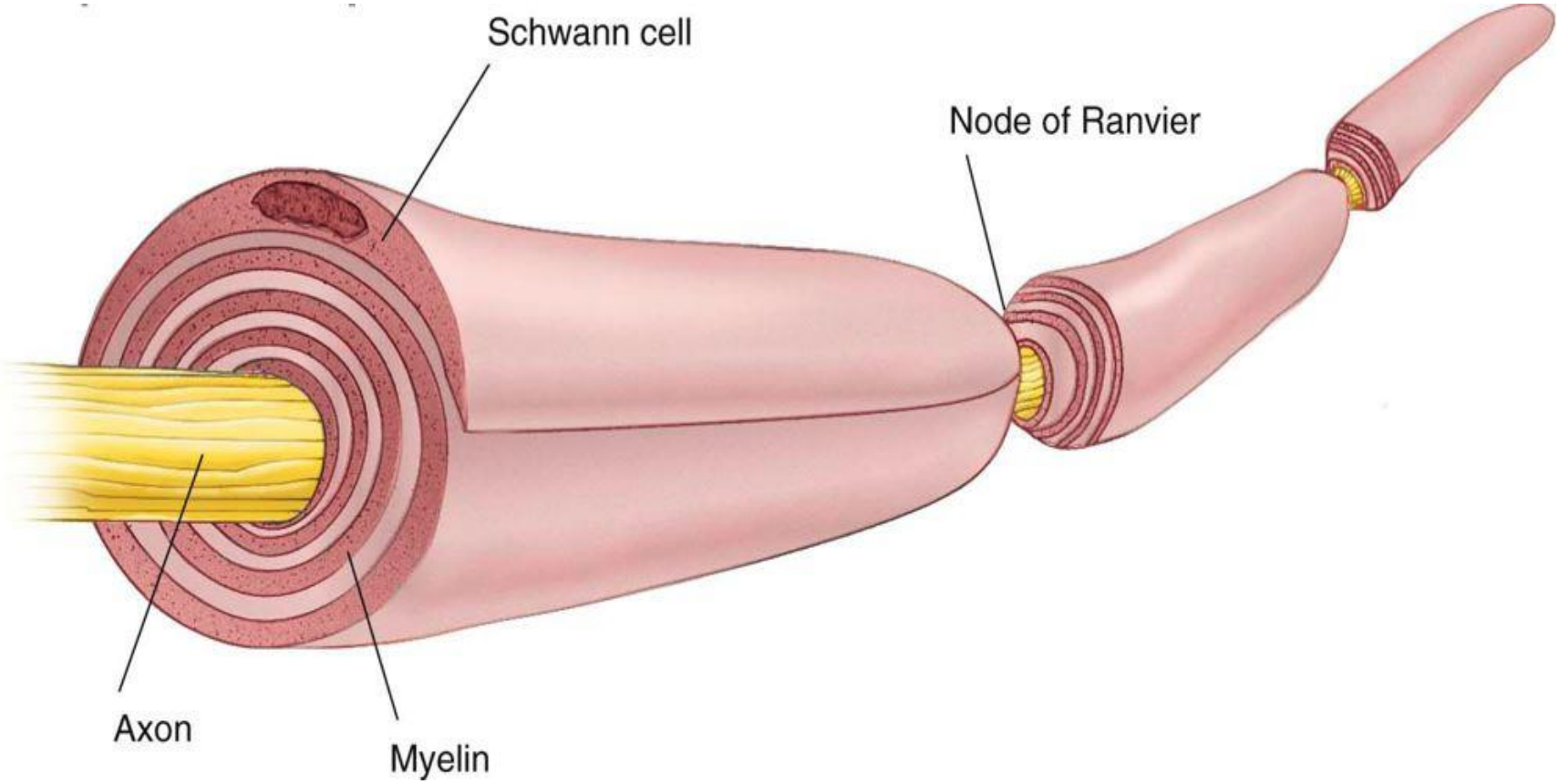
The axon

- The single nerve fiber, the axon, is a long cylinder of neural cytoplasm (axoplasm) encased in a thin sheath, the nerve membrane, or axolemma. The axoplasm, a gelatinous substance, is separated from extracellular fluids by a continuous nerve membrane. In some nerves, this membrane is itself covered by an insulating lipid-rich layer of myelin. Current thinking holds that both sensory nerve excitability and conduction are attributable to changes developing within the nerve membrane. The cell body and the axoplasm are not essential for nerve conduction. The metabolic support of the membrane is probably derived from the axoplasm.

The nerve membrane consist of two layers of lipid molecules (phospholipids } and associated proteins , lipids and carbohydrates . since the nerve membrane has selective permeability , therefore significant differences exist for ions between the intracellular and the extracellular concentrations.



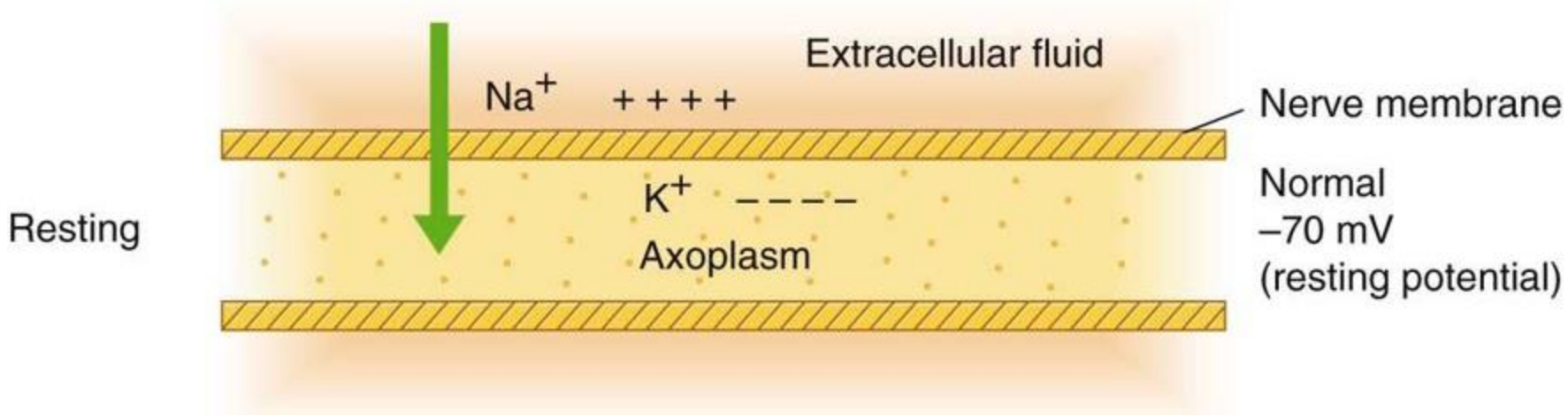
There are two types of nerve fibers myeilinated and unmyeilinated.



Electrophysiology of Nerve Conduction

❑Resting state

A nerve possesses a resting potential. This is a negative electrical potential of −70 mV that exists across the nerve membrane, produced by differing concentrations of ions on either side of the. The interior of the nerve is negative relative to the exterior.

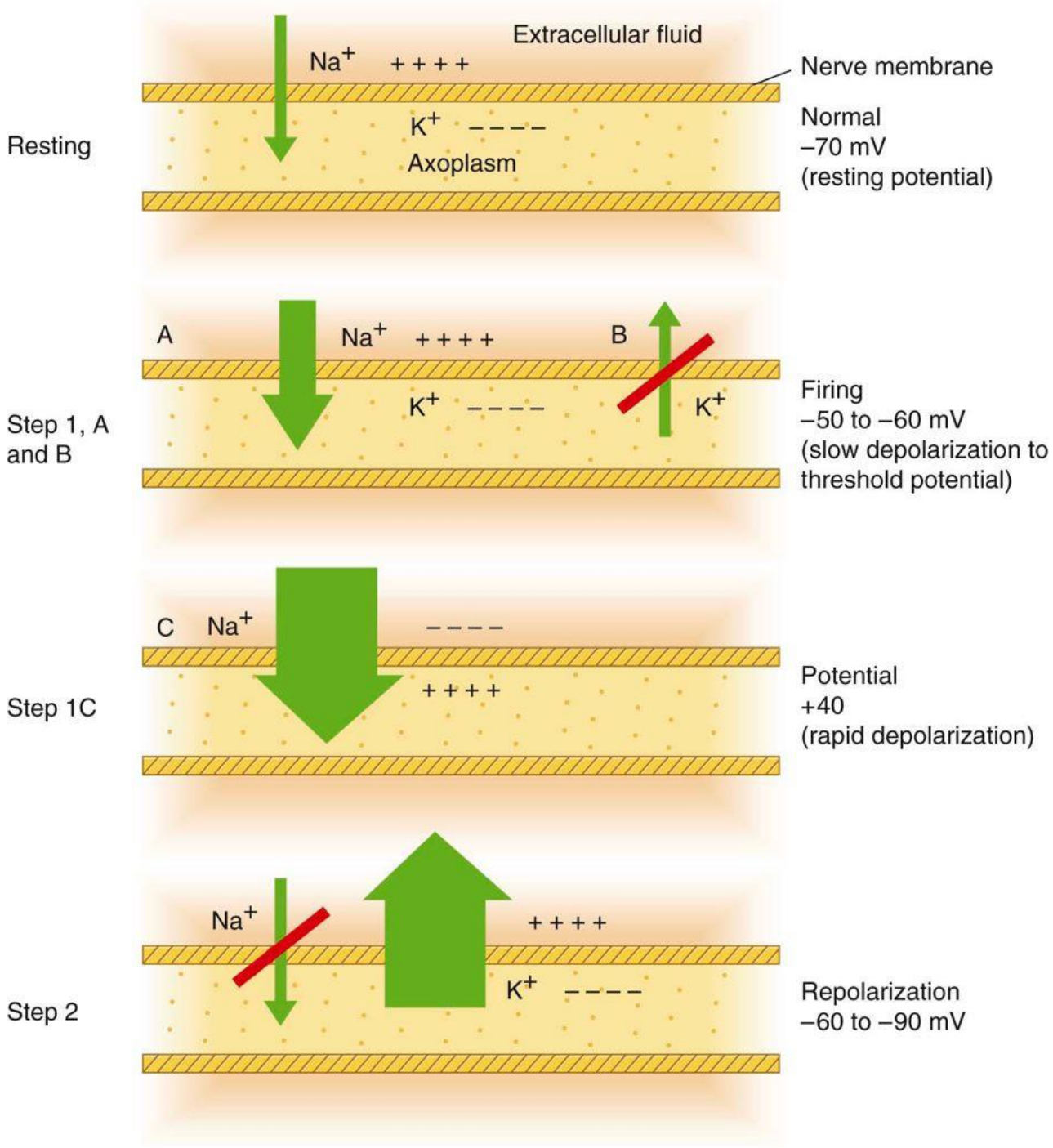


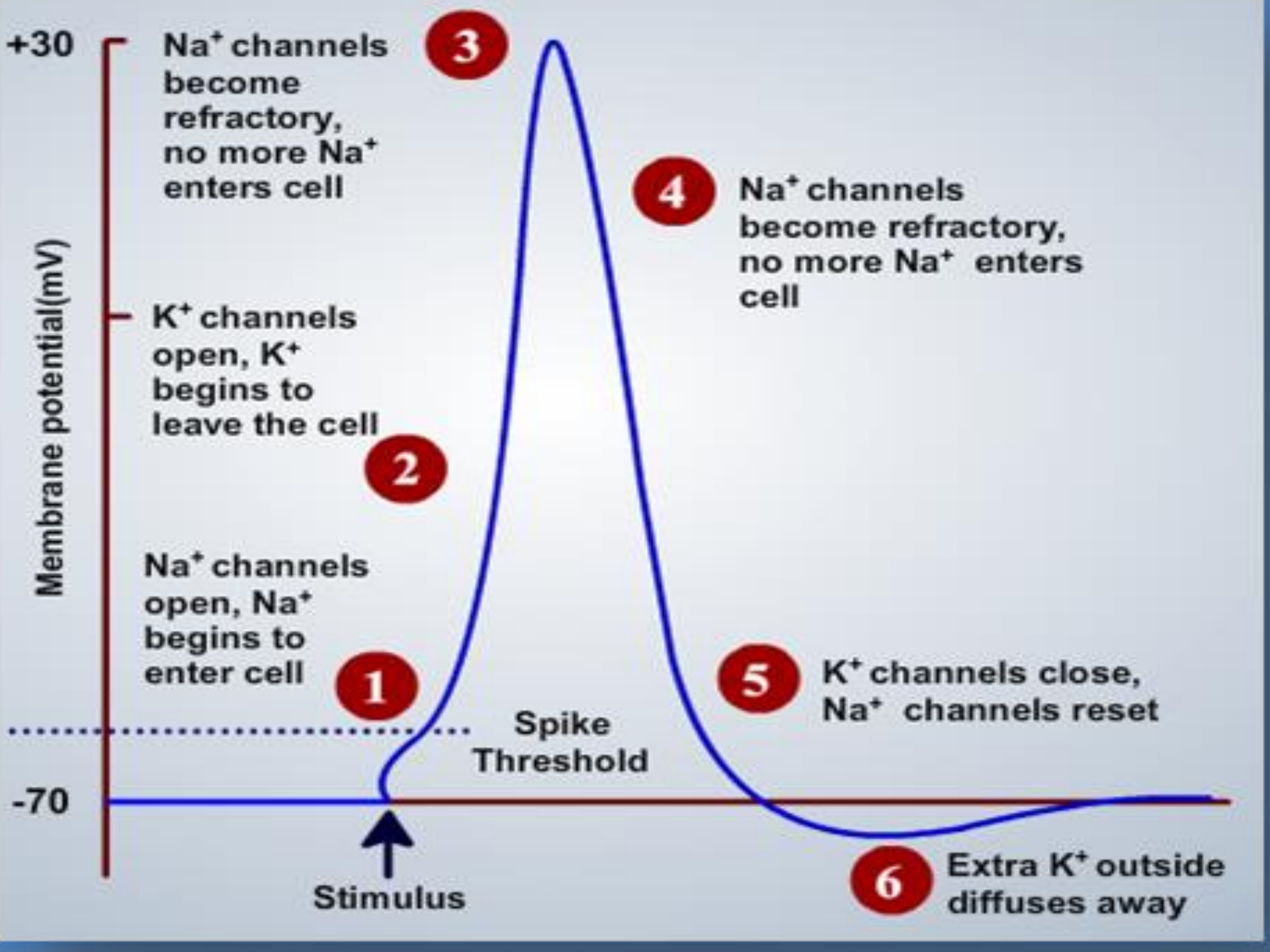
❑Depolarization:

A- An initial phase of slow depolarization. The electrical potential within the nerve becomes slightly less negative.

B- When the falling electrical potential reaches a critical level, an extremely rapid phase of depolarization results. This is termed *threshold potential, or firing threshold.*

C- This phase of rapid depolarization results in a reversal of the electrical potential across the nerve membrane.


Extracellular fluid
Na+ + + + +
Nerve membrane
Resting
K+ – – – –
Axoplasm
Normal
–70 mV
(resting potential)
A
Na+ + + + +
B
K+ – – – –
K+
Step 1, A
and B
Firing
–50 to –60 mV
(slow depolarization to
threshold potential)
C
Na+
– – – –
+ + + +
Step 1C
Potential
+40
(rapid depolarization)
Na+
+ + + +
K+ – – – –
Step 2
Repolarization
–60 to –90 mV


+30
Membrane potential(mV)
-70
Na+ channels become refractory, no more Na+ enters cell
3
Na+ channels become refractory, no more Na+ enters cell
4
K+ channels open, K+ begins to leave the cell
2
Na+ channels open, Na+ begins to enter cell
1
5
K+ channels close, Na+ channels reset
Spike Threshold
Stimulus
6
Extra K+ outside diffuses away

The depolarization occur due to an increase in permeability of the membrane to Na ions . The rapid influx of Na ions to the interior of the nerve will cause depolarization of the nerve membrane from the resting level to its firing threshold of approximately (-50) to (-60) mv , the firing threshold is actually the magnitude of the decrease in the negative membrane potential that is required to initiate an action potential (impulse) , when firing threshold is reached, the permeability of the membrane to Na increases and at the end of depolarization the electrical potential of the nerve is reversed an electrical potential of (+40) mv exists, **this process takes 0.3 millisecond.**

❑Repolarization

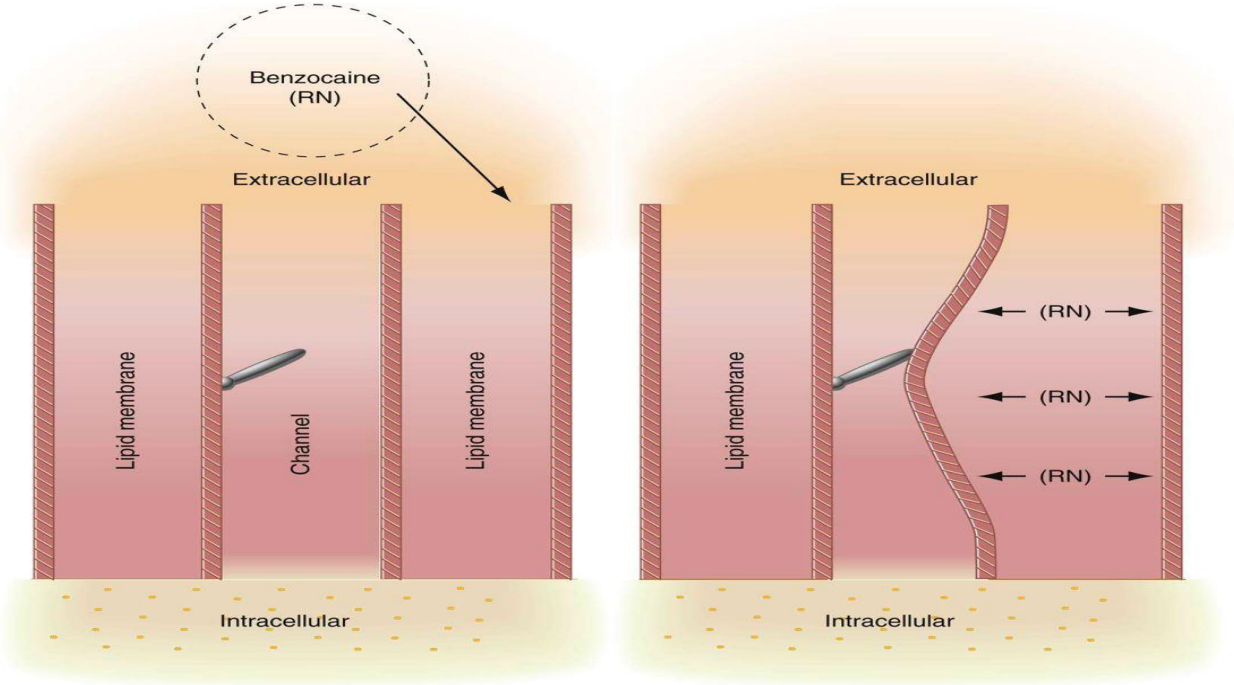
It occurs at the end of the various phases of depolarization , the electrical potential gradually becomes more negative inside the nerve relative to the outside until the original resting potential of - 70 mv is restored, this is achieved by increasing permeability to k ions , and thus K ions move to the outside leading to membrane re - polarization and return to Its resting potential (- 70 mv) , this process takes 0.7 milliseconds.

- The movement of Na ions to the inside of the nerve during depolarization and the movement of K ions out of the nerve during re - polarization are *passive process (not require energy)* since each ions moves along its concentration gradient . When the nerve return to its resting state a slight excess of Na ions exist within the nerve cell and slight excess of K Ions exist extracellularly , accordingly a period of metabolic activity being called sodium pump leading to the movement of Na to the outside as well as movement of K to the inside this pumping mechanism require energy that is coming from oxidative metabolism of adenosine triphosphate (ATP).Accordingly the action potential could be defined as a transient membrane depolarization that result from a brief increase in the permeability of the membrane to sodium and also from delayed increase in the permeability to potassium. Once an impulse has been initiated it moves along the surface of the axon to the CNS.

Mechanism of action of local anesthesia

The concept behind the action of L .A is that it prevents both the generation and the conduction of a never impulse . Many theories have been suggested to explain the mechanism of action of L.A , in general the nerve membrane is the site at which Local anesthetic agents exert their pharmacological actions ,*the* most popular theories are :

1- Membrane expansion theory :■» this theory states that anesthetic molecules diffuse through the nerve membrane producing a general disturbance of the bulk membrane structure and expanding some critical region in the nerve membrane and thus preventing an increase in the permeability to sodium ions thus inhibiting both conduction and nerve excitation.



2- specific receptor theory : - this is most favored theory today , **it proposes that local anesthetics act by binding to specific receptors in the sodium channel** (protein channel along the membrane } In the nerve membrane **, once the local anesthetics has gained access to these receptors permeability to Na ions is decreased or eliminated and nerve conduction is interrupted the probable mechanism.**

Factor affecting local anesthetic action

1- PH value

It is well known that the PH of local anesthetic solution and the PH of the tissue into which It is injected greatly influences its nerve blocking action **Acidification of the tissue decreases local anesthetic effectiveness** .inadequate anesthesia results when local anesthetics are injected into inflamed or infected areas since the inflammatory process produces acidic products.

2- lipid solubility

Increased lipid solubility of local anesthetics permit the anesthetic to penetrate the nerve membrane more easily. Local anesthetics with greater lipid solubility produce more effective conduction blockage at lower concentrations than less lipid soluble solutions.

3- protein binding

The degree of protein binding of the anesthetic molecule is responsible for the duration of local anesthetic activity. Local anesthetic possessing a great degree of protein binding appear to attach more securely to the protein sites and to possess a longer duration of clinical activity.

4-vasodilator activity

Local anesthetic solution with greater vasodilator activity will increase blood flow to the area , this will lead to rapid removal of anesthetic molecules from the injection site , decreasing anesthetic potency and duration.

Duration of local anesthesia

- **1**- ***protein binding :*** the rate at which an anesthetic is removed from a nerve has an effect on the duration of nerve block , longer acting local anesthetic are more firmly bound to the nerve than shorter acting drug and are therefore released from the receptor sites in the sodium channels more slowly.

2-- ***vascularity of the injection site*** : the duration is increased in areas of decreased vascularity

3- *presence or absence of vasoactive substance* ; the addition of a vasopressor into local anesthetic solution decrease the tissue perfusion thus increasing the duration of action .

component of local anesthesia

Vasoconstrictors: are drugs or chemical agents that constrict blood vessels thereby control tissue perfusion , They are added to local anesthetic solutions to oppose the vasodilatation actions of local anesthetics . All inject able local anesthetics posses some degree of vasodilating activity . The degree of vasodilatation varies from one type to another and may vary according to the site of injection and individual patient response .

After local anesthetic injection into tissue , blood vessel dilate in the area , resulting in an increased blood flow to the site . This increase in perfusion leads to the following reactions :

1- increased rate of absorption of the local anesthetic into the cardiovascular system ,which in turn removes it from the injection site.

2- increased plasma level of the local anesthetic , with an increased risk of local anesthetic toxicity .

3- decreased duration of action and decreased depth of anesthesia because it diffuses away from the injection site more rapidly .

4- increased bleeding at the site of injection due to increased perfusion

The advantages of additions of vasoconstrictors to local anesthetic solution are: -

A - By vasoconsrticting blood vessel , vasoconstrictors decrease blood flow (perfusion) to the site of the injection .

B - Absorption of the local anesthetics into the cardiovascular system is slowed resulting in lower anesthetic blood levels .

C - The lower local anesthetic blood levels decrease the risk of local anesthetic toxicity.

D - Higher volumes of the local anesthetic agent remain in and around the nerve for longer periods thereby increasing the duration of action of local anesthetics .

E - Vasoconstrictor decrease bleeding in the site of injection and are useful when increased bleeding is anticipated (ex: during a surgical procedure) .

Classification of vasoconstrictor

These drugs can be classified on the basis of mode of action , into the following three categories :

1- Direct acting drugs : these drugs stimulate or exert their action directly on the adrenergic receptors , for example epinephrine , nor epinephrine, levonordefrine .

2- Indirect acting drugs : These drugs act by releasing nor epinephrine from the adrenergic nerve terminals , for example tyramine , amphetamine .

3- Mixed acting drugs : These drugs have both direct and indirect actions , for example ephedrine .

All the vasoconstrictors used in conjunction with local anesthetic are direct acting agents .

Type of the vasoconstrictors : -

A - Epinephrine (adrenaline)

Epinephrine remains the most effective and the most commonly used vasoconstrictor in medicine and dentistry .

Sources :- it is secreted primarily by adrenal medulla . It is available as synthetic and is also obtained from adrenal medulla of animals .

Mode of action : - it acts directly on both alpha and beta adrenergic receptors .

Systemic action : -

1- cardiovascular system

It causes increased systolic and diastolic blood pressure increased heart rate and strength of contraction ,increased stroke volume and cardiac output ,and it causes increased myocardial Oxygen consumption On blood vessel it cause vasoconstriction and so frequently used a lone as a vasoconstrictor for hemostasis during surgical procedures .

- respiratory system

Adrenaline is a potent dilator of the smooth muscle of the bronchiole , so it is the drug of choice for management of acute asthma .

- central nervous system

In the usual therapeutic dosage adrenaline is not a potent CNS stimulant, CNS stimulation occurs when an excessive dosage is given .

Availability in dentistry

Adrenaline is the most potent and widely used vasoconstrictor in dentistry . it is available in 1 : 50 000 , 1 : 80 000 ,1 : 100 000 , 1: 200 000 dilution

Maximum dosage :

This drug is potent, and can produce undesirable results A - if used in large volumes B - if inadvertently injected intravascularly .

So these drugs should be used with consideration to their benefits and risks . The maximum doses is 0.2 mg. For patient with clinically significant cardiovascular disease The max dose is 0.04 mg

B- Nor epinephrine (nor adrenaline)

Source : either synthetic or obtained from adrenal medulla of animals . **Mode of action** : it act almost exclusively on alpha receptors . it also stimulate beta receptors in the heart , it has one fourth of adrenaline potency .

Systemic action

- on cardiovascular system

It causes increased systolic blood pressure , decreased heart rate , slightly decrease in cardiac output increased stroke volume . On the blood vessel it cause vasoconstriction .

- on respiratory system

It dose not relax the smooth muscle as do adrenaline and it is not clinically effective in the management of bronchospasm .

3-onCNS

In the usual therapeutic dose nor epinephrine is not potent CNS stimulant.

Availability in dentistry:

Nor epinephrine is used with local anesthesia as vasoconstrictor in a 1: 30 000 dilution .

Maximum recommended dose,: -

for normal healthy adult patient the maximum recommended dose is 0.34 **mg per appointment. For patient with clinically significant cardiovascular disease 0. 14 mg.**

C — Levonordifrine

It is synthetic substance , it act through direct alpha receptor stimulation with some beta activity , it produces less cardiac and CNS stimulation than epinephrine dose it is mainly used with mepivacaine in a 1 : 20 000 dilution.

the maximum dose for all patient should be 1 mg per appointment that mean 20 ml of a 1:20000 dilution (11 cartridge).

,

D - Felypressine

Source : it is a synthetic analogue of the anti diuretic hormone (vasopressin) . it is a non sympathomimetics drug and is categorized as vasoconstrictor.

Mode of action it act as direct stimulant of vascular smooth muscle .

Systemic action

- Heart: no direct effect.
- Blood vessel : in high doses Felypressine - induced constriction of the cutaneous blood vessel.
- CNS : no effect.
- Uterus : it has oxytocic action so it is contraindicated for pregnant patients .

Availability in dentistry

It is used in dentistry in a dilution of 0.03 IU / ml with 3 % prilocaine . Maximum dose is 0.27 IU that's mean 9 ml of 0.03 IU / ml.

Selection of a vasoconstrictor

The selection of an appropriate vasoconstrictor is based on following factors :

- - Length of the surgical or dental procedure .
- - Requirement for hemostasis during the surgical procedure .
- - Requirement for postoperative pain control .
- - Medical or physical status of the patient and if used any medications

1 - Length of the surgical procedure

The duration of pulpal and hard tissue anesthesia with 2% lidocaine only lasts for 10 min , the addition of adrenaline of 1 : 50 000 or 1: 100 000 dilution prolong the duration to 60 min

- Hence for any surgical treatment requiring 40 -50 min it is difficult to achieve pulpal anesthesia without using a vasoconstrictor.

- 2-- Requirement of hemostasis

Some of the vasoconstrictors are effective in minimizing the blood loss during the surgical procedure as adrenaline , others as Felypressine which is of minimal value in achieving hemostasis .

3- Requirement of postoperative pain control

- Profound pain control of adequate duration by a local anesthetic agent with a vasoconstrictor is used .Plain local anesthetic agent produce pulpal anesthesia of shorter duration than that of local anesthetic agent with vasoconstrictor and is likely to produce stress response .

4- Medical "or physical status of the patient and medication used

The benefit and risks of including a vasoconstrictor in a local anesthetic solution in patients who are medically compromised must be weighed against benefits and risks of using plain anesthesia .

For the following group of patients the use of local anesthetic agents with vasoconstrictor is contraindicated :

- A - Patients with significant cardiovascular disease such as ischemic heart disease /hypertension , cerebral strokes .
- B - Patients with certain uncontrolled non - cardiovascular disease such as thyrotoxicosis or hyperthyroid states.
- C - Patients receiving monoamine - oxidase inhibitors , tricyclic antidepressant

Reducing agent

Vasoconstrictors in local anesthetic solution are unstable and maybe oxidize especially on prolonged exposure to sunlight and this will lead to brown discoloration of the solution , to overcome this problem a small quantity of antioxidant as sodium bisulphate is added to the cartridges ,this substance reacts with Oxygen before oxygen can destroy the vasoconstrictor (adrenaline or nor adrenaline) so it protects their stability.

Preservative

The sterility of local anesthetic solution is maintained by the inclusion of small amount of preservative . A number of chemicals are used as general preservatives , these are added to increase the shelf-life ,and include :

- 1 - Methylparaben which is bacteristatic and fungistatic agent

2-Thymol which is antiseptic , fungistatic

- **Fungicide**

In the past some solutions tended to become cloudy due to the proliferation of minute fungi, now a small quantity of thymole is added to serve as a fungicide and prevent this occurrence .

- **Sodium chloride (Nacl) or Ringers solution**

The anesthetic agent and the additives mentioned above are dissolved in modified ringers solution . It is added to content of the cartridge to make the solution isotonic with the tissue of the body This isotonic vehicle minimizes the discomfort during injection of local anesthesia .

- **Distilled water**

It is used as a diluents to provide the volume of solution in the dental cartridge .


Thank you

Surgical anatomy in relation to local anesthesia

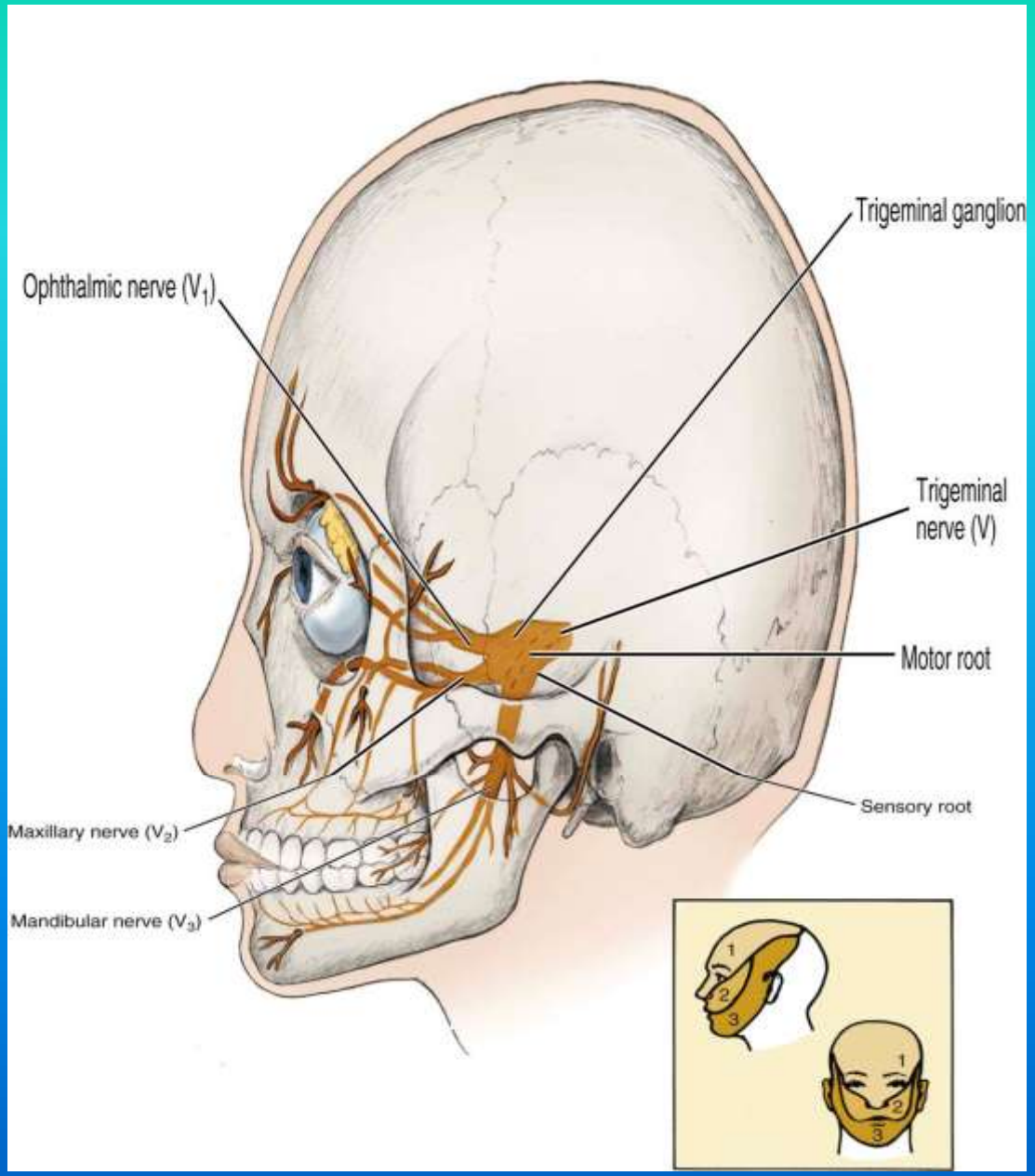
The skull bones involved in the local anesthetic administration are the maxilla , palatine bone , and the mandible . soft tissues of the face and oral cavity may serve the dental professional as initial landmarks to visualize and palpate for local anesthesia . The dental professional must also know the location of certain adjacent soft tissue structures such as major blood vessel and glandular tissue . The dental professional must have an increased level of knowledge of the nervous system of the head and neck especially the fifth { V) cranial or trigeminal nerve which is the largest cranial nerve composed of a large sensory root and a small motor root , the trigeminal nerve supplies sensation to meninges, skin of the anterior part of the head ,nasal and oral cavities and the teeth . it provides motor innervations to the muscles of mastication and other muscles in the region .

- The trigeminal nerve divided into three branches which are

1-Ophthalmic nerve.

2-Maxillary nerve.

3-Mandibular nerve

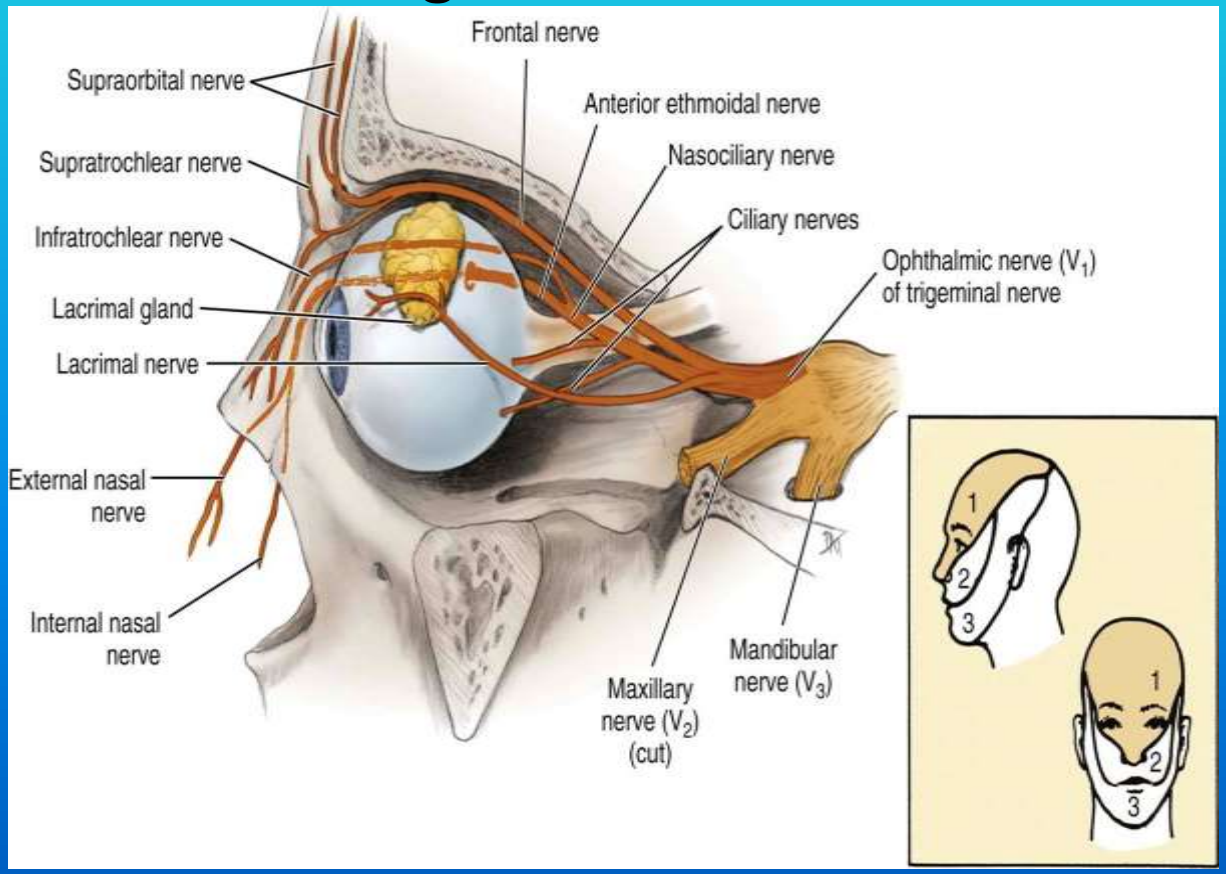


Ophthalmic nerve It is the smallest branch of the trigeminal nerve which transmit sensory innervations from eyeballs, conjunctiva, skin of the upper face and anterior scalp , the lining of the upper part of the nasal cavity and paranasal air sinuses, and the meninges of the anterior cranial fossa .The ophthalmic nerve have the following terminal branches

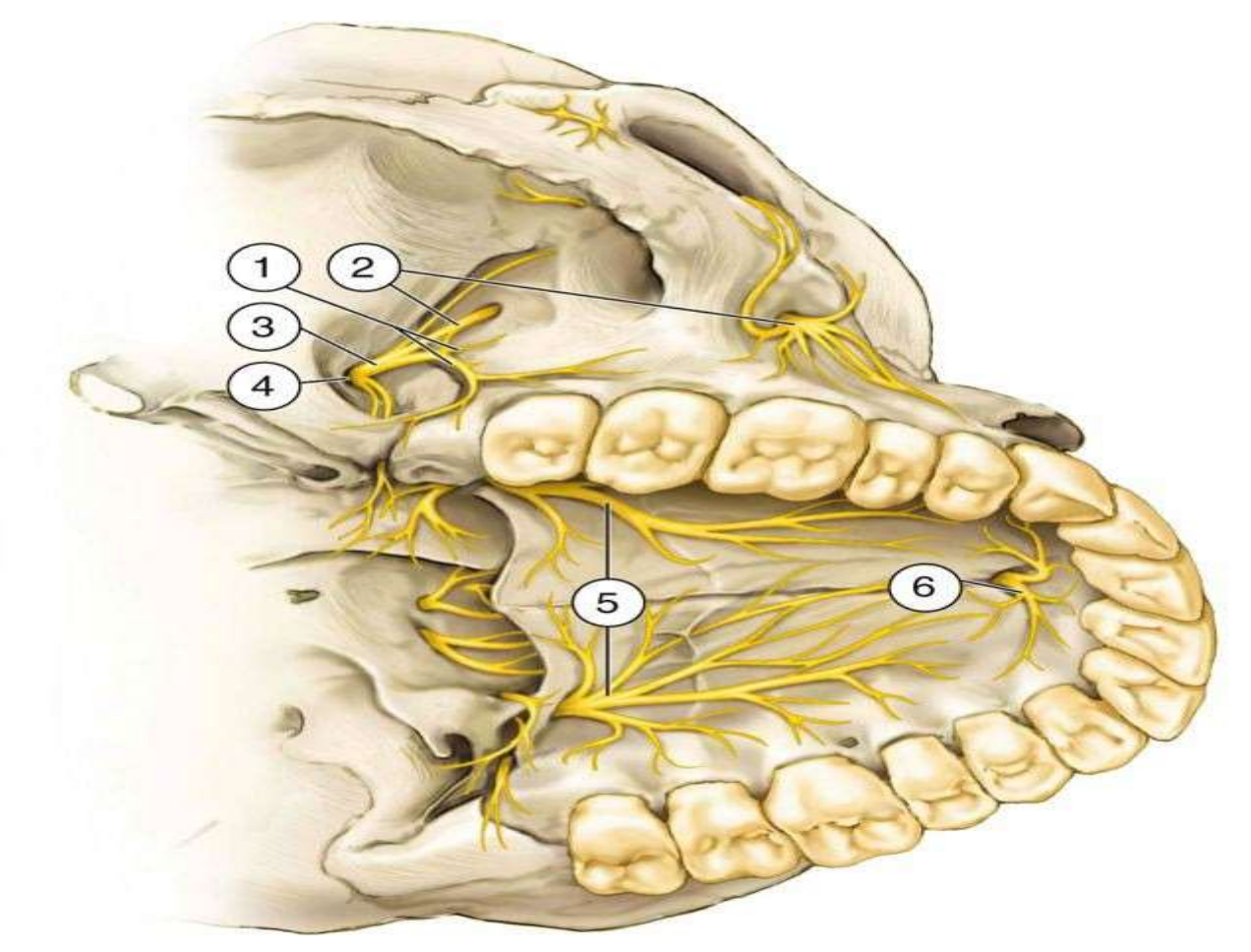
A - Lacrimal nerve.

B - Frontal nerve.

C- Nasociliary nerve .



Maxillary nerve: It is the second division of the trigeminal nerve , is purely sensory, and is intermediate in size between ophthalmic and mandibular nerves . It transmit sensory fibers from the skin of the face between the lower eyelid and the mouth , from the nasal cavity and the sinuses, from the maxillary teeth and from the maxilla.



1- Branches within the cranium

A- Middle meningeal nerve

2- Branches within the pterygopalatine fossa

A- Zygomatic nerve:

- ❖Zygomaticotemporal nerve
- ❖Zygomaticofacial nerve

B- Pterygopalatine nerves

- ❖Orbital branches
- ❖Nasal branches
- ➢*Nasopalatine nerve*
- ❖Palatine branches

- *Greater (anterior) palatine nerve*
- Lesser (middle and posterior) palatine nerves
  - Pharyngeal branch

C-Posterior superior alveolar nerve

3- Branches within the infraorbital canal

A- *Middle superior alveolar nerve.*

B- *Anterior superior alveolar nerve.*

4- Branches on the face

A- Inferior palpebral branches

B- External nasal branches

C- Superior labial branches

Branches within the pterygopalatine fossa:

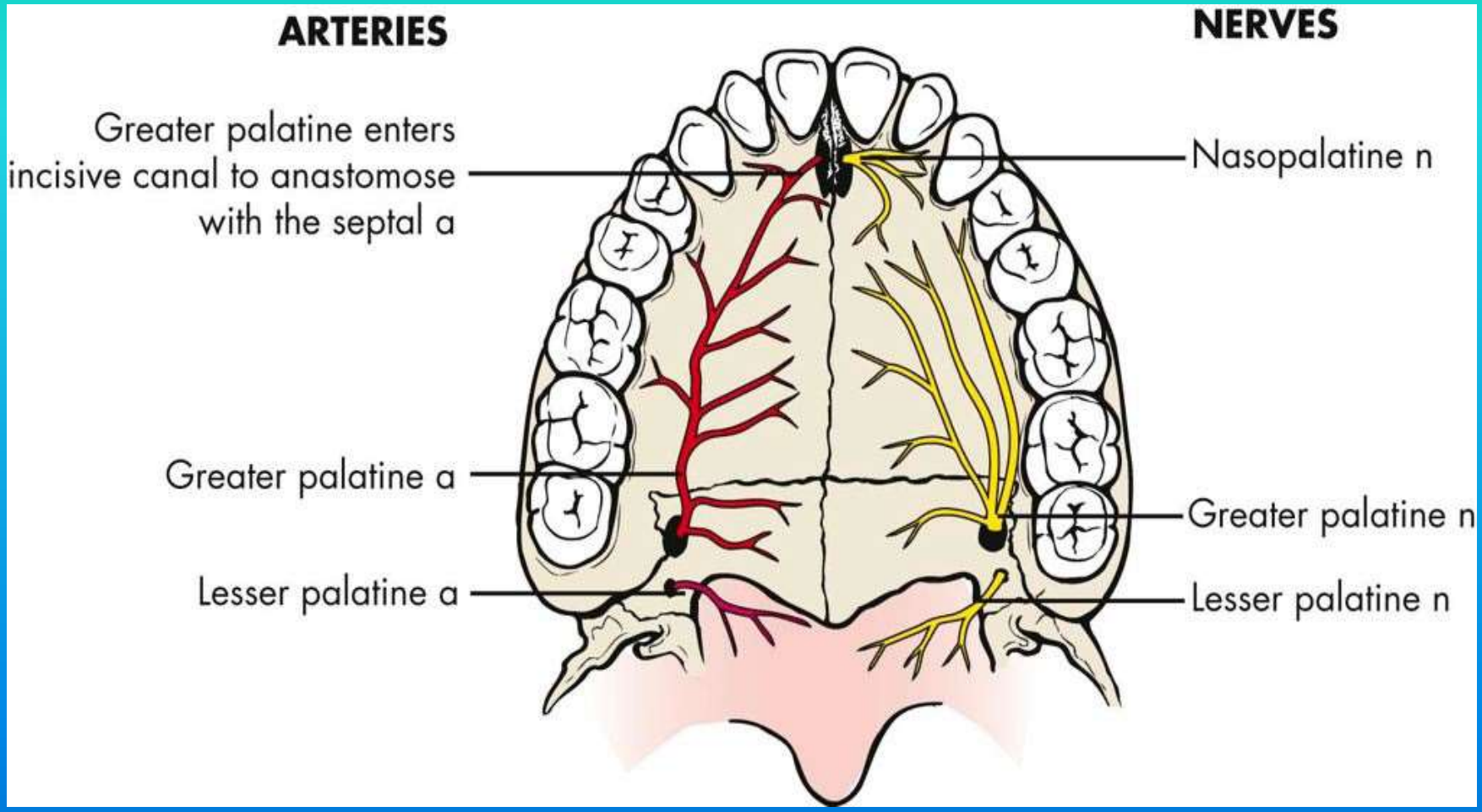
B- Pterygopalatine nerves

By way of pterygopalatine ganglion , the maxillary nerve have the following branches , all of which carry sensory , secretomotor , and sympathetic fibers and are divided into four groups to supply four areas : orbit, nose , palate and the pharynx .

- Nasal branches The most important one is the nasopalatine nerve which supplies the roof of the nasal cavity , nasal septum and the floor of the nasal cavity then it enters the incisive canal through which it passes into the oral cavity via the incisive foramen , located in the midline of hard palate , about 1 cm posterior to maxillary central incisors . The right and the left nasopalatine nerves emerge together through the foramen and provide sensory innervations to palatal mucosa in the region of premaxilla (central incisor, lateral incisors, and canines).

- palatine branches which are the greater palatine nerve and the lesser palatine nerve.

- The greater palatine nerve provides sensory supply to the hard palate , it emerges on hard palate through the greater palatine foramen which is usually located about 1 cm towards the palatal midline, just distal to second molar . The nerve crosses anteriorly between mucoperiosteum and osseous hard palate supplying sensory innervations to palatal soft tissue and bone up to the canine / first premolar, where it communicates with terminal fibers of nasopalatine nerves . it also provides sensory innervations to some parts of soft palate . it supplies all the hard palate except that in the incisor area .
- The lesser palatine nerve supplies sensory innervations to the soft palate .


ARTERIES
NERVES
Greater palatine enters incisive canal to anastomose with the septal a
Nasopalatine n
Greater palatine a
Greater palatine n
Lesser palatine a
Lesser palatine n

C - posterior superior alveolar nerves These nerves are 2 - 3 in number they emerge through the pterygomaxillary fissure and reach the posterior surface of the maxilla . when more than two one branch remains external to bone, to provide sensory innervations to buccal gingival in maxillary molar region and adjacent facial mucosal surfaces . The other branch enters maxilla and provide sensory innervations to the alveolar bone , buccal periodontal ligament and pulpal tissue of maxillary molars, with the exception of mesiobuccal root of the first molar.

3-in the infraorbital canal We have two branches

A - Middle superior alveolar nerve : - which originated in the infraorbital canal and run downward supplying adjacent lining of maxillary sinus , pulp of premoiars and mesiobuccal root of first molar , buccal periodontal tissues , buccal soft tissues and alveolar bone in the premolar region .

B - Anterior superior alveolar nerve : - It is a relatively larger branch . It is given off in the infraorbital canal, it provides innervations to the central and lateral incisors and canines ,as well as sensory innervations to the adjacent lining of maxillary sinus , buccal periodontal tissues, buccal bone and buccal gingival of these teeth .

Mandibular nerve : - It is the largest of the three divisions of the trigeminal nerve . It is a mixed nerve and consist of two roots, a large sensory root and a small motor root.It gives off branches in three areas:

A - Branches from the undivided trunk:

1-Meningeal branch.

2 - Nerve to the medial pteygoid muscle(motor).

B - Branches from the anterior trunk which provide:

1-motor innervations to the muscle of mastication.

C - branches from the posterior trunk which are primarily sensory with a small motor component and they are:

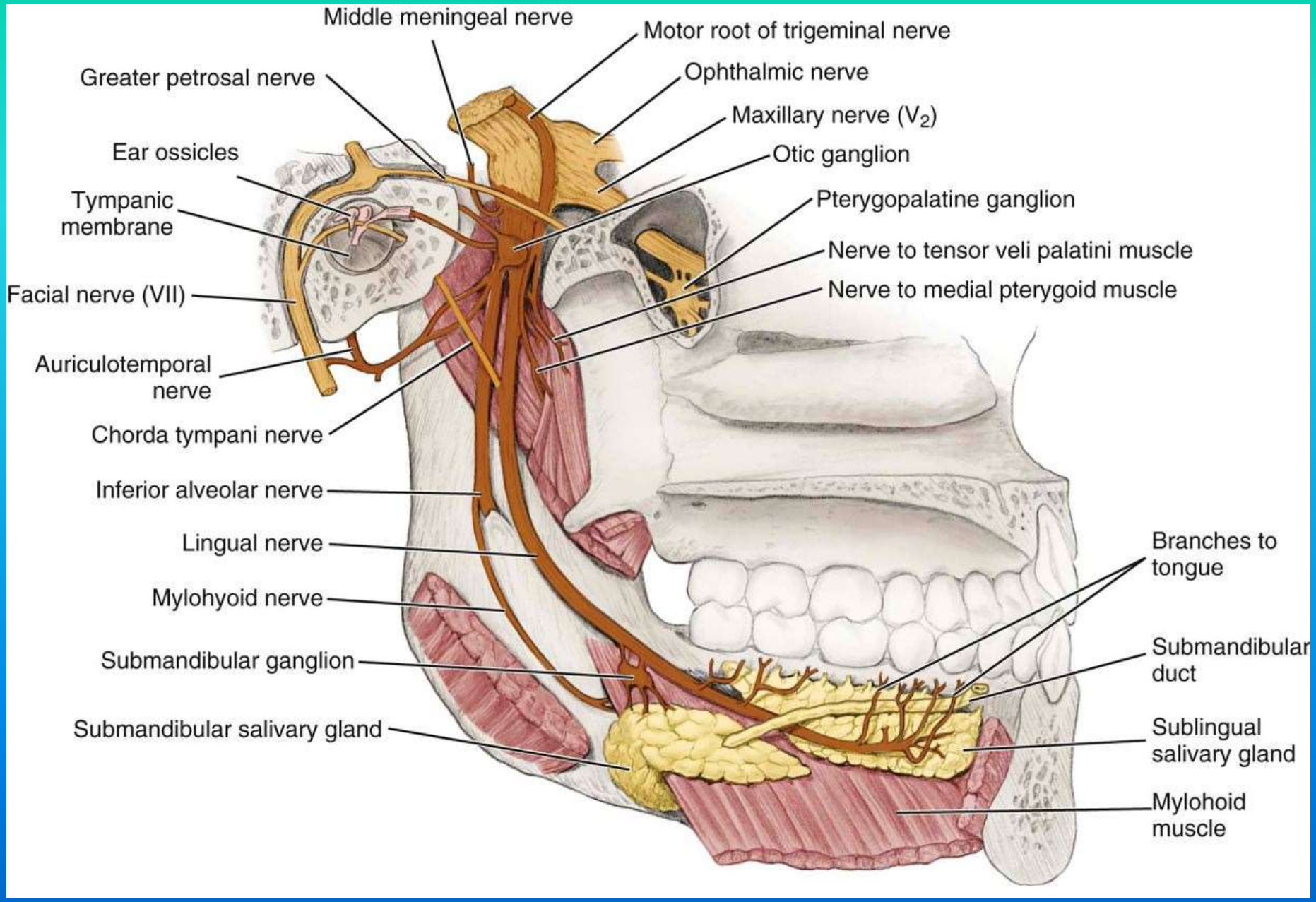
1- Auriculotemporal nerve which supplies the temporomandibular joint , parotid fascia .

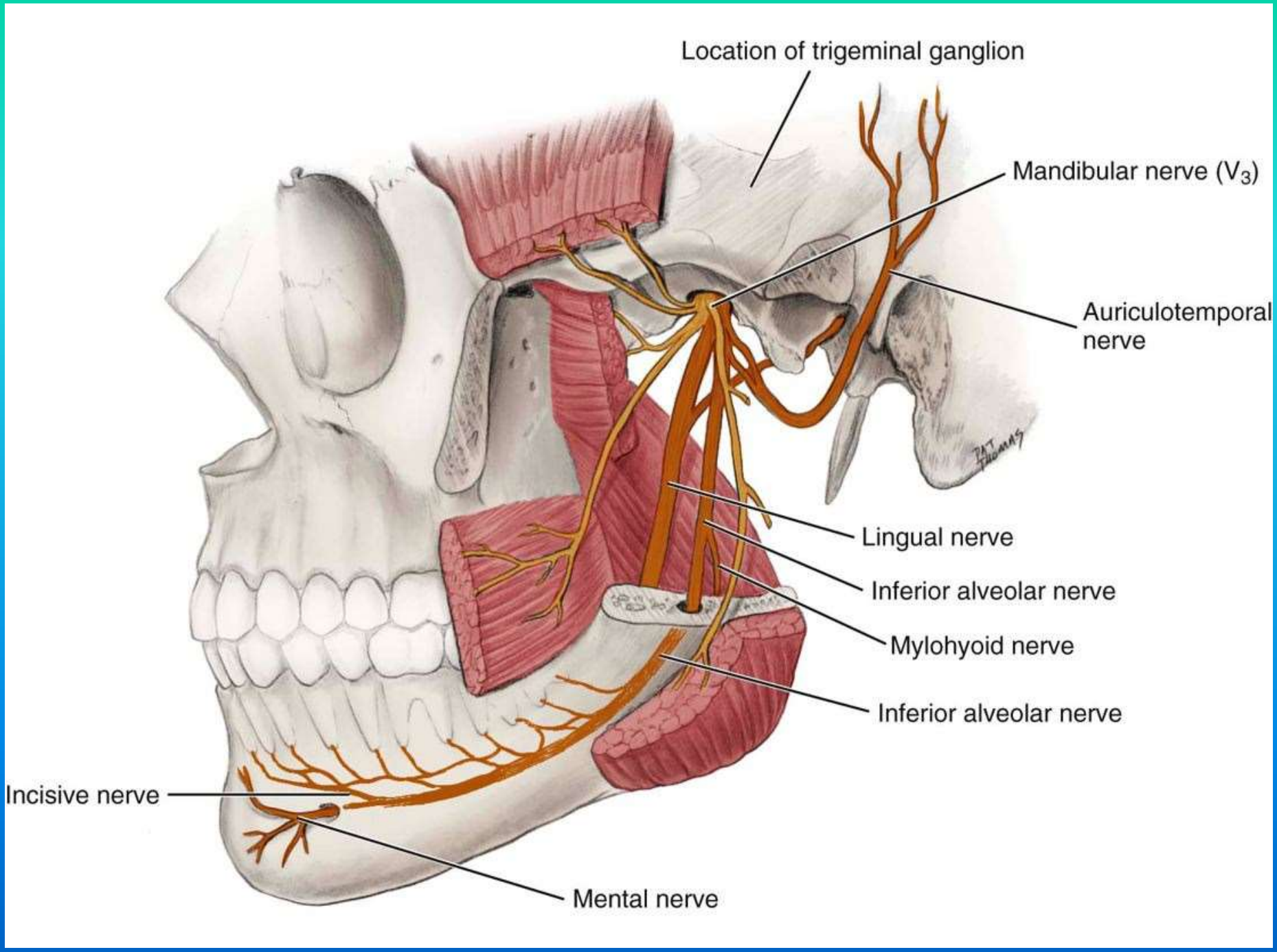
2- Lingual nerve which provides sensory innervations to the gingiva on the lingual side of the mandible from the last molar to the central incisor up to the midline , to the mucous membrane of the floor of the mouth , to the sublingual and submandibular salivary glands , and to the mucous membrane of the anterior 2 / 3rds of the tongue .

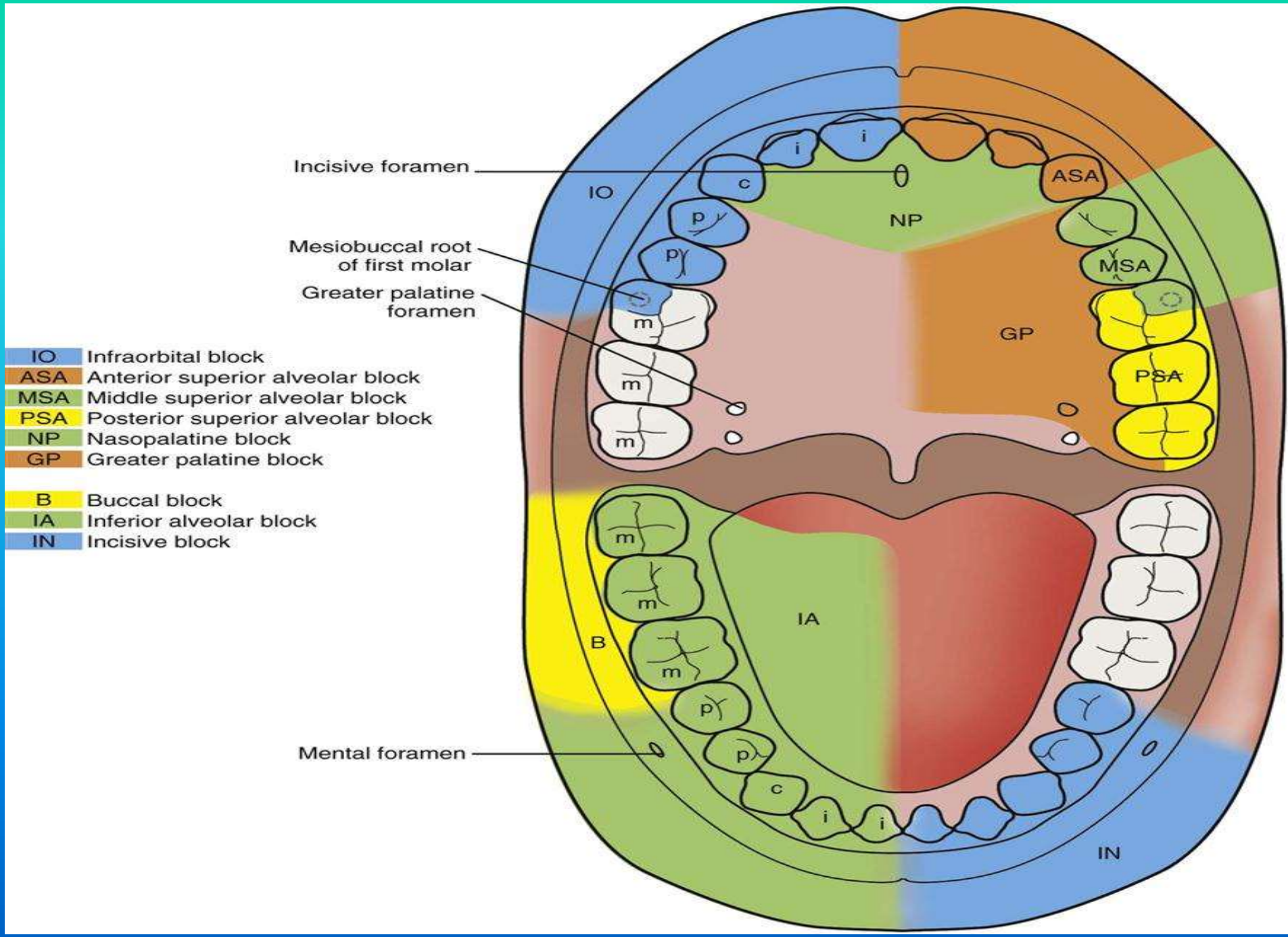
3- Inferior alveolar nerve which is the largest branch of the mandibular nerve where it enters the mandibular canal at the level of the mandibular foramen , throughout its path it is accompanied by inferior alveolar artery and inferior alveolar vein . in the mandibular canal the three structures together are referred as inferior alveolar **neurovascular bundle** . it supplies the inferior portion of the ramus of the mandible , entire body of the mandible , and pulps of the mandibular molars and premolars , the nerve , artery and vein travel anteriorly in the mandibular canal as far forward as mental foramen which is located at a point below and between the roots of the premolars where the nerve divided into its terminal branches which are :

1- Mental nerve which supplies the skin of the chin, skin and the mucous membrane of the lower lip, and the buccal mucosa from the incisor to the premolars.

2- Incisive nerve which is the smaller terminal branch and the continuation of the inferior alveolar nerve , within the substance of the body of the mandible , anterior to the mental foramen . It supplies the **pulps of the anterior teeth** , central and lateral incisors and canine and sometimes the first bicuspid , supporting alveolar bone , periodontal ligament , and the overlying soft tissue anterior to the mental foramen.


Middle meningeal nerve
Motor root of trigeminal nerve
Greater petrosal nerve
Ophthalmic nerve
Maxillary nerve (V_2)
Ear ossicles
Otic ganglion
Tympanic membrane
Pterygopalatine ganglion
Nerve to tensor veli palatini muscle
Facial nerve (VII)
Nerve to medial pterygoid muscle
Auriculotemporal nerve
Chorda tympani nerve
Inferior alveolar nerve
Lingual nerve
Branches to tongue
Mylohyoid nerve
Submandibular ganglion
Submandibular duct
Submandibular salivary gland
Sublingual salivary gland
Mylohoid muscle


Location of trigeminal ganglion
Mandibular nerve (V_3)
Auriculotemporal nerve
Lingual nerve
Inferior alveolar nerve
Mylohyoid nerve
Inferior alveolar nerve
Incisive nerve
Mental nerve



IO Infraorbital block
ASA Anterior superior alveolar block
MSA Middle superior alveolar block
PSA Posterior superior alveolar block
NP Nasopalatine block
GP Greater palatine block

B Buccal block
IA Inferior alveolar block
IN Incisive block


Thank you

Basic techniques of local anesthesia

There are several methods of achieving pain control with local anesthetic agents a variety of techniques used in administration and deposition of these local anesthetic agents which include : -

1- Topical anesthetic technique (surface or topical anesthesia)

2- infiltration technique

3- Block technique (regional)

The selection of the type of local anesthesia depends on the area and the type of the surgery.

1- Topical or surface anaesthesia

By this method small terminal nerves in the surface area of the intact mucosa or the skin up to the depth of about 2mm are anesthetized by application of local anesthetic agent directly to the area . This method commonly used to obtain anaesthesia of mucosa prior to injection , prior to carrying out incision and drainage of abscesses , we have several preparations as: -

A - **sprays** : - A spray containing an appropriate local anaesthetic agent are particularly suitable for this purpose because of their rapidity of action . the active ingredient is 10 % or 15 % lignocaine hydrochloride in water base which have rapidity of onset .The onset of time of anesthesia is approximately 1 minute and the duration of anesthesia is approximately 10 minutes .

B – ointments: Ointment containing 5 % lignocaine hydrochloride can be used for similar purpose but it takes 3-4 minutes to produce surface anesthesia

C- Emulsion: Emulsion containing 2 % lignocaine hydrochloride is also available . this is of value when full - mouth impressions have to be taken in patients who are prone to retching.

D - ethyl chloride spray: Ethyl chloride when sprayed on to either skin or mucosa volatilizes so rapidly that it quickly produces anaesthesia by refrigeration . This phenomenon is of clinical value only when the spray is directed at a limited area until snow appears . care must be taken to avoid stimulation of the pulps of adjacent teeth . this technique is of limited value but it occasionally used to produce surface anaesthesia prior to the incision of fluctuant abscesses

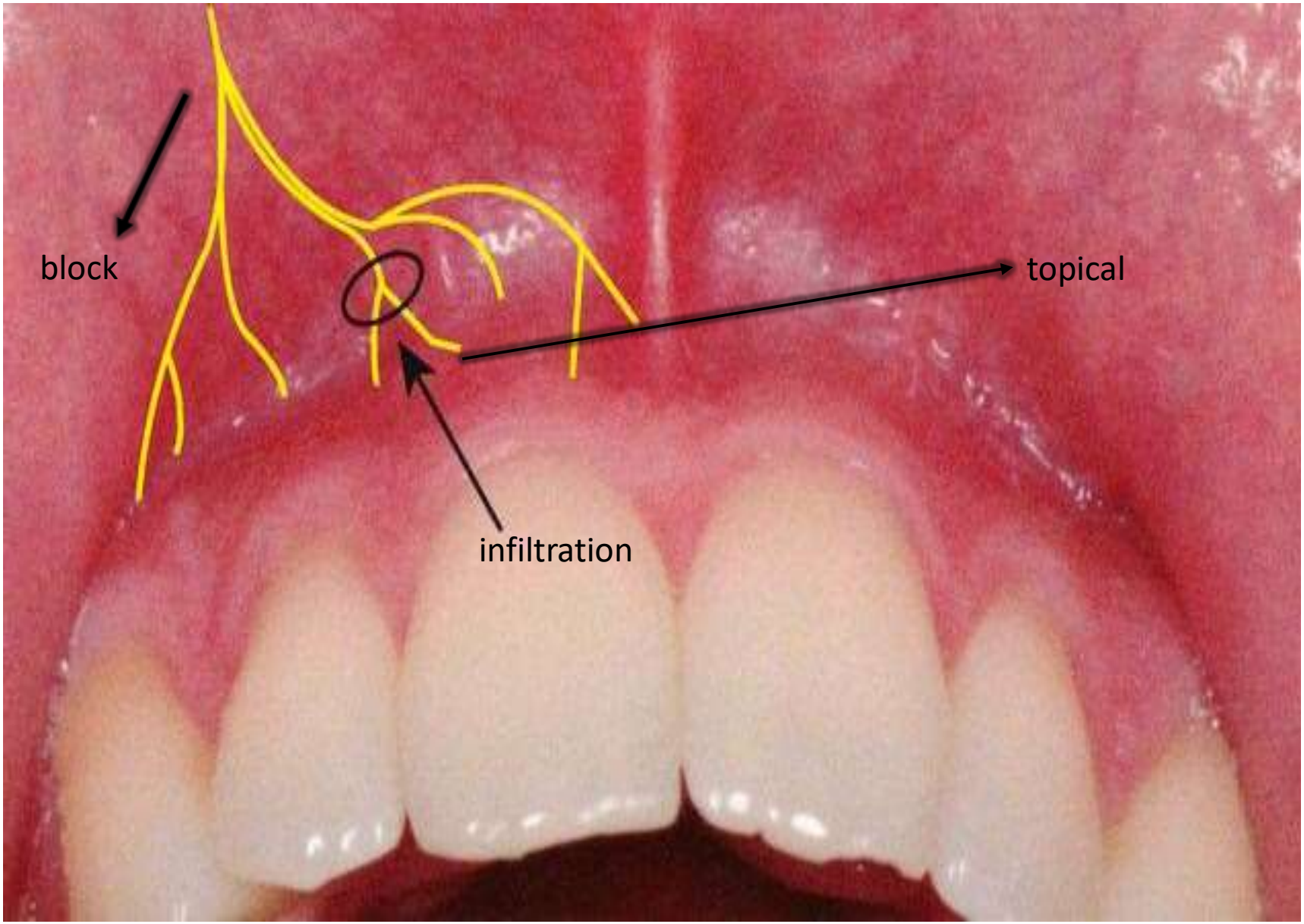
Vasoconstriction to artery that supply n. (vasa nervorum)

Used in severe pain and inflammation cases

2- Infiltration anaesthesia ; -

in this method the anaesthetic solution deposited near the terminal fibers of any nerve it will infiltrate through the tissue to reach the nerve fibers and thus produce anaesthesia of the localized area served by them .The maxilla has thin labial / buccal cortical plate , and moreover shows area of porosity , and the compact bone presents numerous foramina which aid in absorption of local anesthetic solution , these factors therefore make the maxilla more favorable for infiltration anesthesia techniques .The mandible bone is generally dense and has thicker cortical plates than the maxilla particularly in the posterior region so only the anterior part of the mandible presents sufficient porosity , which is favorable for the infiltration techniques .

We use infiltration technique only in maxilla and anterior part of mandible(from mental to mental) cuz its more porosity and child


block
topical
infiltration

Types of infiltration anesthesia

There are several types of infiltration anesthesia depending upon the site of deposition of the local anesthetic solution .On the basis of deposition site this technique include : -

A — **sub —mucous injection** : in this technique the solution is deposited just beneath the mucous membrane ,the solution diffuses through the interstitial tissue and reaches the terminal fibers of the nerve in the area of deposition of the local anesthetic solution . this technique is unlikely to produce anesthesia of the dental pulp it is often employed to anaesthetize the long buccal nerve prior to the extraction of mandibular molars or for soft tissue surgery.

B - supra - periosteal injection : in some sites , such as maxilla . the outer cortical plat of alveolar bone is thin and perforated by tiny vascular canals . in these areas when anaesthetic solution is deposited outside the periosteum . It will infiltrate through the periosteum , cortical plate and medullary bone to the nerve fibers, by this means anaesthesia of the dental pulp can be obtained by injecting alongside the approximate position of the tooth apex . the supra - periosteal injection is the technique most frequently used in dentistry.(use with buccal nb with molars)

C - sub -periosteal injection : in this technique the solution is deposited between the periosteum and the cortical plate (beneath the periosteum) . this technique is painful since the periosteum is firmly attached to the cortical plate .

D -Supplementary injections

1- Intraligamentary (**periodontal**) **injection** As the name suggests the local anesthetic solution is deposited into the periodontal ligament or membrane . The local anesthetic solution is injected along the periodontal membrane of the maxillary and mandibular teeth , using small amount of local anesthetic solution usually 0 .2 ml delivered via a specifically designed system which comprises of high pressure syringes and ultrafme needles . The high pressure forces the solution rather than causing diffusion , through the periodontal ligament to the nerves in that area . This technique can also carried out by the conventional syringes , however , care should be exercised to avoid shattering of the glass cartridges . The needle is inserted into the gingival sulcus and into the periodontal ligament. This technique can anesthetize only single individual tooth . The single rooted tooth should be injected on the mesial and the distal sides while the multi-rooted teeth are injected over each root . In oral surgery this technique is most frequently used if pain is being despite the normal techniques of infiltration or block anesthesia , this can occur with a tooth with acute pulpitis or periapical infection , it may also be of value in case of limitation of the jaw opening which makes the block injection difficult or impossible .

Use when a patient with hemophilic, severe pain and acute inflammation.

2- Intrapulpal anesthesia : - This technique is indicated for obtaining anesthesia for procedures which require direct instrumentation of the pulpal tissue . First, put a cotton ball soaked in local anesthetic solution in the cavity , wait for a minute and then a 25 or 27 gauge needle is inserted directly into the pulp chamber . The needle should be held firmly into the pulp chamber or to the root canal, initially , slight discomfort is felt by the patient which subsequently gets subsided . Sometimes the needle is bent to get a proper angle for good approach .

3- Intraosseoous injection technique: In this method **,** the local anesthetic solution is deposited directly into the cancellous bone adjacent to the tooth to be anesthetized , between the two cortical plates of the bone of maxilla and mandible . An incision is made in the mucosa and the periosteum , a small opening is made in the outer cortical layer of the bone . The drill is similar to 25 gauge needle, the needle is inserted into the opening created , and approximately 0 . 5 - 1 ml of solution is slowly injected under pressure . Anesthesia by intraosseous method will not be of very long duration , possibly between 10 -20 minutes .

Maxillary Injection Techniques:

Numerous injection techniques are available to provide clinically adequate anesthesia of the teeth and soft and hard tissues in the maxilla. Selection of the specific technique to be used is determined, in large part, by the nature of the treatment to be provided. The following techniques are available:

1- Supraperiosteal (infiltration), recommended for limited treatment protocols

2- Periodontal ligament (PDL, intraligamentary) injection, recommended as an adjunct to other techniques or for limited treatment protocols

3 Intraseptal injection, recommended primarily for periodontal surgical techniques.

4- Intraosseous (IO) injection, recommended for single teeth (primarily mandibular molars) when other techniques have failed

5-Posterior superior alveolar (PSA) nerve block, recommended for management of several molar teeth in one quadrant.

6-Middle superior alveolar (MSA) nerve block, recommended for management of premolars in one quadrant.

7- Anterior superior alveolar (ASA) nerve block, recommended for management of anterior teeth in one quadrant

8-Maxillary (V2, second division) nerve block, recommended for extensive buccal , palatal, and pulpal management in one quadrant

9- Greater (anterior) palatine nerve block, recommended for palatal soft and osseous tissue treatment distal to the canine in one quadrant

10 -Nasopalatine nerve block, recommended for palatal soft and osseous tissue management from canine to canine bilaterally

11- Anterior middle superior alveolar (AMSA) nerve block, recommended for extensive management of anterior teeth, palatal and buccal soft and hard tissues

12- Palatal approach-anterior superior alveolar (P-ASA) nerve block, recommended for treatment of maxillary anterior teeth and their palatal and facial soft and hard tissues

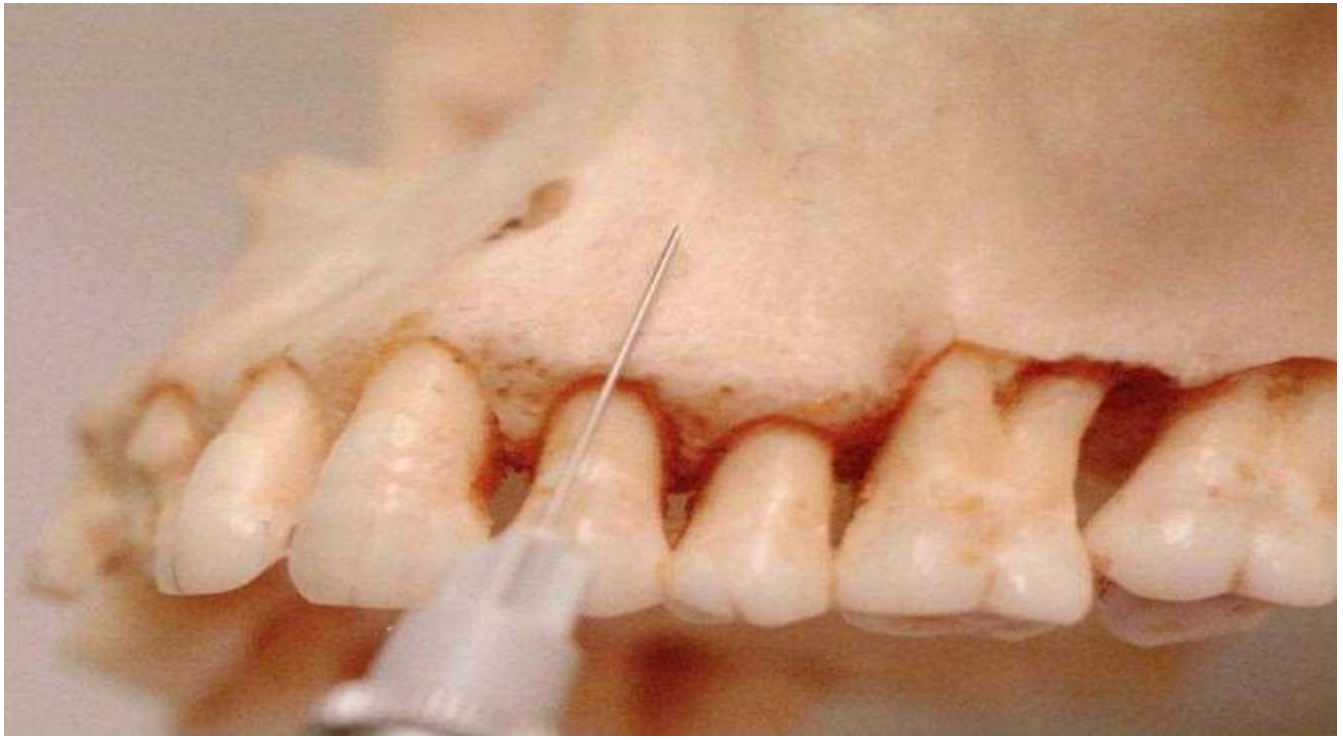
1-Supraperiosteal Injection:

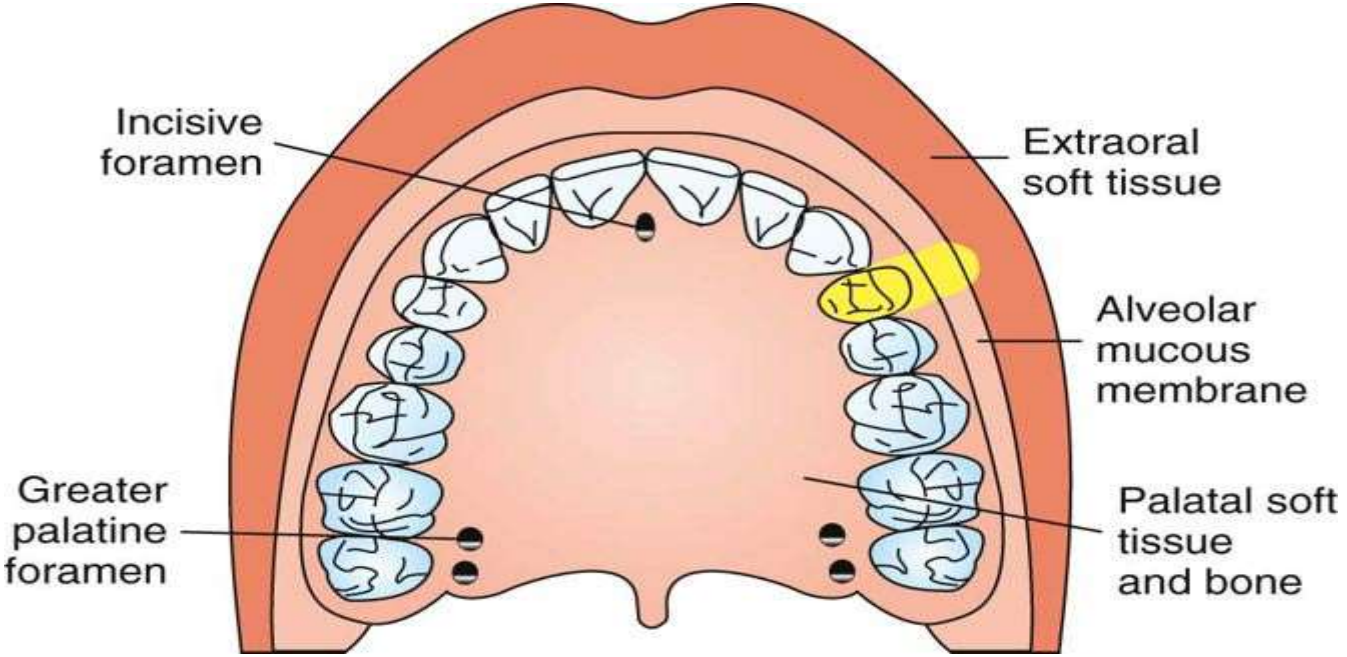
- The supraperiosteal injection, more commonly called *local infiltration*, is the most frequently used technique for obtaining pulpal and soft tissue anesthesia in circumscribed area of maxillary teeth. Although it is a simple procedure with a high success rate, The supraperiosteal injection is indicated whenever dental procedures are confined to arelatively circumscribed area in the maxillary or mandibular incisor region.

Contraindications (relative not absolute)

1 Infection or acute inflammation in the area of injection.

2-Dense bone covering the apices of teeth (can be determined only by trial and error; most likely over the permanent maxillary first molar in children, as its apex may be located beneath the zygomatic bone, which is relatively dense). The apex of an adult's central incisor may also be located beneath denser bone (e.g., of the nose), thereby increasing the failure rate (although not significantly).




Incisive foramen
Extraoral soft tissue
Alveolar mucous membrane
Greater palatine foramen
Palatal soft tissue and bone

Posterior Superior Alveolar Nerve Block:

Indications (14-16 mm)

1 When treatment in volves two or more maxillary molars

2 When supraperiosteal injection is contraindicated (e.g., with infection or acute inflammation)

3 When supraperiosteal injection has proved ineffective.

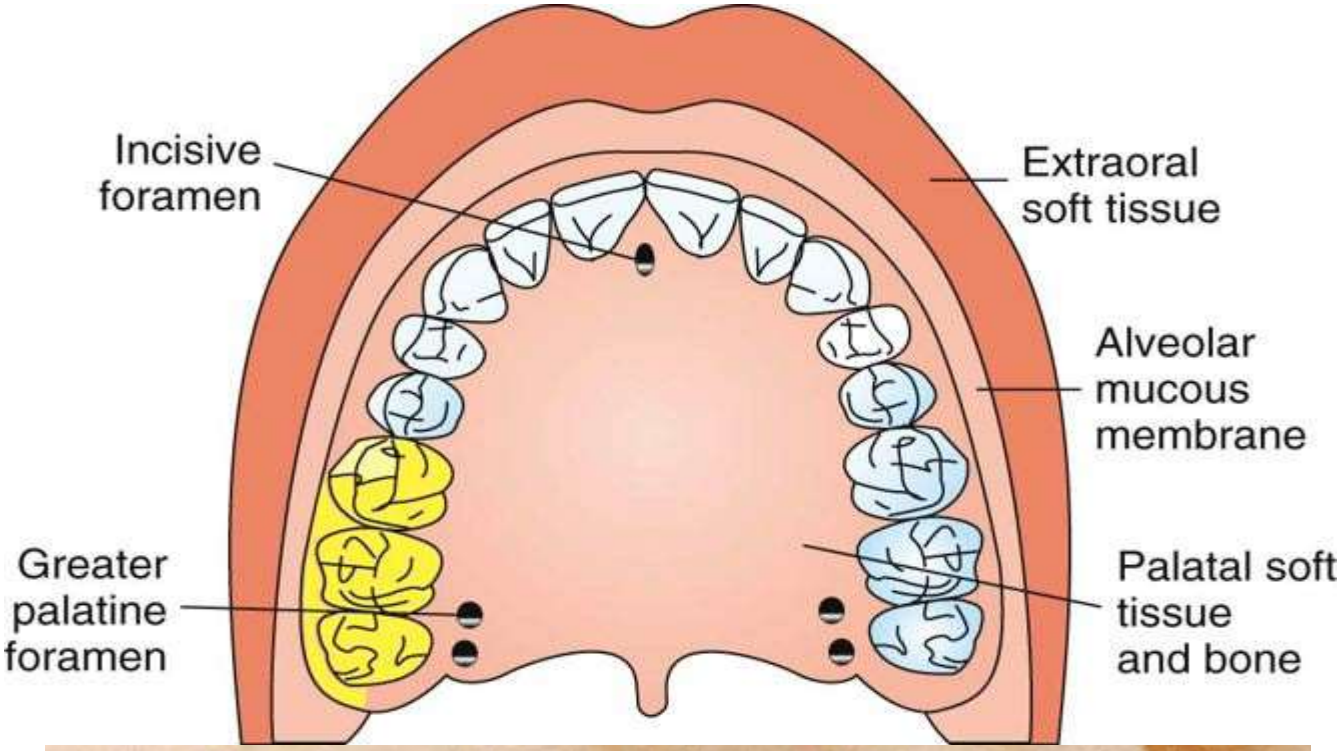
Distal surface of 2nd molar, high of vestibule (inward, backward and upward)

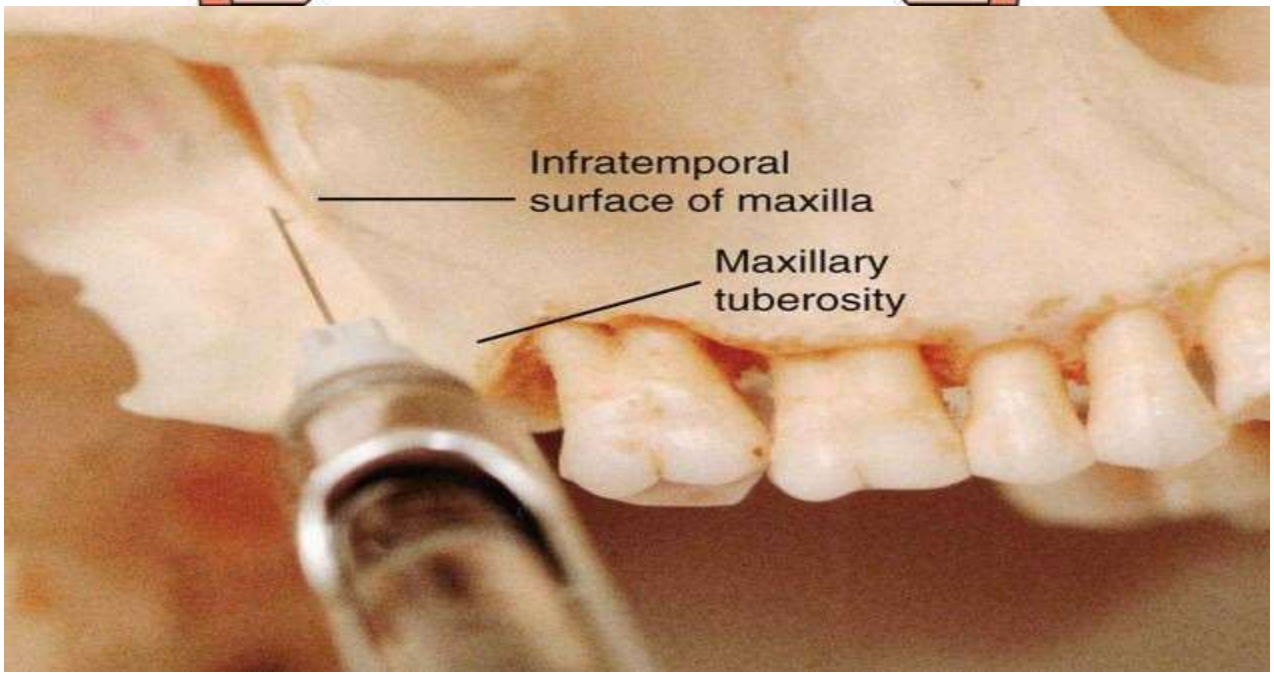
Contraindication

- When the risk of hemorrhage is too great (as with a hemophiliac), in which case a supraperiosteal or

PDL injection is recommended

- Child


Incisive foramen
Extraoral soft tissue
Alveolar mucous membrane
Greater palatine foramen
Palatal soft tissue and bone


Infratemporal surface of maxilla
Maxillary tuberosity

Multi punctures disadvantages :

1- ulceration

2- pain

3- inflammation and infection

4- more toxicity

Complications:

1- Hematoma:

A-This is commonly produced by inserting the needle too far posteriorly into the pterygoid plexus of veins. In addition, the maxillary artery may be perforated. Use of a short needle minimizes the risk of pterygoid plexus puncture.

B- A visible intraoral hematoma develops within several minutes, usually noted in the buccal tissues of the mandibular region.

2 -Mandibular anesthesia: (30-32mm)

- The mandibular division of the fifth cranial nerve (V3) is located lateral to the PSA nerves.

Middle Superior Alveolar Nerve Block:

Middle Superior Alveolar Nerve found in 28% of people

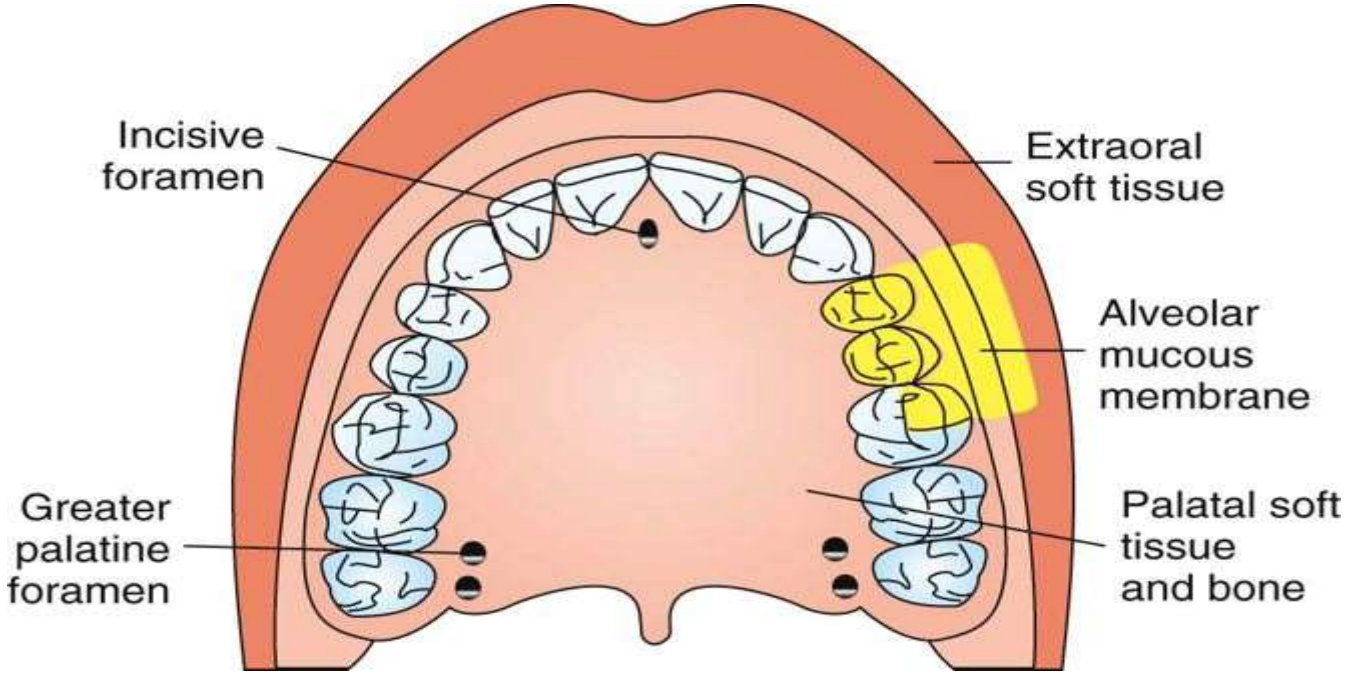
-height of mucobuccal fold. Distal and apex to the 2nd molar

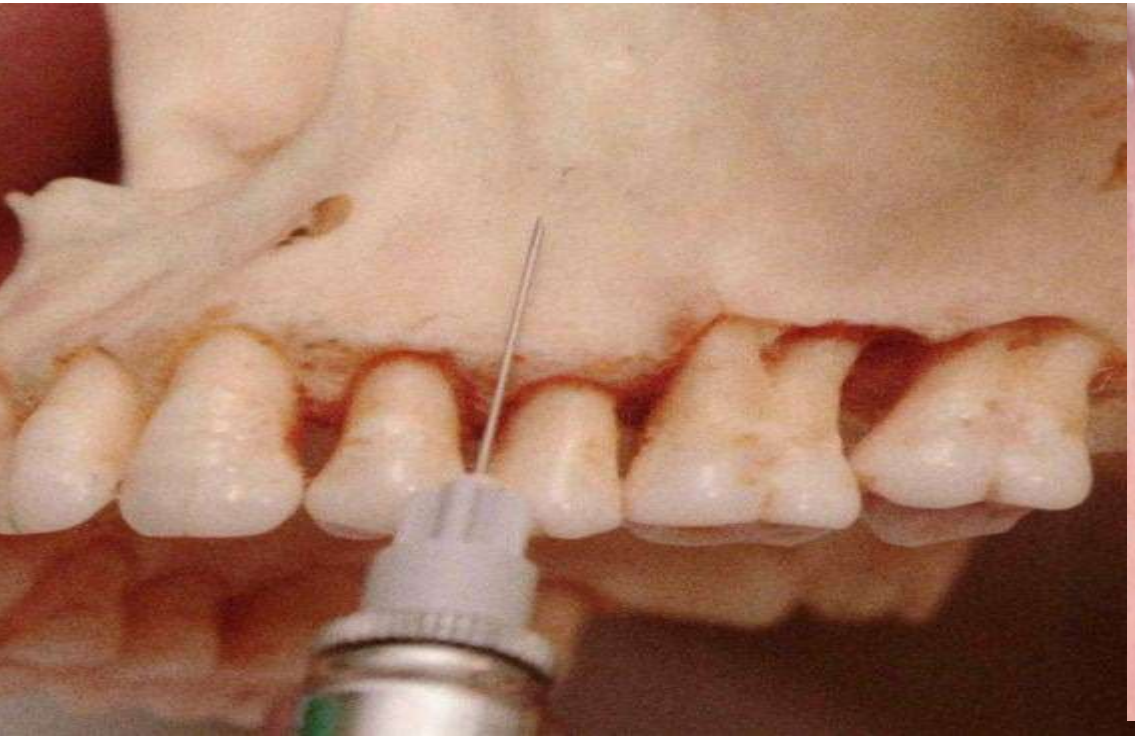
Dental or surgical procedure for multiple teeth.

Contraindications

1 -Infection or inflammation in the area of injection or needle insertion or drug deposition

2- Where the MSA nerve is absent, innervation is through the anterior superior alveolar (ASA) nerve; branches of the ASA innervating the premolars and the mesiobuccal root of the first molar.


Incisive foramen
Extraoral soft tissue
Alveolar mucous membrane
Greater palatine foramen
Palatal soft tissue and bone



Anterior Superior Alveolar Nerve Block (Infraorbital Nerve Block):

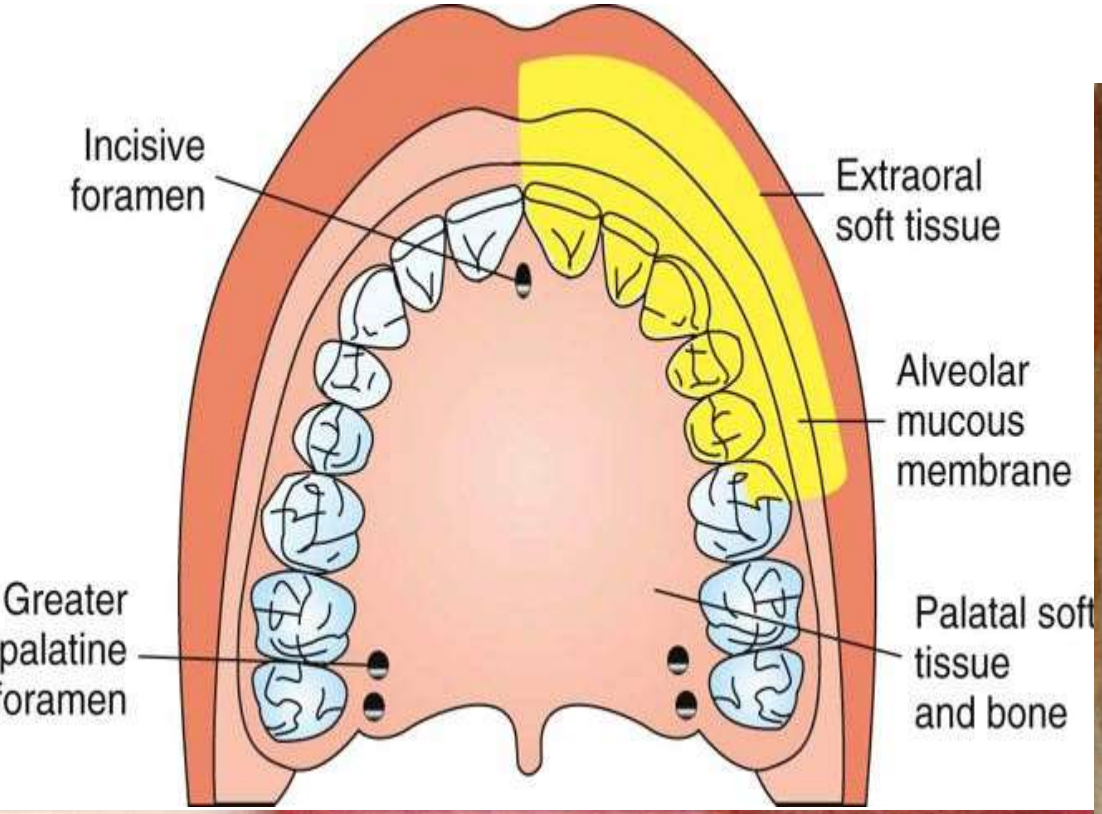
-in 72% of people.

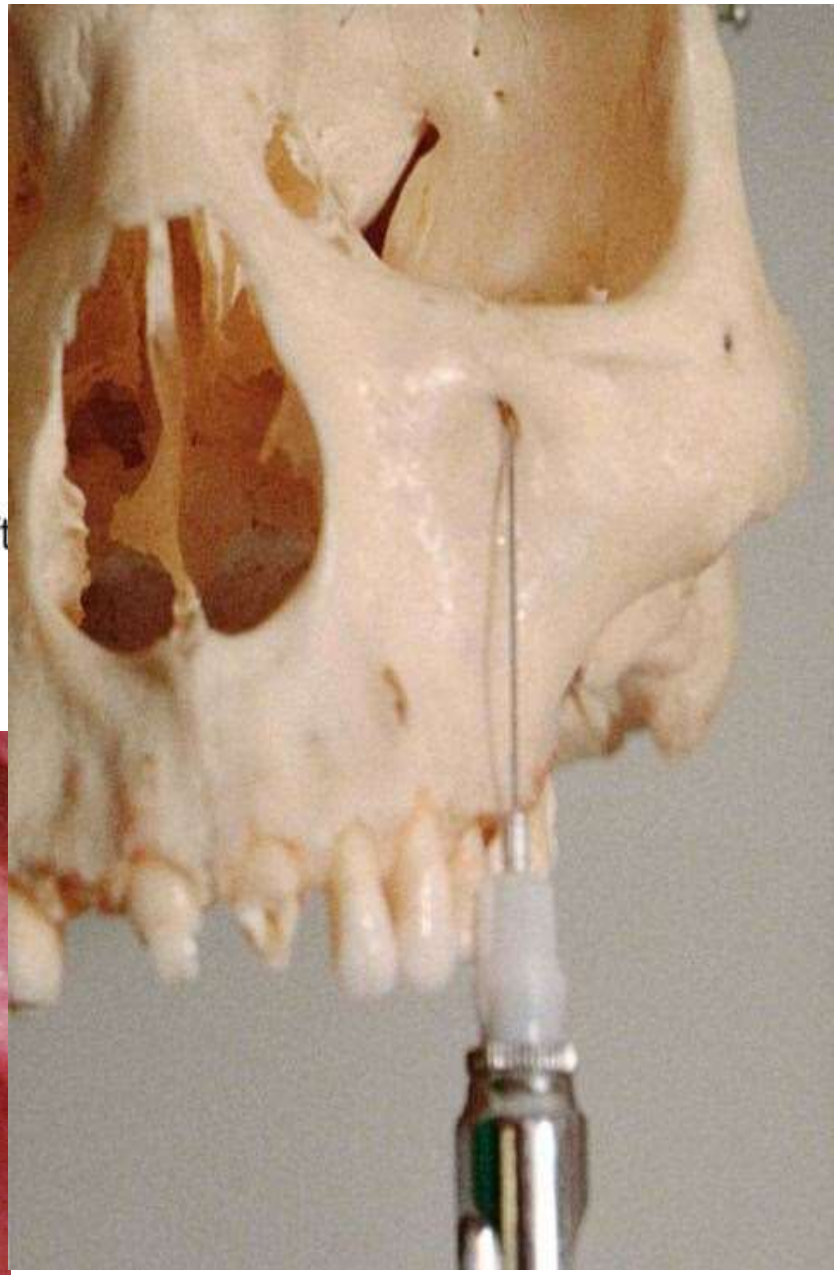
INDICATIONS:

1- Dental procedures involving more than two maxillary teeth and their overlying buccal tissues

2- Inflammation or infection (which contraindicates supraperiosteal injection): If a cellulitis is present, the maxillary nerve block may be indicated in lieu of the ASA nerve block.

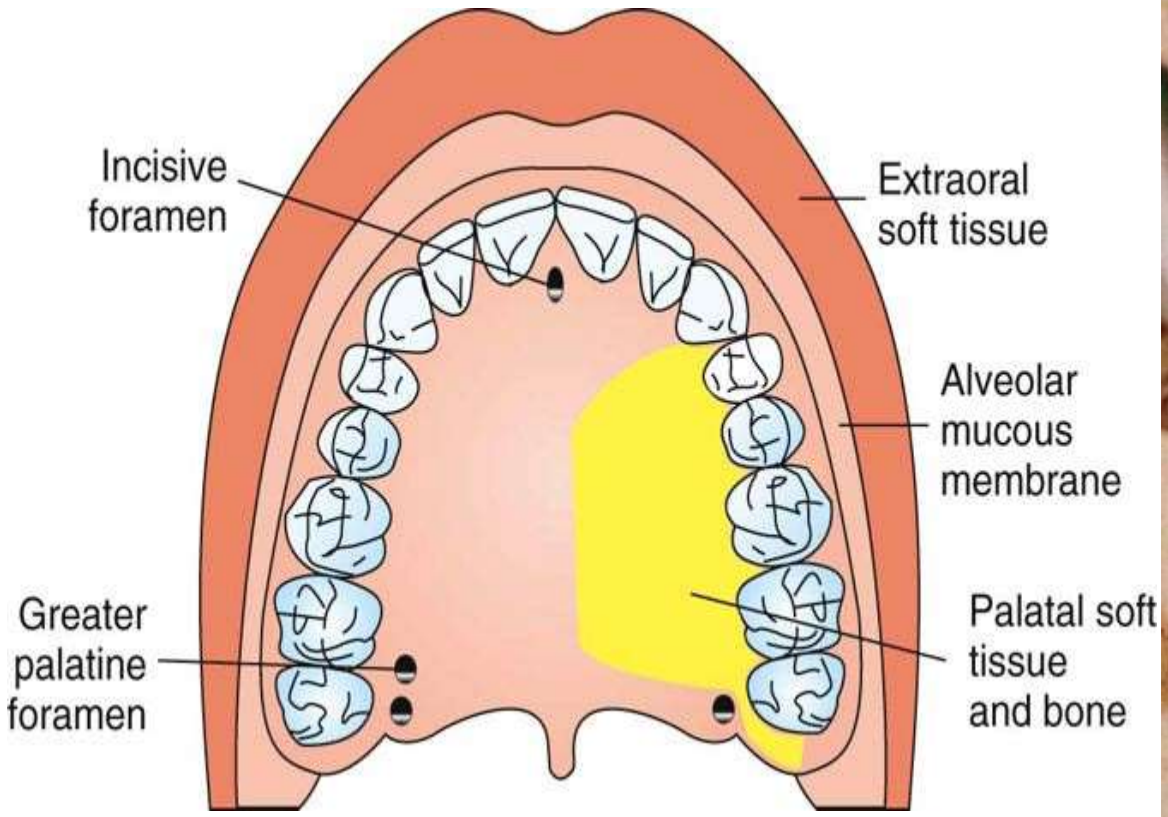
3- When supraperiosteal injections have been ineffective because of dense cortical bone.

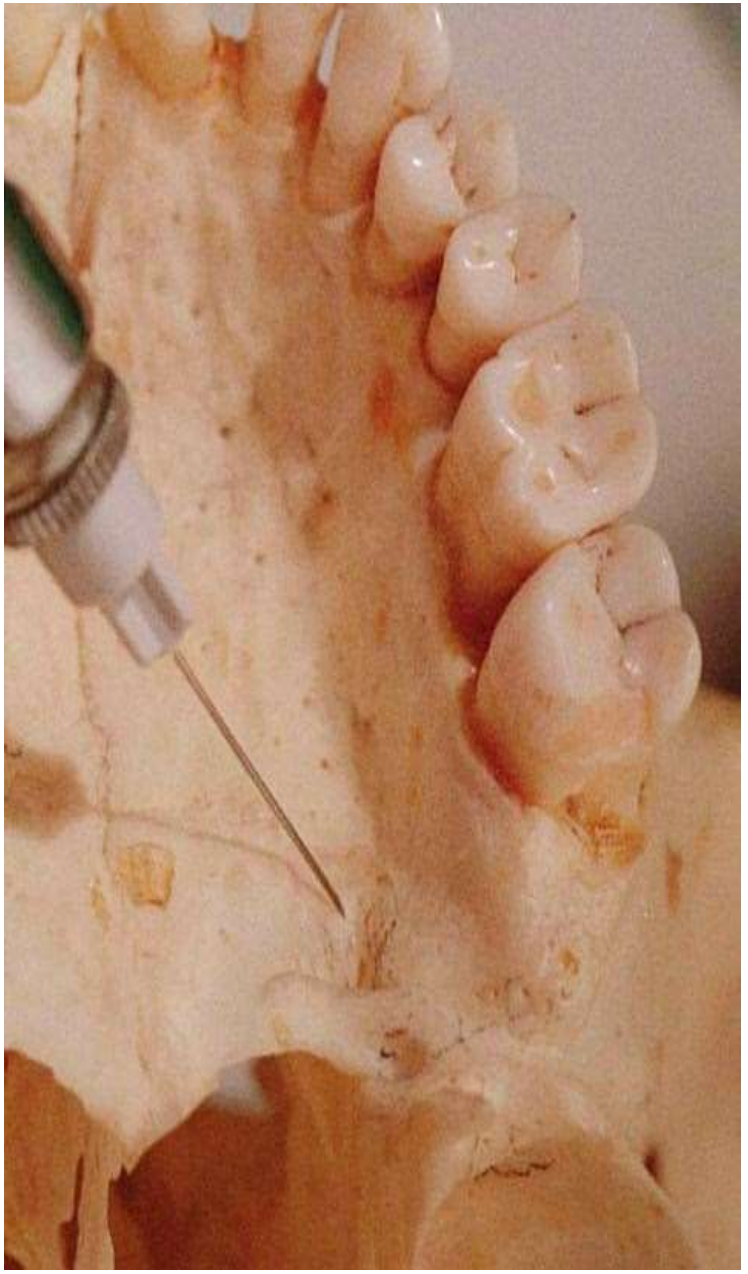

Incisive foramen
Extraoral soft tissue
Alveolar mucous membrane
Greater palatine foramen
Palatal soft tissue and bone



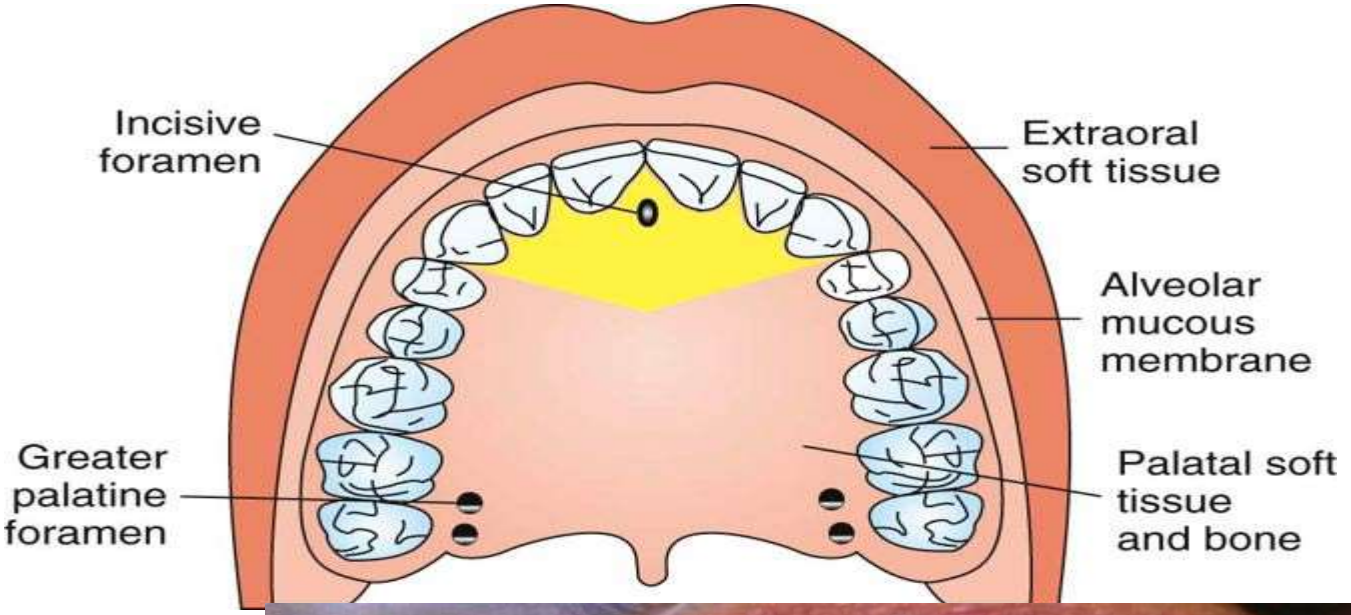
Local infiltration of the palate : - The anesthesia of the hard plate is necessary for dental procedures involving manipulation of the palatal soft and hard tissues . The palatal injection is one of the most painful injections so its advisable to inform the patient prior to injection about the pain during the injection . This helps in preparing the patient psychologically . The tissue is prepared with antiseptic , take the preloaded syringe , and insert the needle at the point of insertion which is in the mucoperiosteum on a line 1 cm from the gingival margin or in midway between the gingival margin and the median palatine line at an angle of 45 to the bony surface. Penetrate the mucoperiosteum with the needle to touch the bone gently , withdraw the needle by 1 mm and deposit about 0.25-0. 5 ml of the solution in the area to be anesthetize , withdraw the needle slowly , cover the needle and keep it aside . Later the patient will feel numbness at the area and lack of demonstration of pain with instrumentation .

Greater Palatine Nerve Block:





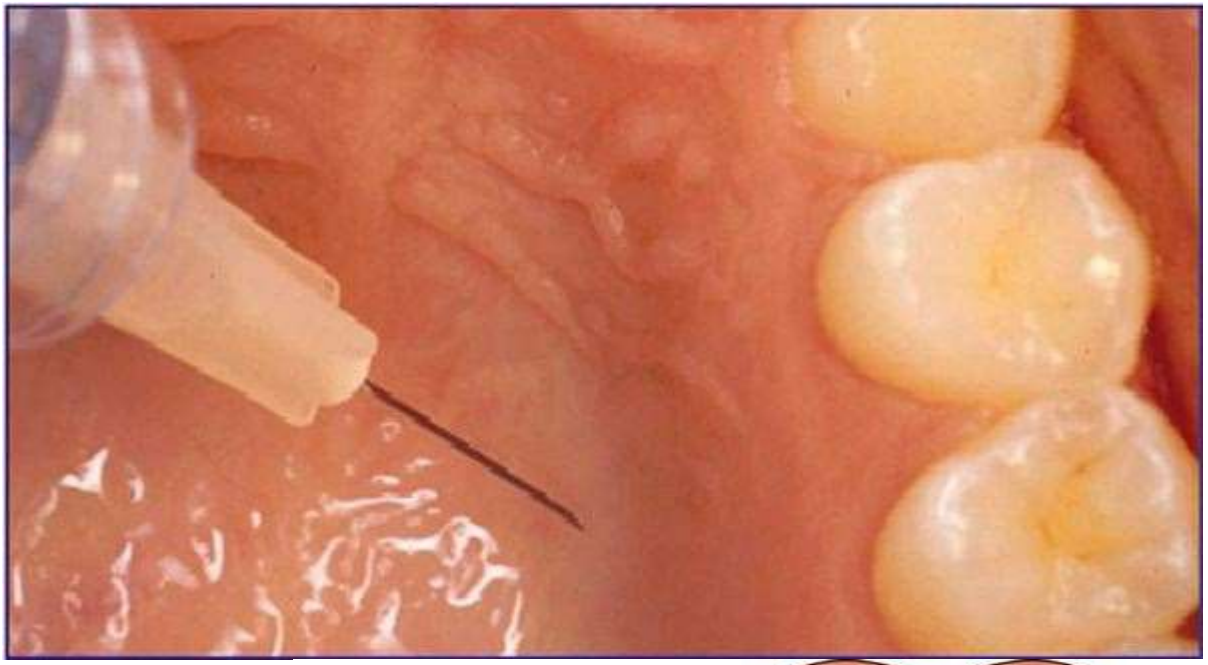
Nasopalatine Nerve Block:



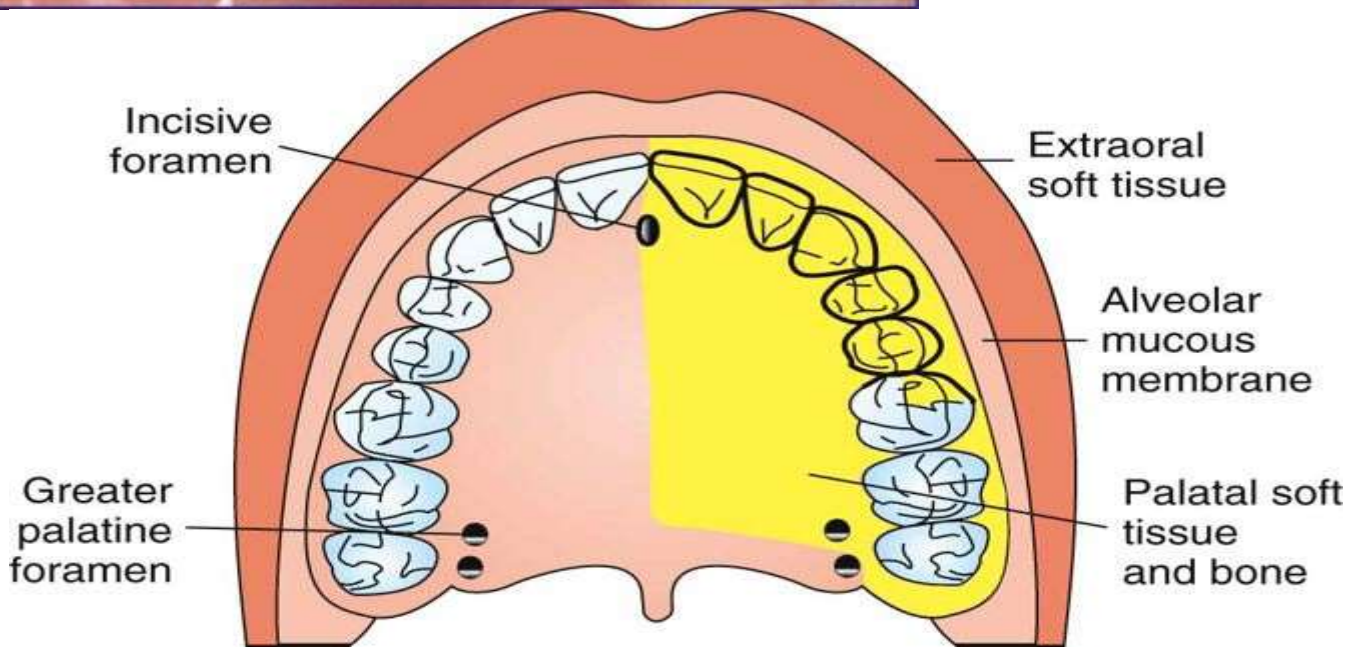
In nasopalatine and greater palatine nerves block we use sub periosteal inj.

Beacause supraperoistwal inj. Cause ulceration

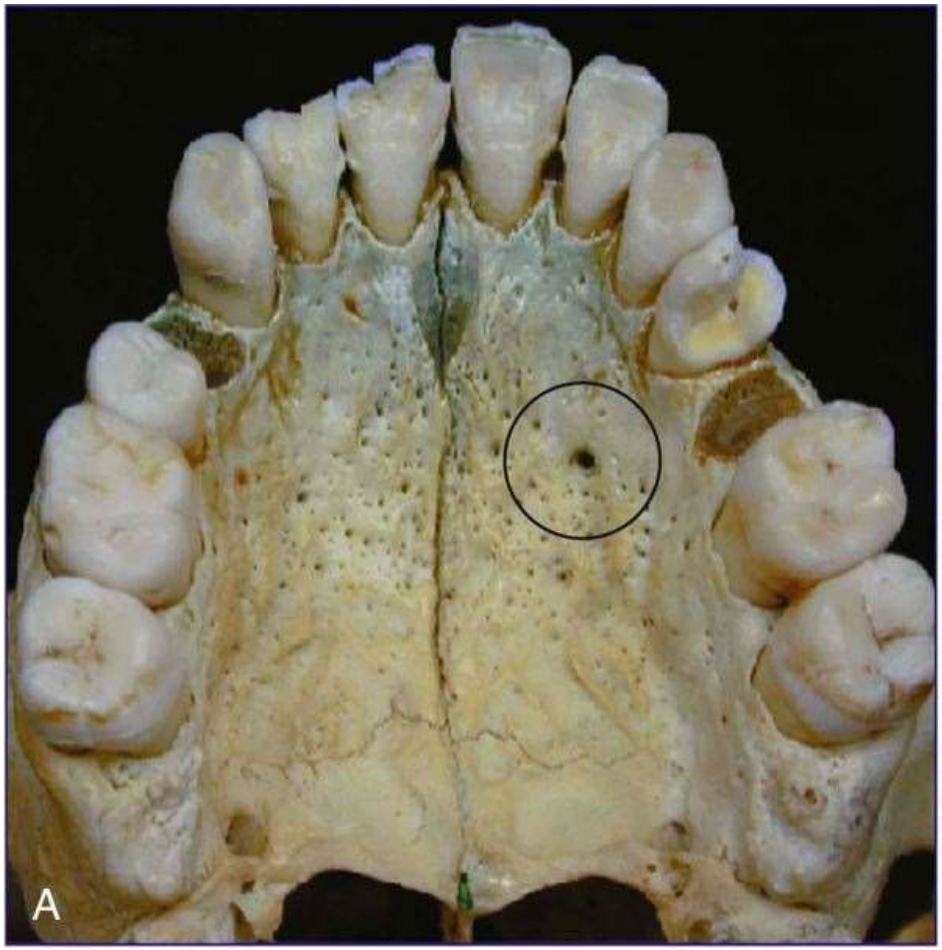
Anterior Middle Superior Alveolar Nerve Block

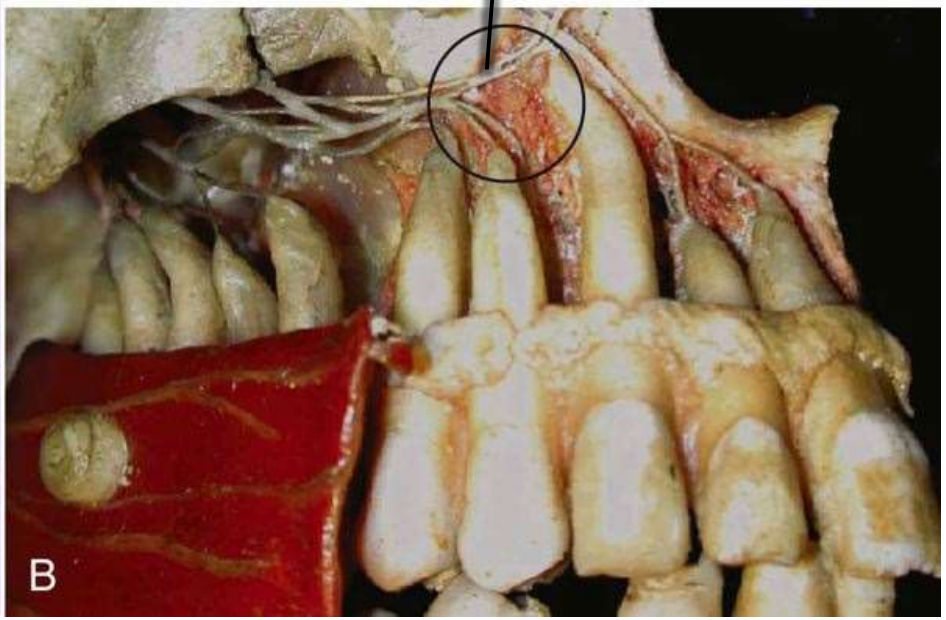


Half of the distance between midline of plate and gingival margin and distal to the premolar, needle inserted in to give that block

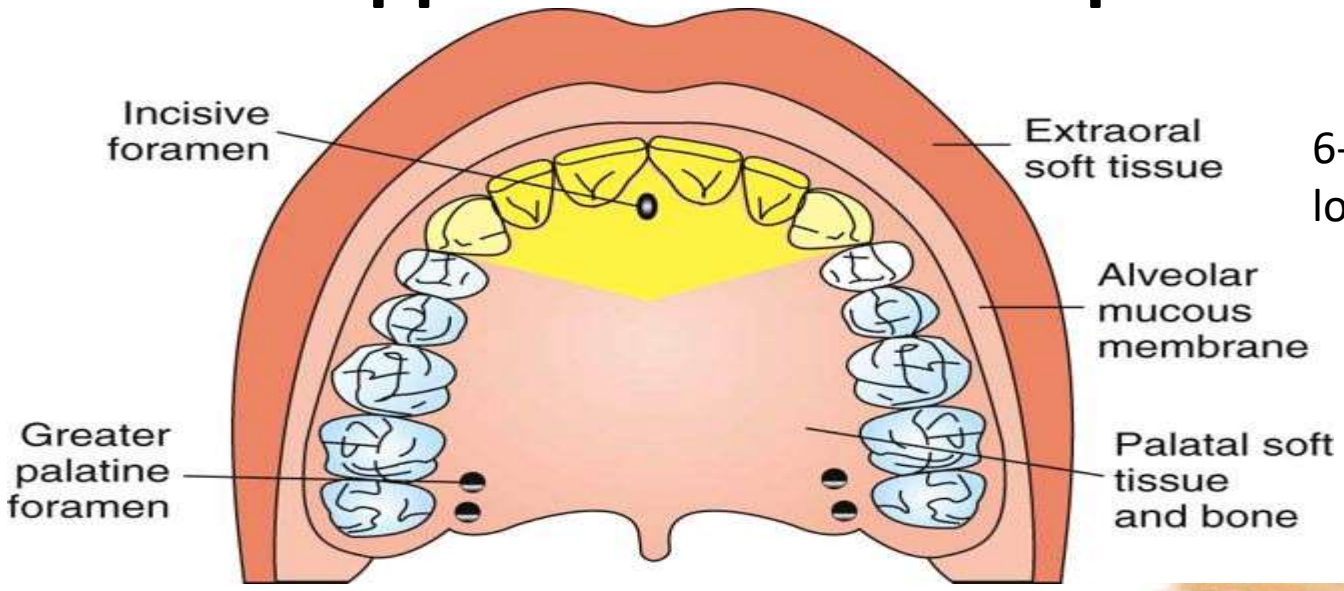


Sub neural plexus of anterior and middle superior alv. N. block

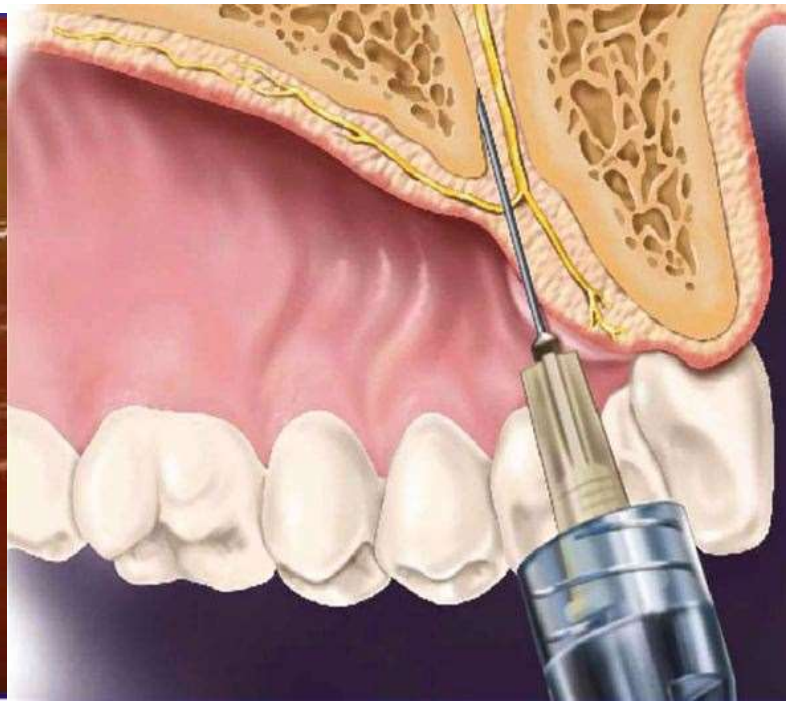




Palatal Approach-Anterior Superior Alveolar: painful

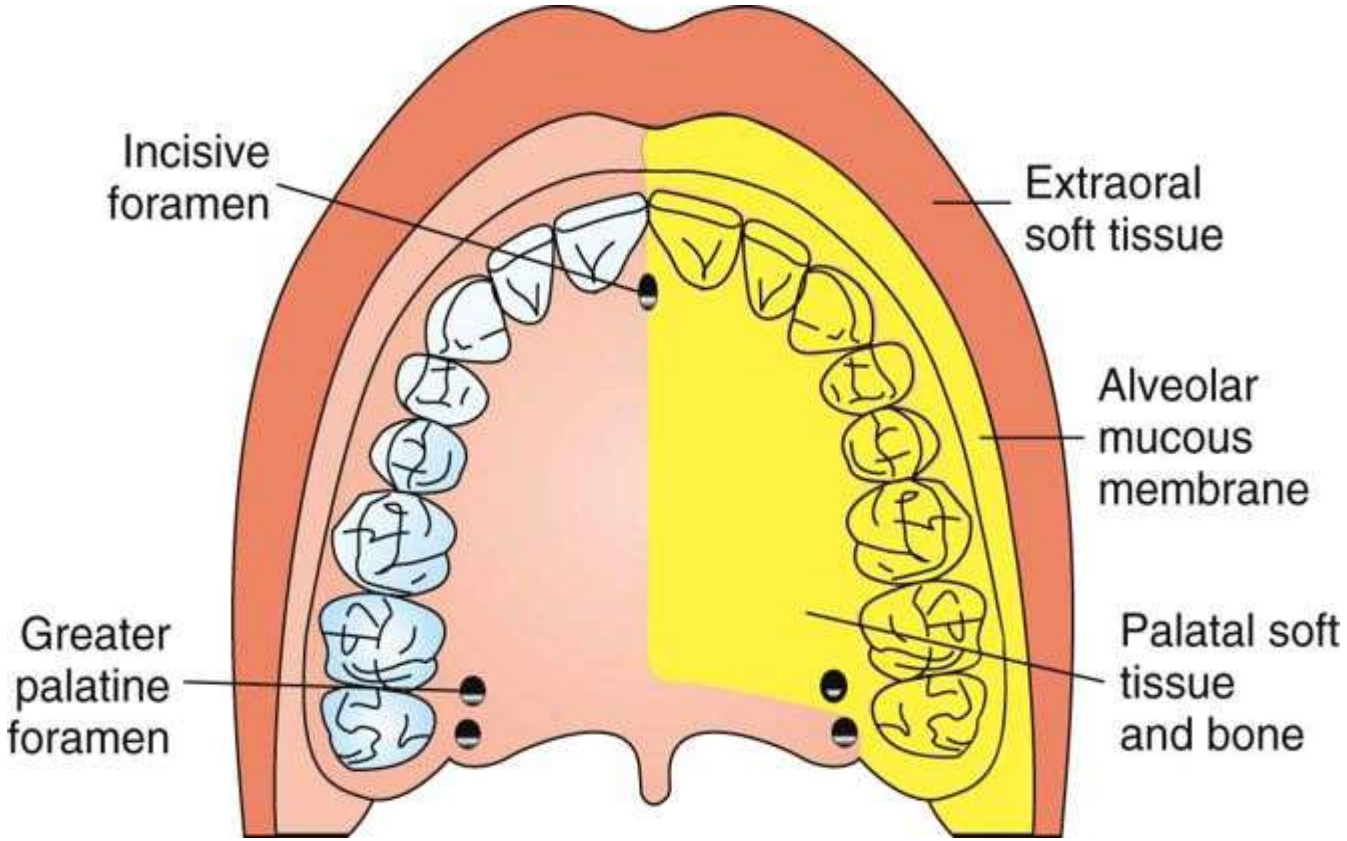


6-8 mm and parallel to the long axis of the tooth



Maxillary Nerve Block:

- The maxillary (second division or V2) nerve block is an effective method of achieving profound anesthesia of a hemimaxilla. It is useful in procedures involving quadrant dentistry.



Indications:

1- Pain control before extensive oral surgical, periodontal, or restorative procedures requiring

anesthesia of the entire maxillary division

2 -When tissue inflammation or infection precludes the use of other regional nerve blocks (e.g., PSA,

ASA, AMSA, P-ASA) or supraperiosteal injection

3- Diagnostic or therapeutic procedures for neuralgias.

Contraindications

1- Inexperienced administrator.

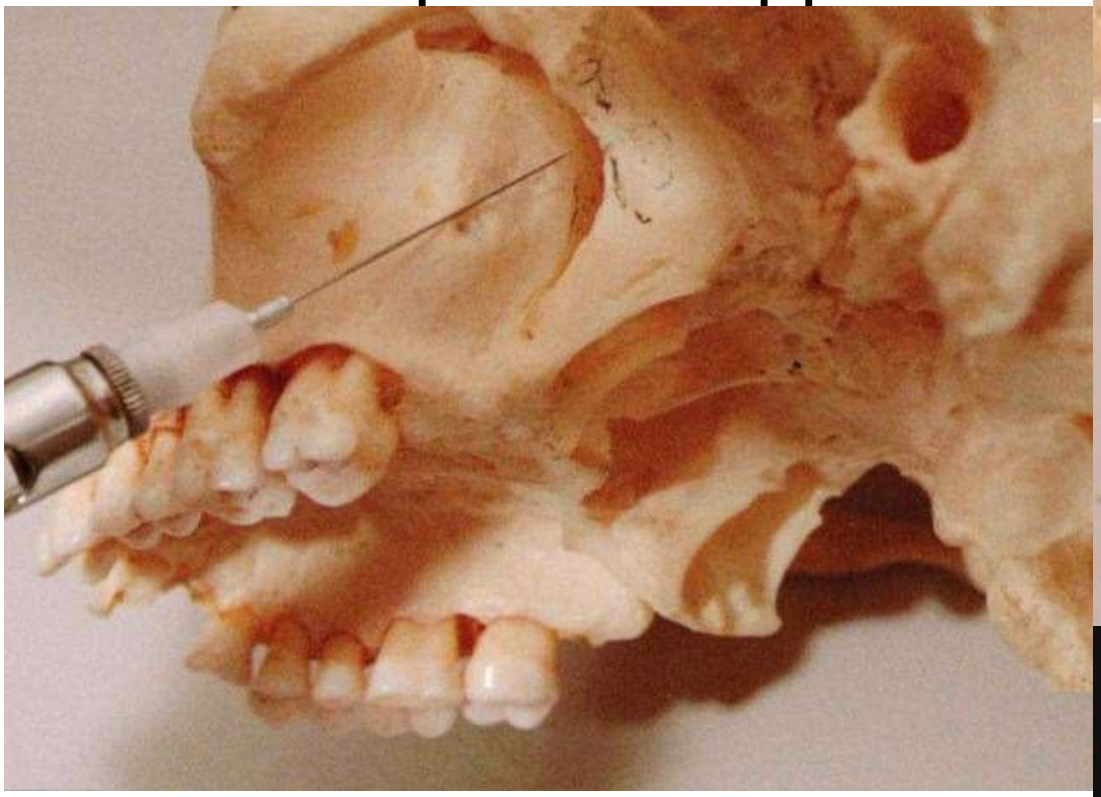
2- Pediatric patients.

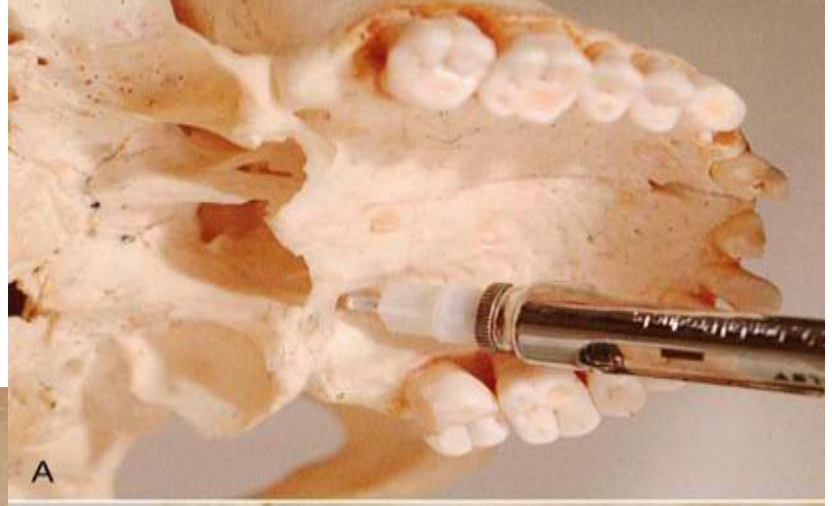
3- When hemorrhage is risky (e.g., in a hemophiliac patient)

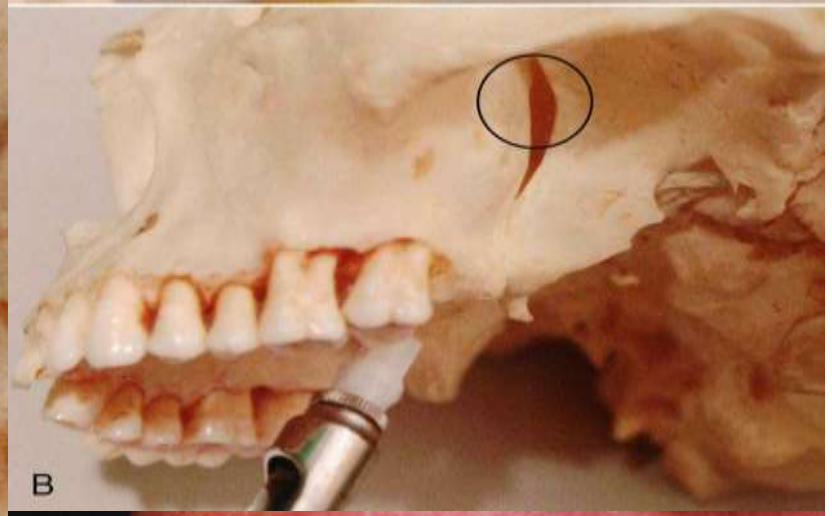
Approaches:

1- High tuberosity approach.

2- Greater palatine approach.







Complications:

1- Hematoma develops rapidly if the maxillary artery is punctured.

2- Penetration of the orbit may occur during a greater palatine foramen approach if the needle goes in too far; more likely to occur in the smaller-than-average skull.

3-Penetration of the nasal cavity.


Thank you

Basic techniques of local anesthesia

Mandibular Injection Techniques:

Numerous injection techniques are available to provide clinically adequate anesthesia of the teeth and soft and hard tissues in the mandible. Selection of the specific technique to be used is determined, in large part, by the nature of the treatment to be provided. The following techniques are available:

1- Supraperiosteal (infiltration), recommended for limited treatment protocols.

2- Periodontal ligament (PDL, intraligamentary) injection, recommended as an adjunct to other techniques or for limited treatment protocols.

3 Intraseptal injection, recommended primarily for periodontal surgical techniques.

4- Intraosseous (IO) injection, recommended for single teeth (primarily mandibular molars) when other techniques have failed

5-Inferior alveolar nerve block.

6-Gow-Gate mandibular nerve block.

7- Akinosi (closed mouth) mandibular nerve block.

8- Extraoral mandibular nerve block.

1-Inferior dental nerve block(IDB):

- **Other Common Names:**

Mandibular block.

- **Nerves Anesthetized**

1 Inferior alveolar, a branch of the posterior division of the mandibular division of the trigeminal

nerve (V3).

2- Incisive.

3- Mental.

4- Lingual (commonly).

- **Areas Anesthetized:**

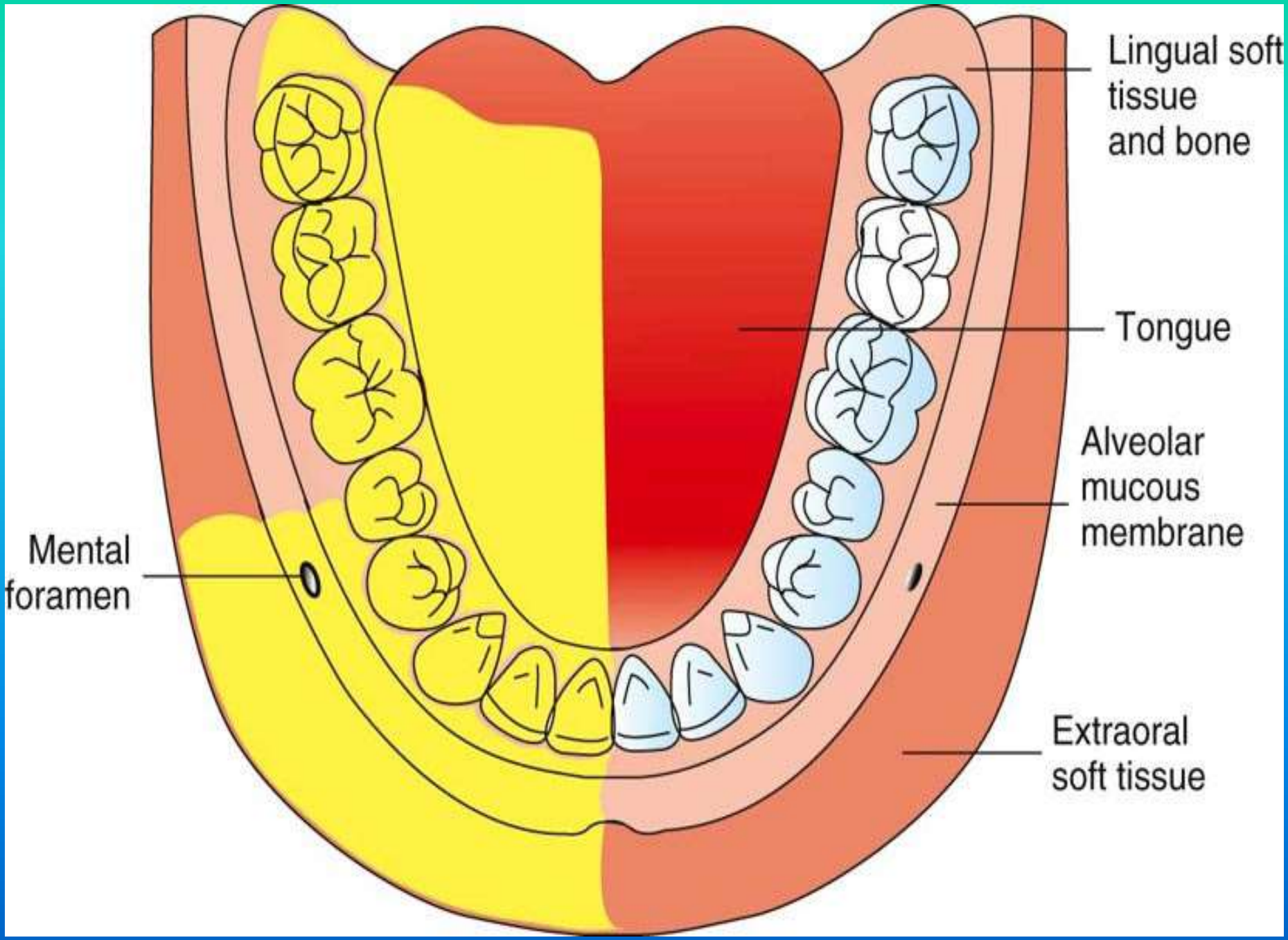
1- Mandibular teeth to the midline

2- Body of the mandible, inferior portion of the ramus

3- Buccal mucoperiosteum, mucous membrane anterior to the mental foramen (mental nerve)

4- Anterior two thirds of the tongue and floor of the oral cavity (lingual nerve)

5- Lingual soft tissues and periosteum (lingual nerve).


Lingual soft tissue and bone
Tongue
Alveolar mucous membrane
Mental foramen
Extraoral soft tissue

- **Indications**

1- Procedures on multiple mandibular teeth in one quadrant

2- When buccal soft tissue anesthesia (anterior to the mental foramen) is necessary

3- When lingual soft tissue anesthesia is necessary

- **Contraindications**

1- Infection or acute inflammation in the area of injection (rare)

2- Patients who are more likely to bite their lip or tongue, for instance, a very young child or a physically or mentally handicapped adult or child


4
7
6
5
3
1
2

Technique

1- A long dental needle is recommended for the adult patient. A 25-gauge long needle is preferred;

2 -*Area of insertion:* Mucous membrane on the medial (lingual) side of the mandibular ramus, at the intersection of two lines—one horizontal, representing the height of needle insertion, the other vertical, representing the anteroposterior plane of injection

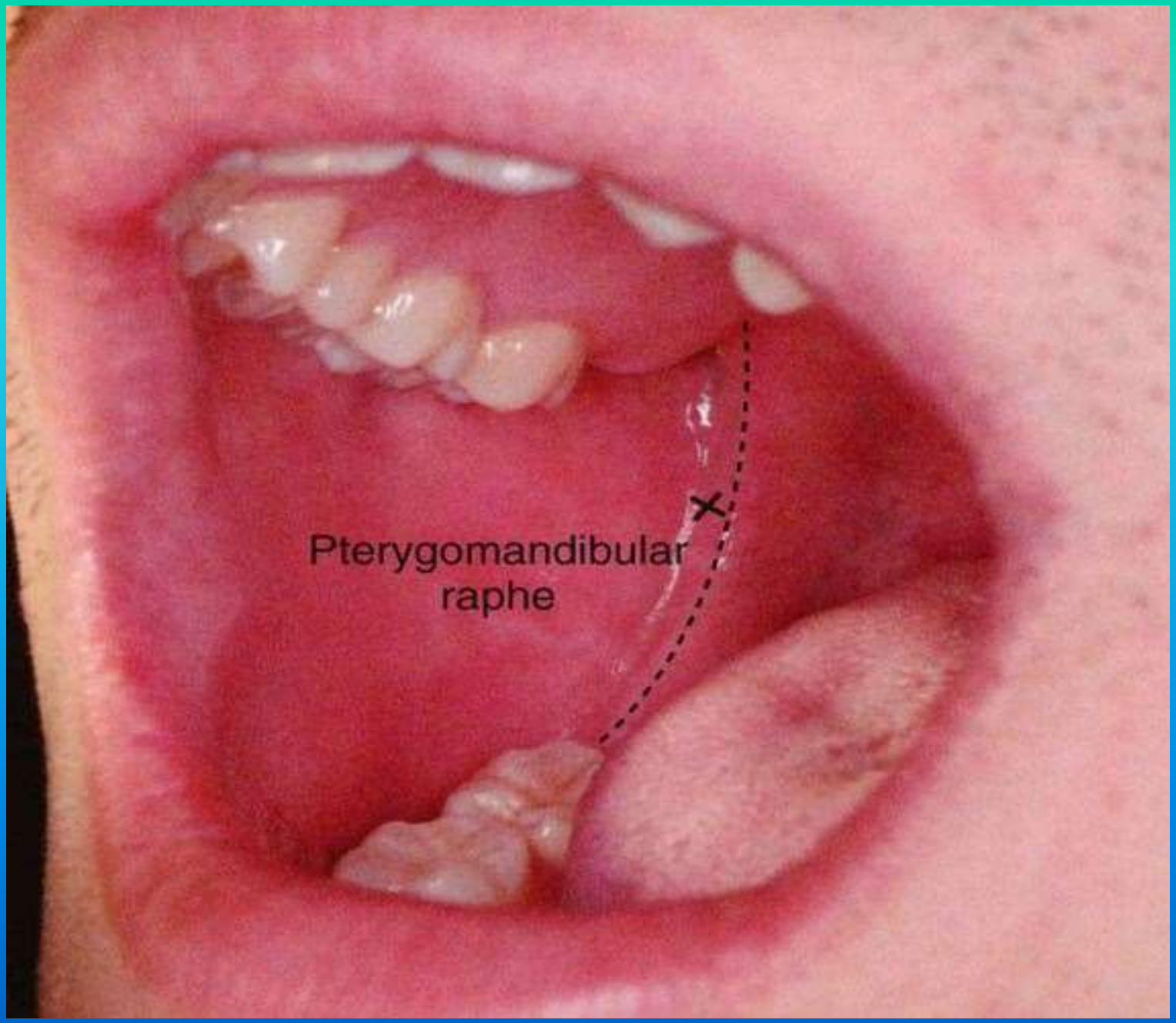
3- *Target area:* Inferior alveolar nerve as it passes downward toward the mandibular foramen but before it enters into the foramen

4- Landmarks:

A- Coronoid notch (greatest concavity on the anterior border of the ramus)

B-Pterygomandibular raphe (vertical portion)

C- Occlusal plane of the mandibular posterior teeth


Pterygomandibular
raphe


A
B

Signs and Symptoms

1 -*Subjective:* Tingling or numbness of the lower lip indicates anesthesia of the mental nerve, a terminal branch of the inferior alveolar nerve. This is a good indication that the inferior alveolar nerve is anesthetized.

2- *Subjective:* Tingling or numbness of the tongue indicates anesthesia of the lingual nerve, a branch of the posterior division of V3.

3- *Objective:* Using an electrical pulp tester.

4- *Objective:* No pain is felt during dental therapy.

Failures of Anesthesia

The most common causes of absent or incomplete IANB follow:

1 Deposition of anesthetic too low (below the mandibular foramen). To correct: Reinject at a higher site (approximately 5 to 10 mm above the previous site).

2 Deposition of the anesthetic too far anteriorly (laterally) on the ramus. This is diagnosed by lack of

anesthesia except at the injection site and by the minimum depth of needle penetration before contact with bone (e.g., the [long] needle is usually less than halfway into tissue). To correct: Redirect the needle tip posteriorly.

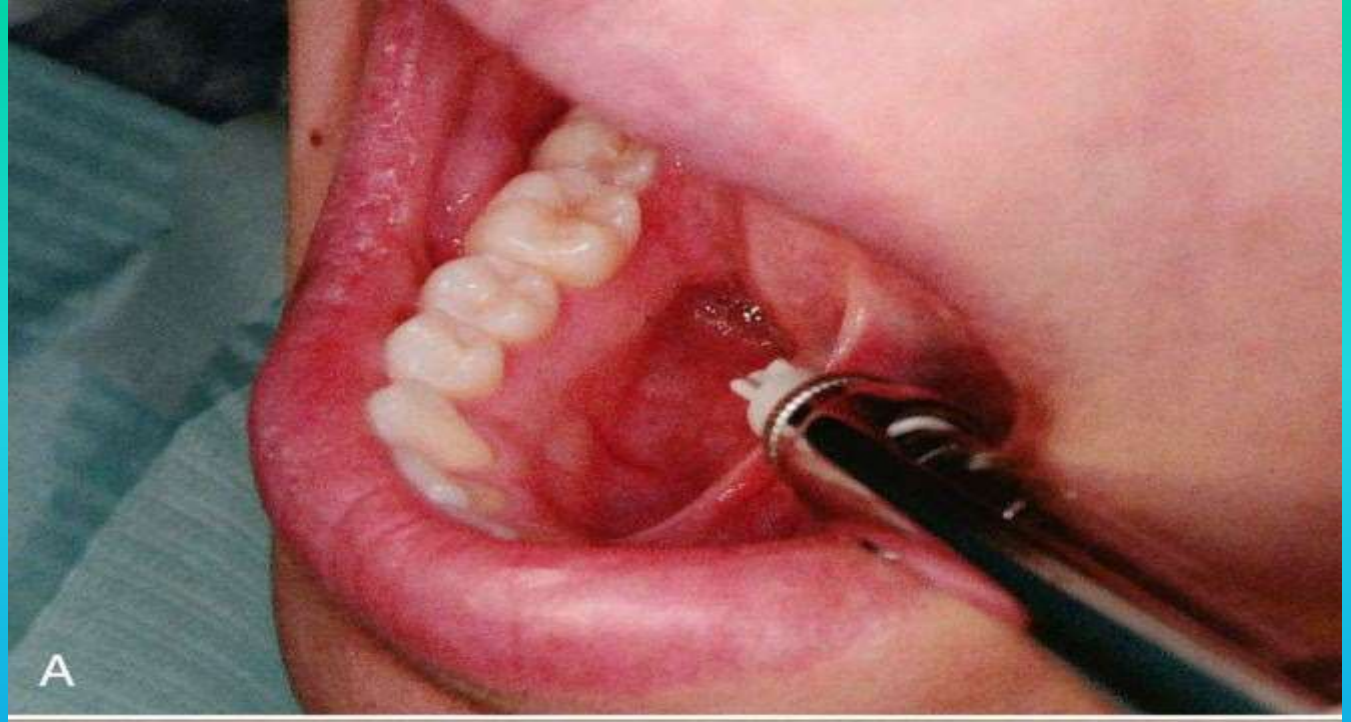
3- Accessory innervation to the mandibular teeth

A- The primary symptom is isolated areas of incomplete pulpal anesthesia encountered in the mandibular molars (most commonly the mesial portion of the mandibular first molar).

B- Although it has been postulated that several nerves provide the mandibular teeth with

accessory sensory innervation (e.g., mylohyoid nerves), current thinking supports the mylohyoid nerve as the prime candidate.

C- To correct:

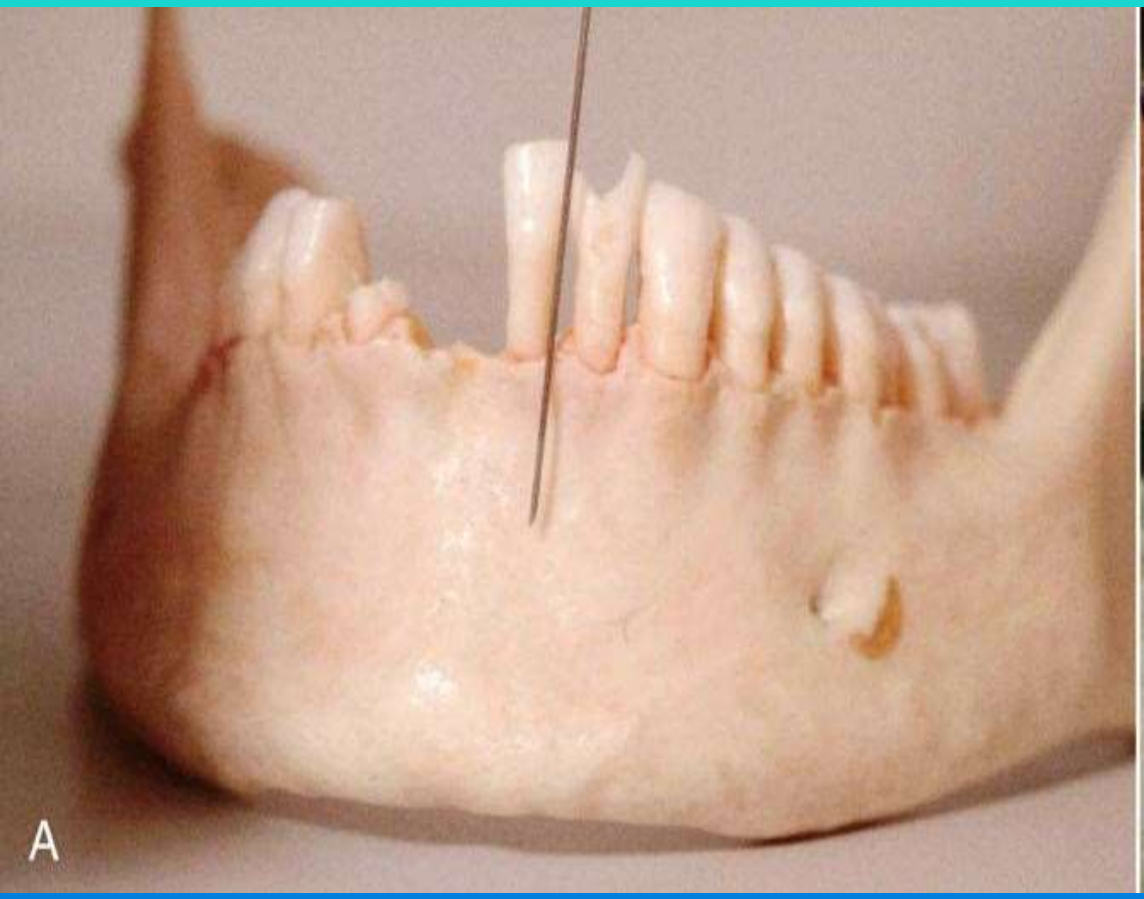

A


B

D- Whenever a bifid inferior alveolar nerve is detected on the radiograph, incomplete anesthesia of the mandible may develop after IANB. In many such cases, a second mandibular foramen, located more inferiorly, exists. To correct: Deposit a volume of solution inferior to the normal anatomic landmark.

4- Incomplete anesthesia of the central or lateral incisors,often this is due to overlapping fibers of the contralateral inferior alveolar nerve, although itmay also arise (rarely) from innervation from the mylohyoid nerve.

To correcet:



Complications:

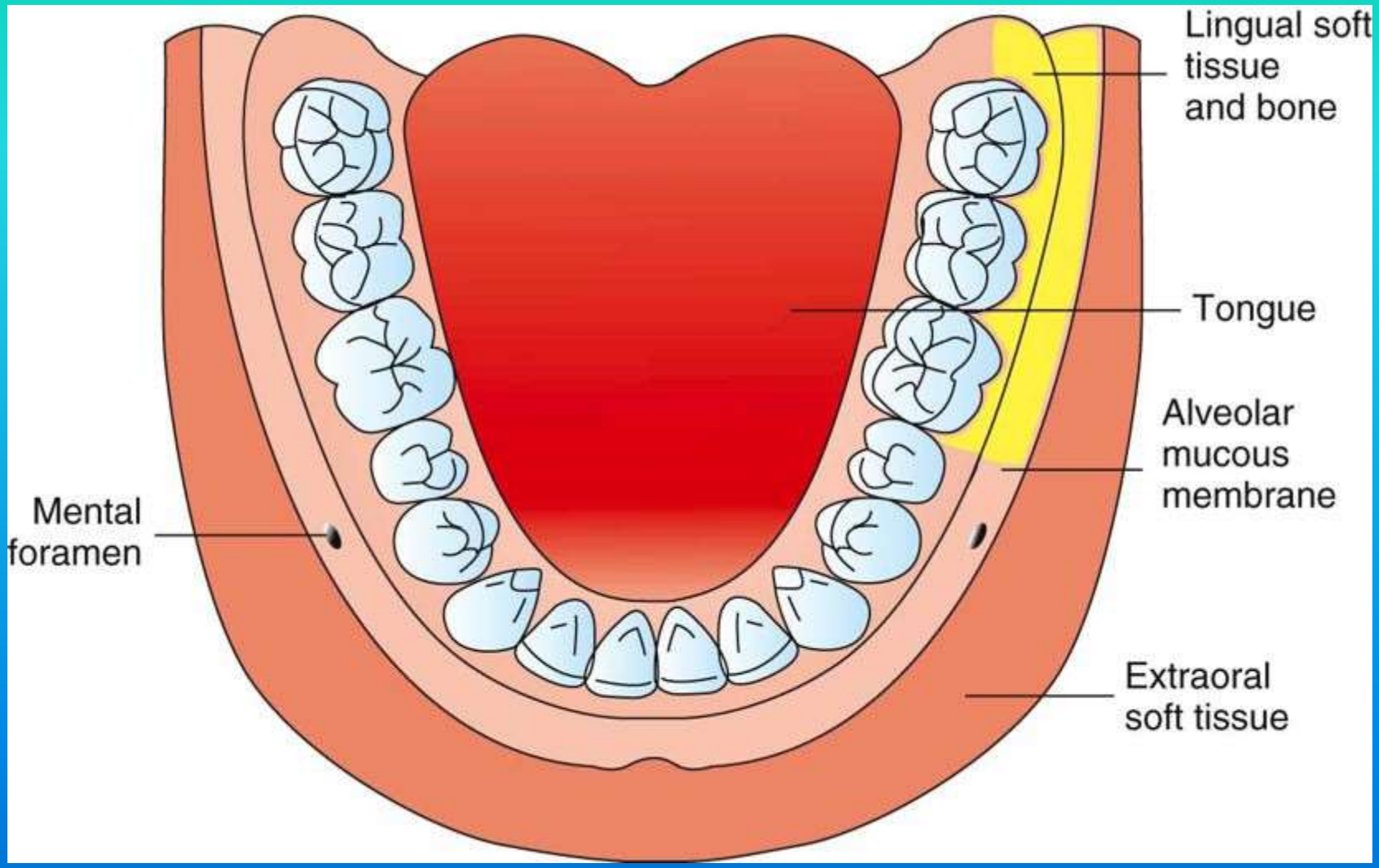
1- Hematoma.

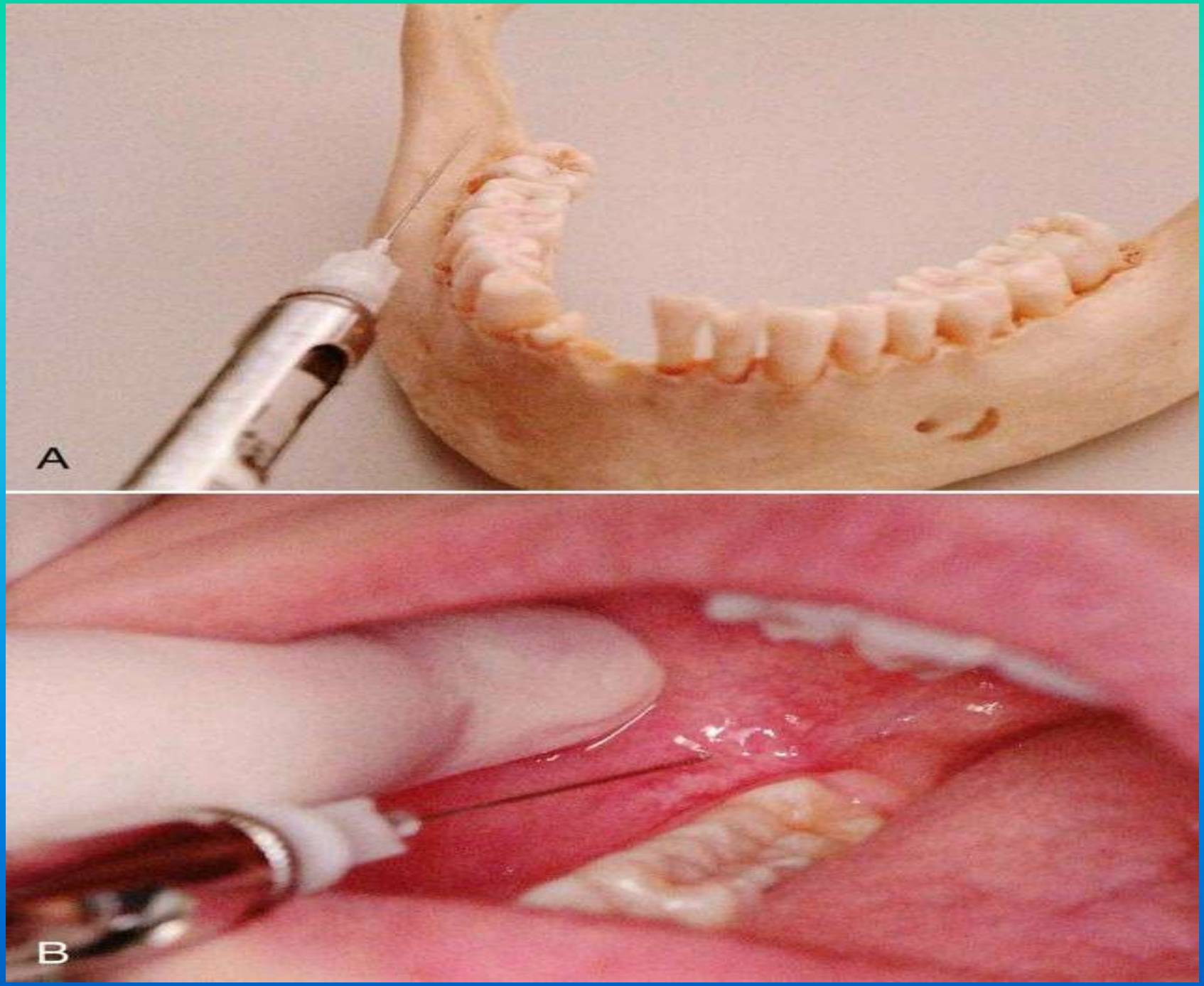
2- Trismus.

3-Transient facial paralysis (facial nerve anesthesia)

Buccal Nerve Block

The buccal nerve is a branch of the anterior division of V3 and consequently is not anesthetized during IANB. Nor is anesthesia of the buccal nerve necessary for most restorative dental procedures. The buccal nerve provides sensory innervation to the buccal soft tissues adjacent to the mandibular molars only. The sole indication for administration of a buccal nerve block therefore is when manipulation of these tissues is contemplated.


Lingual soft tissue and bone
Tongue
Alveolar mucous membrane
Mental foramen
Extraoral soft tissue


A
B

- **Mandibular Nerve Block: The Gow GatesTechnique**
- Successful anesthesia of the mandibular teeth and soft tissues is more difficult to achieve than anesthesia of maxillary structures. Primary factors for this failure rate are the greater anatomic variation in the mandible and the need for deeper soft tissue penetration. The Gow-Gates technique is a true mandibular nerve block because it provides sensory anesthesia to virtually the entire distribution of V3. The inferior alveolar, lingual, mylohyoid, mental, incisive,auriculotemporal, and buccal nerves all are blocked in the Gow-Gates injection.

Indications:

1- Multiple procedures on mandibular teeth

2- When buccal soft tissue anesthesia, from the third molar to the midline, is necessary

3- When lingual soft tissue anesthesia is necessary

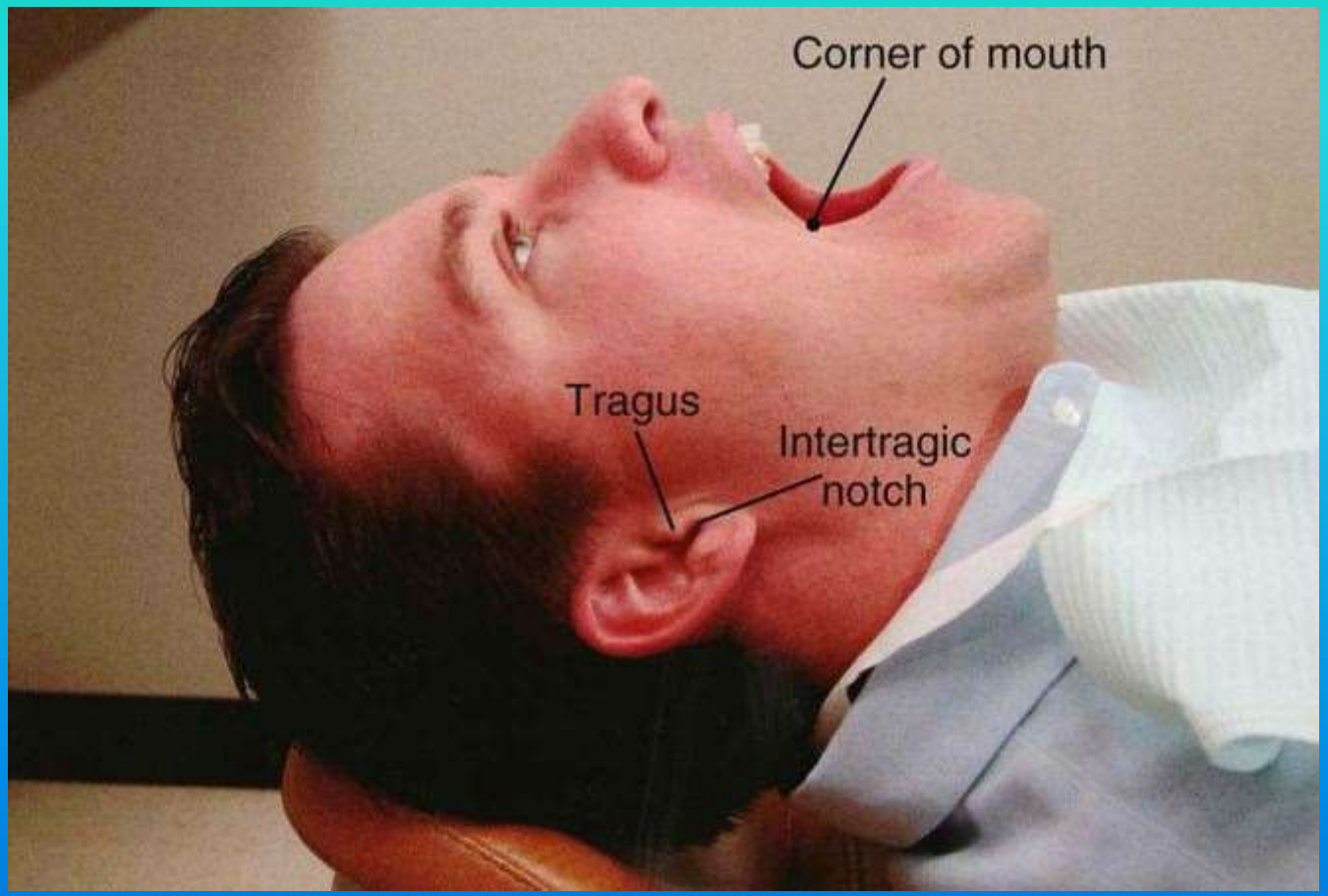
4- When a conventional inferior alveolar nerve block is unsuccessful.

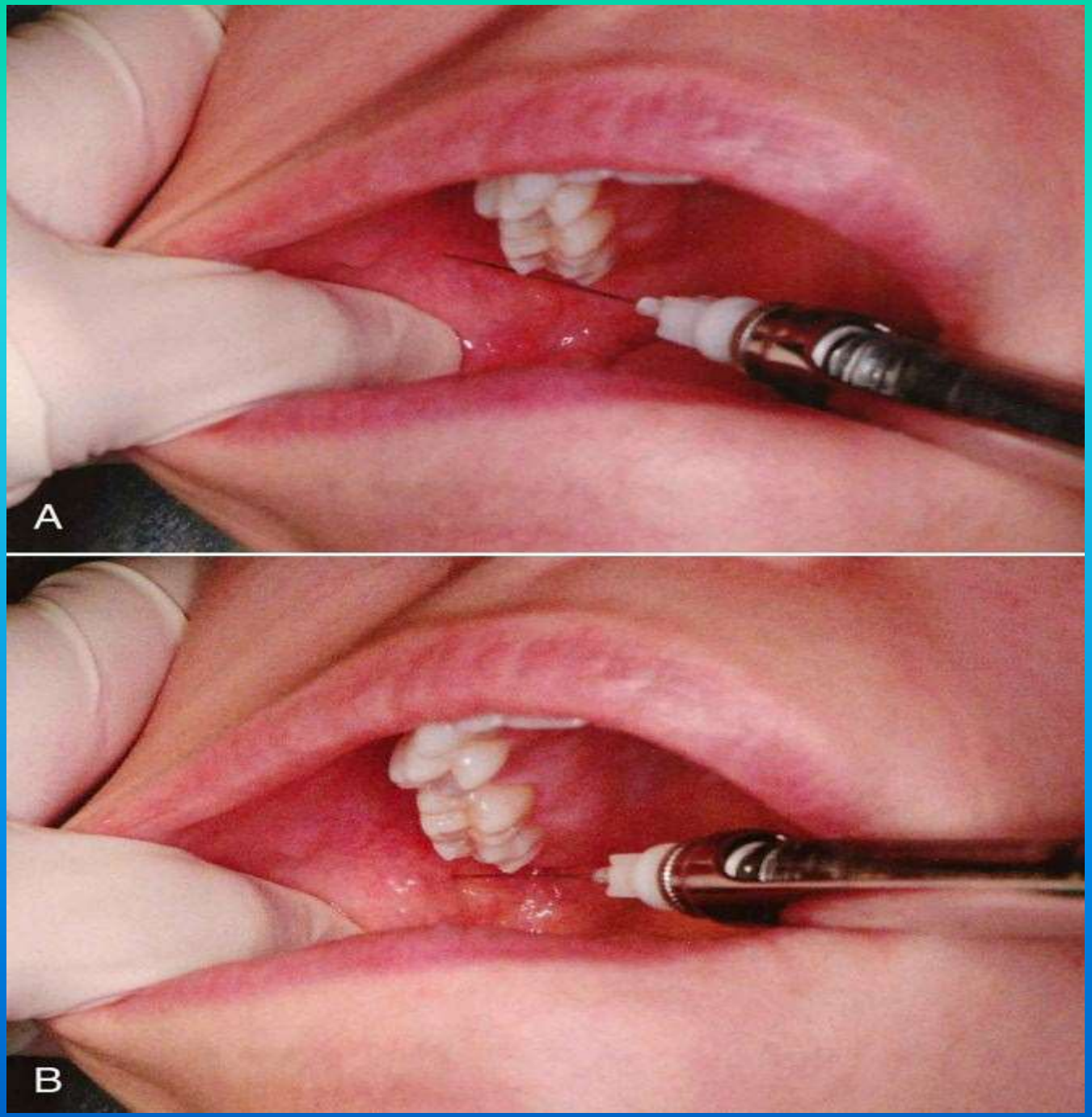
Contraindications:

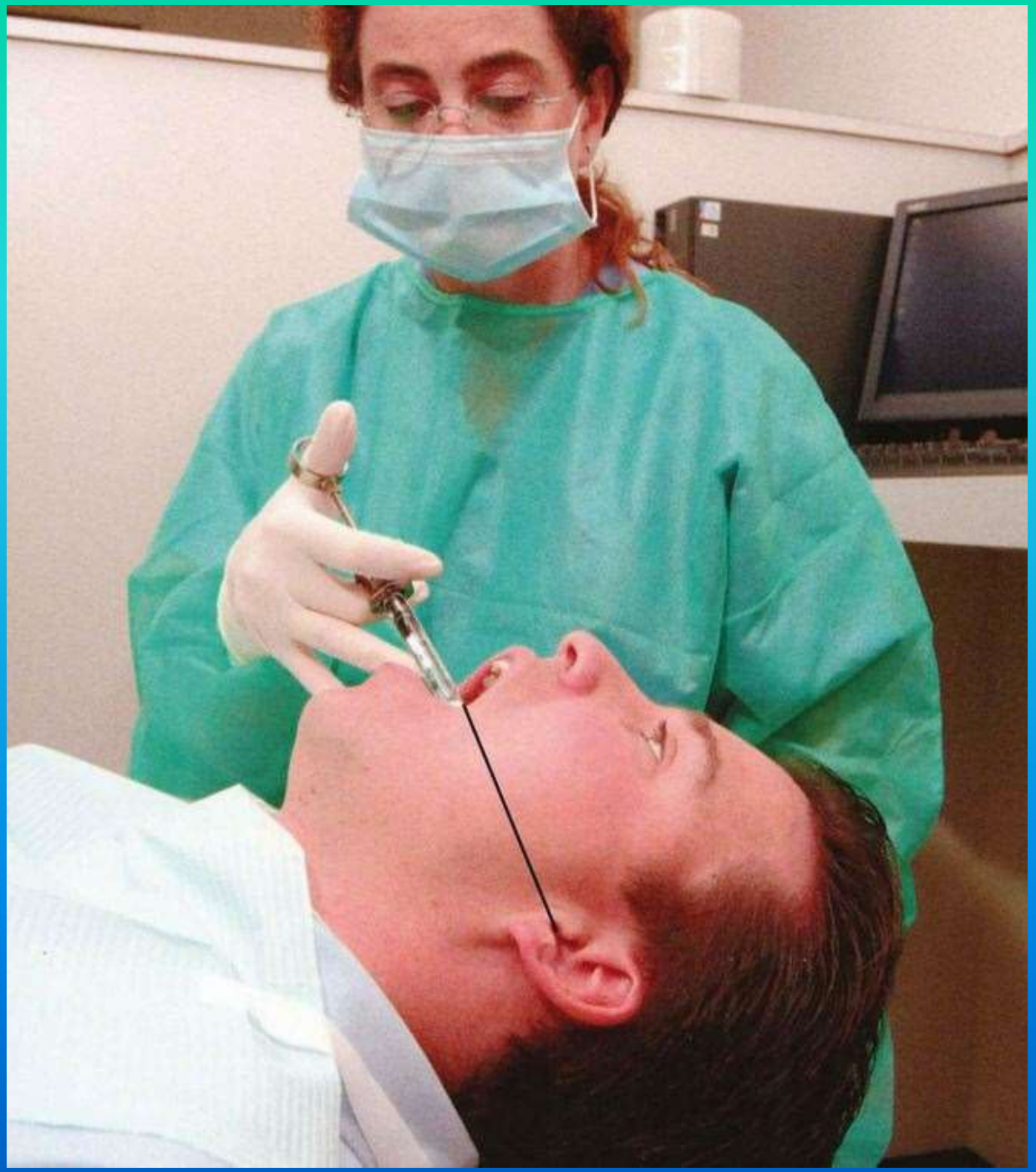
1- Infection or acute inflammation in the area of injection (rare).

2- Patients who might bite their lip or their tongue, such as young children and physically or mentally handicapped adults.

3- Patients who are unable to open their mouth wide (e.g., trismus).


Corner of mouth
Tragus
Intertragic notch


A
B



Vazirani-Akinosi Closed-Mouth Mandibular Block:

Indications:

1- Limited mandibular opening

2- Multiple procedures on mandibular teeth

3- Inability to visualize landmarks for IANB (e.g., because of large tongue)

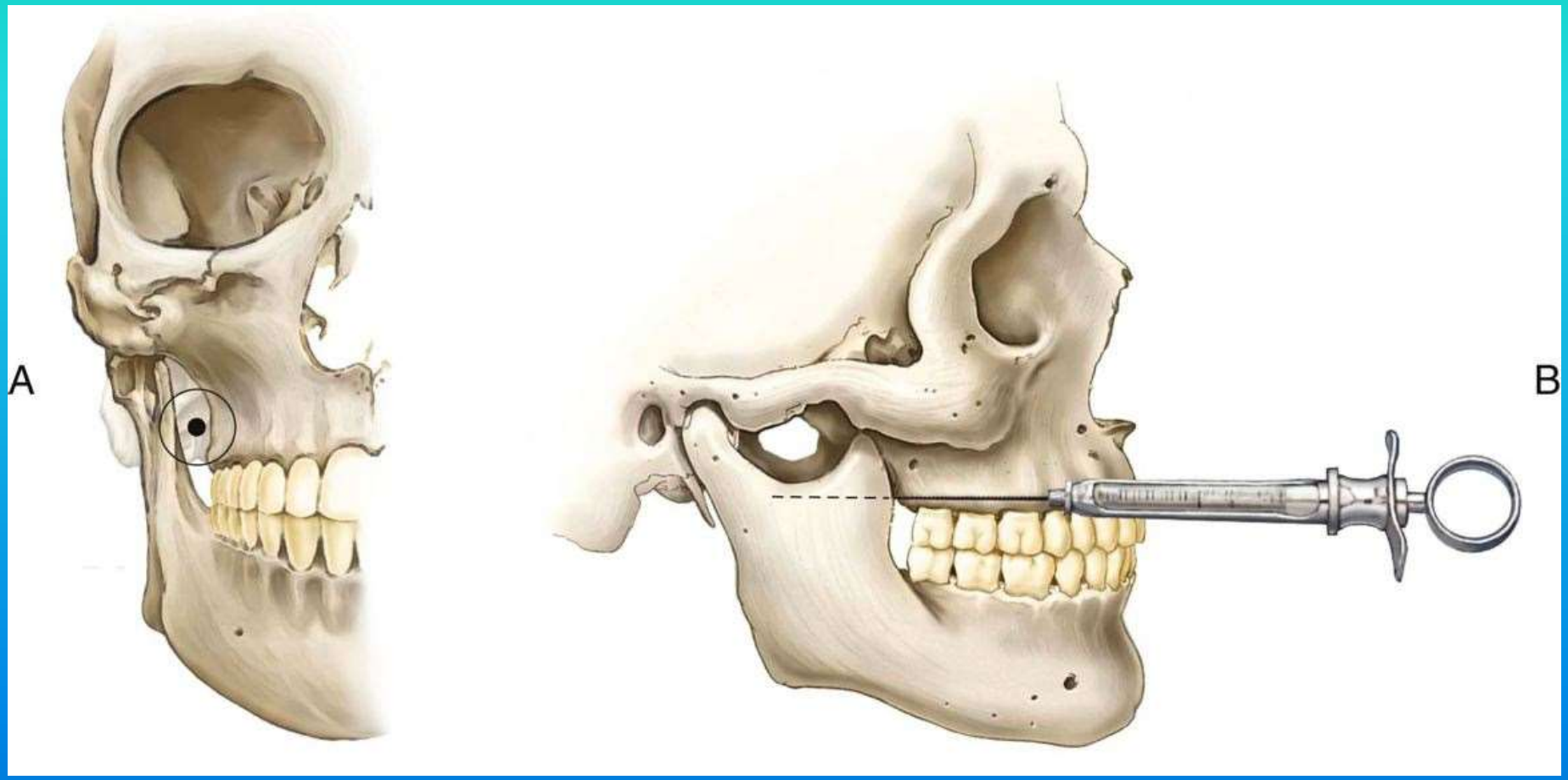
Contraindications:

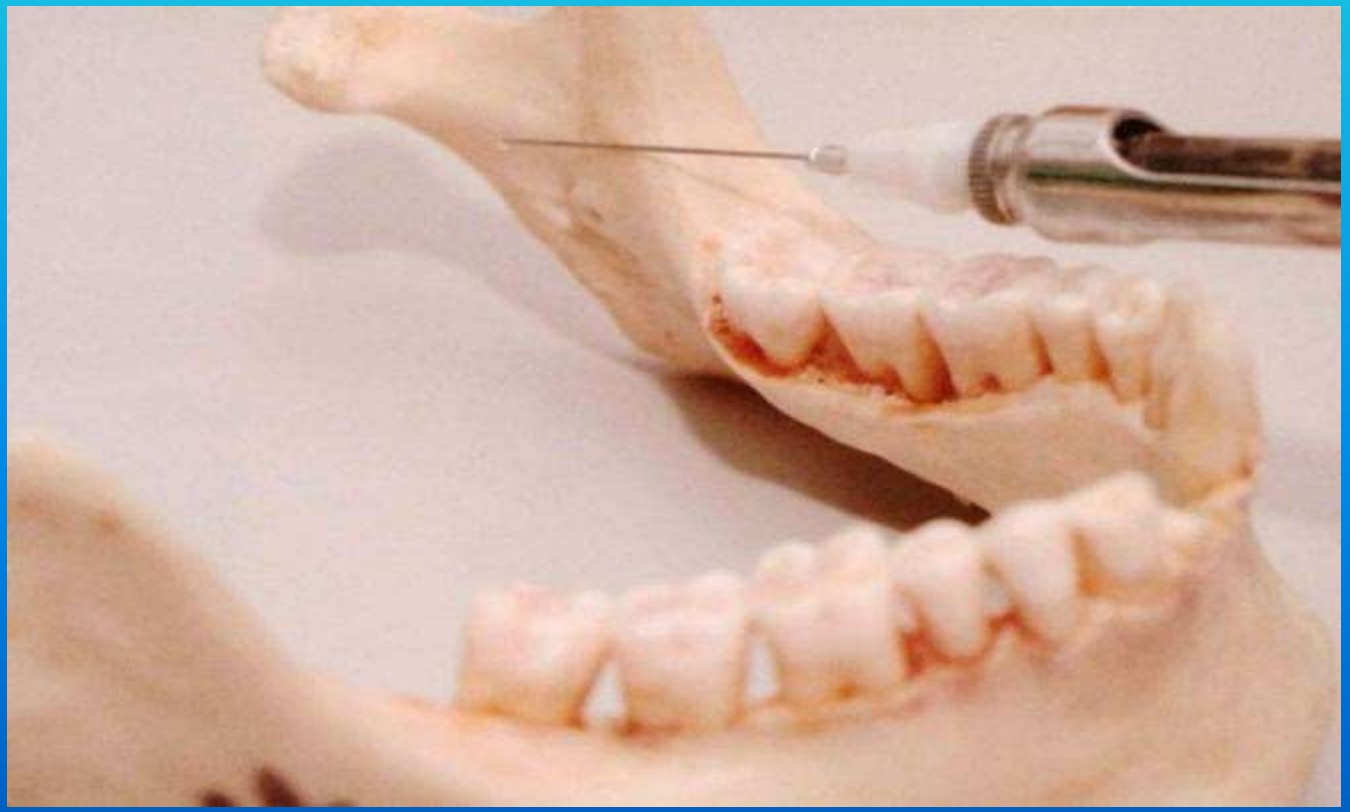
1- Infection or acute inflammation in the area of injection (rare)

2 -Patients who might bite their lip or their tongue, such as young children and physically or mentally

- handicapped adults

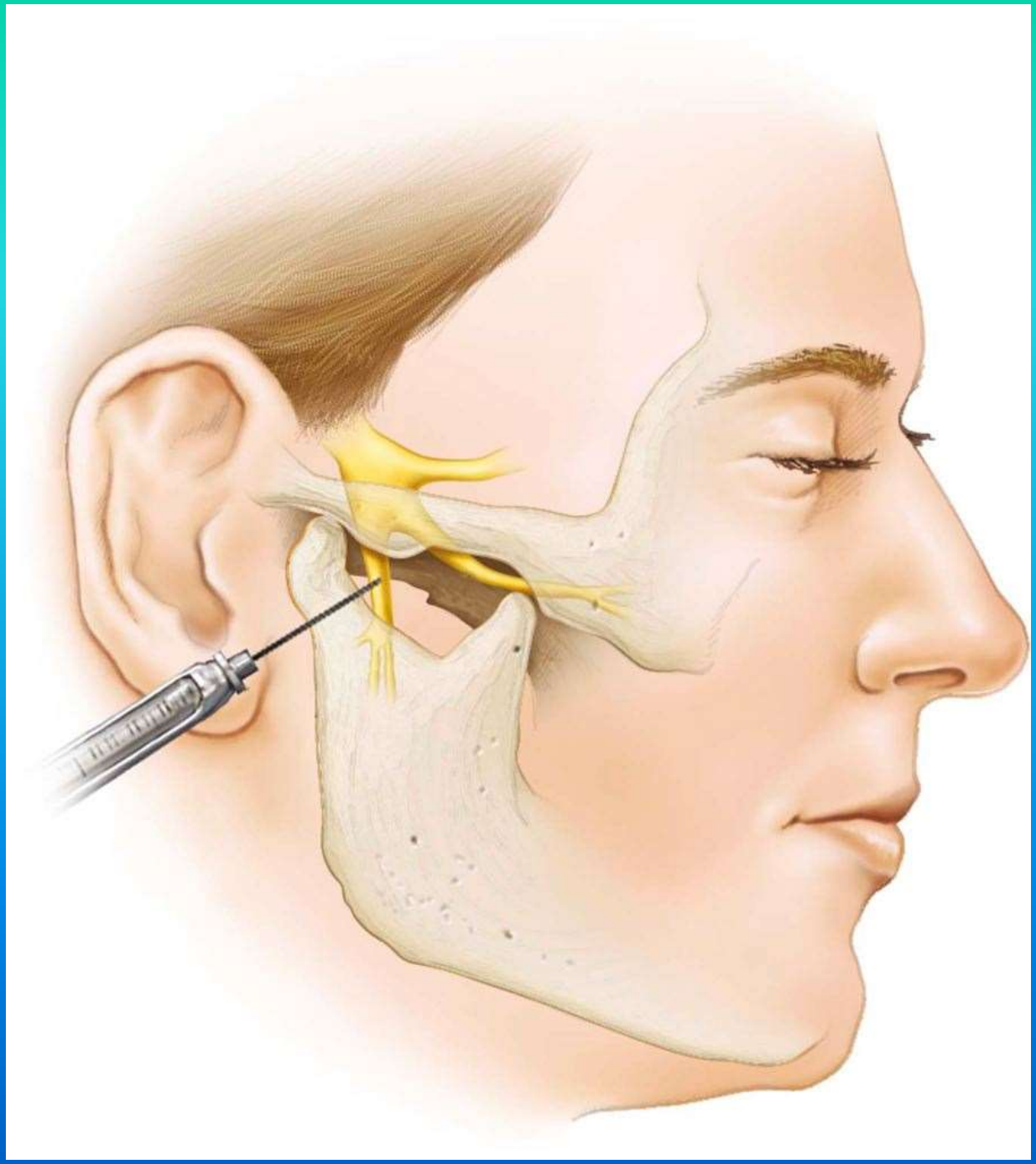
3- Inability to visualize or gain access to the lingual aspect of the ramus


A
B



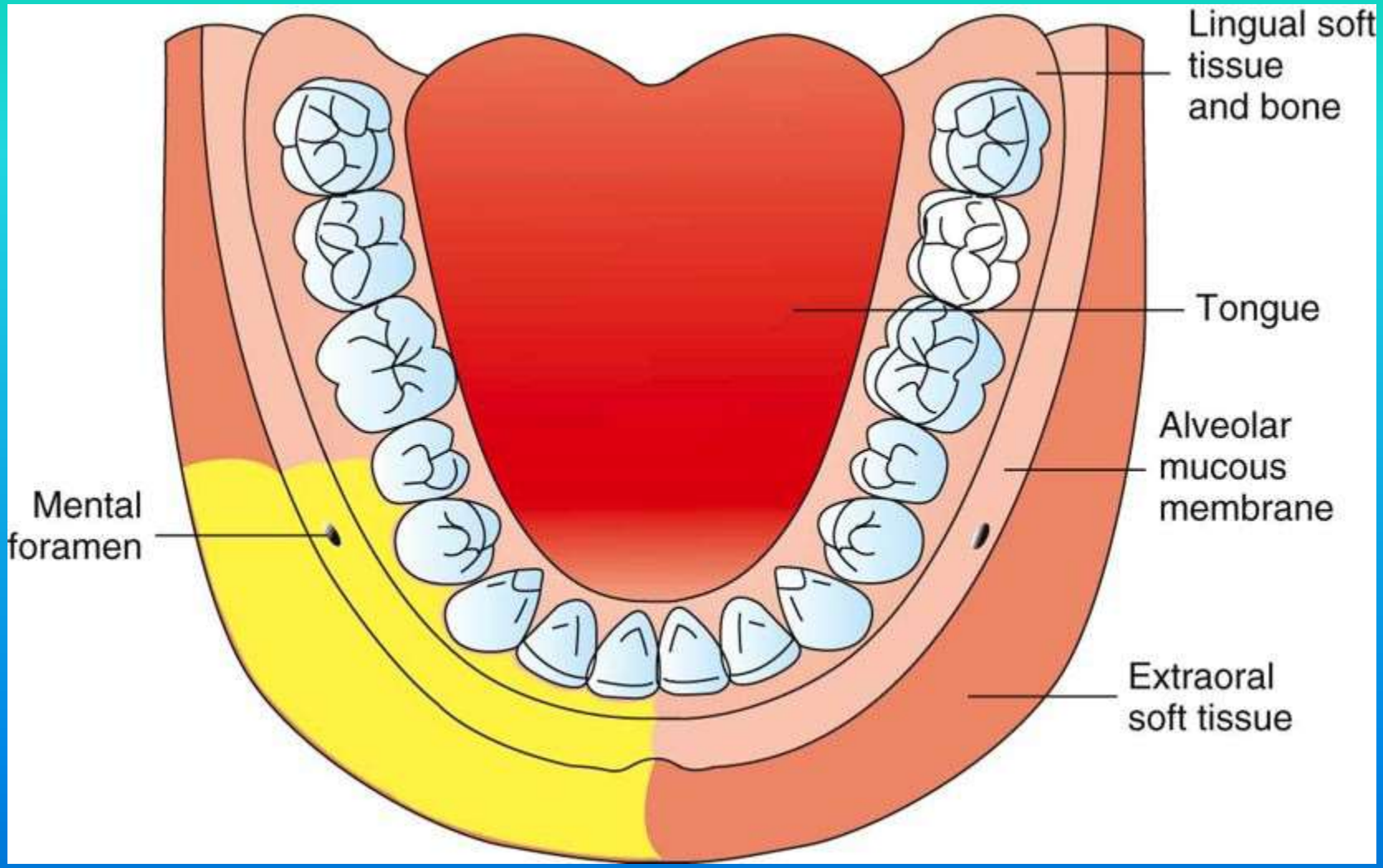
Extraoral mandibular nerve block:

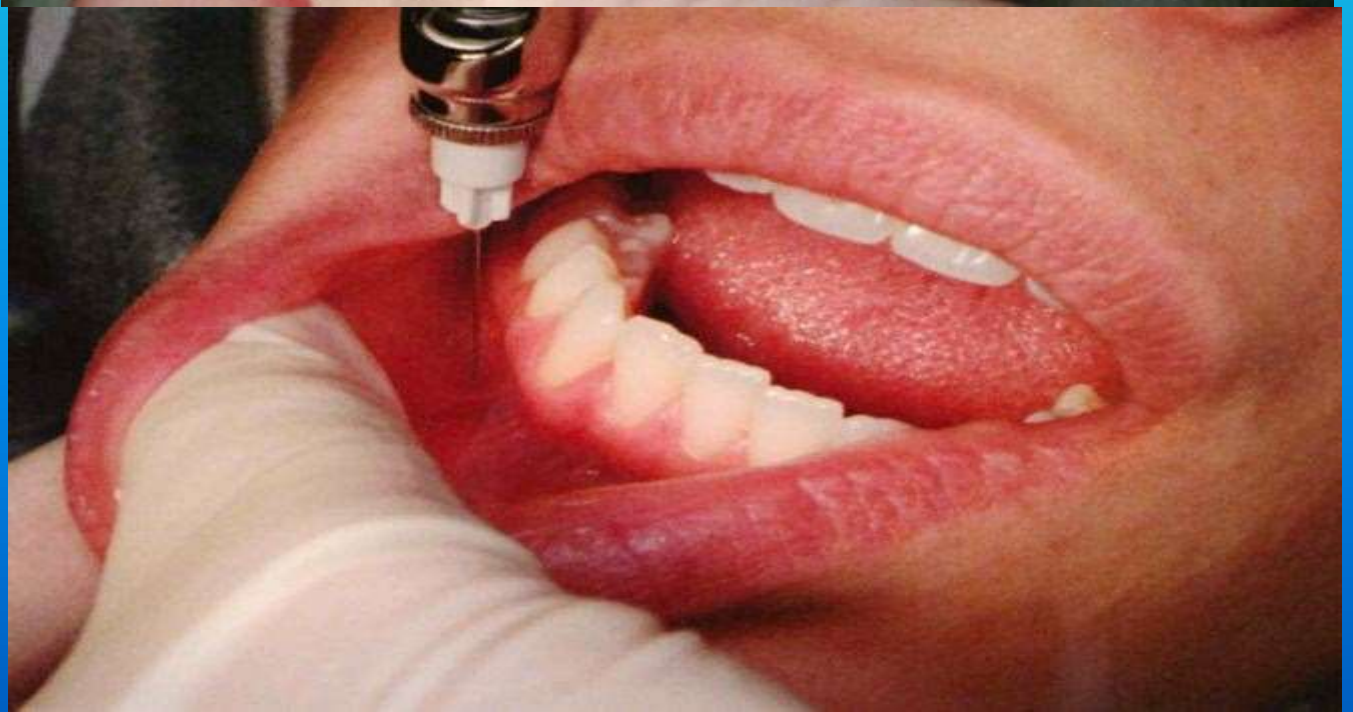
This technique is indicated when there is acute infection at the site of injection for the subdivisions of the mandibular nerve , presence of trauma that would make it difficult or impossible to anesthetize the subdivisions of the mandibular nerve , when there is need to anesthetize the entire mandibular nerve and its branches with one single penetration and minimum amount of local anesthetic solution.



Mental Nerve Block

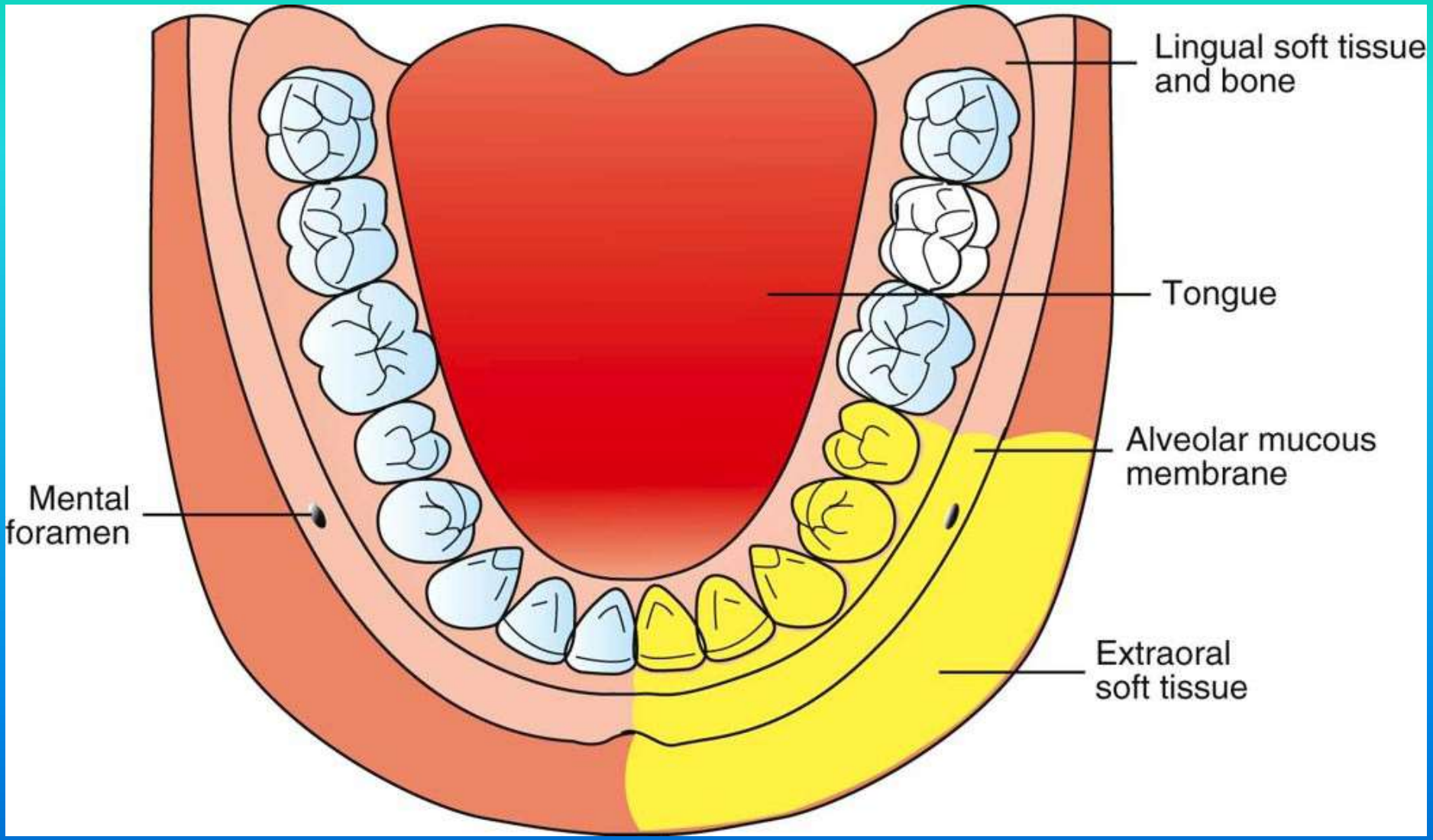
- The mental nerve is a terminal branch of the inferior alveolar nerve. Exiting the mental foramen at or near the apices of the mandibular premolars, it provides sensory innervation to the buccal soft tissues lying anterior to the foramen and the soft tissues of the lower lip and chin on the side of injection. **Indication:**When buccal soft tissue anesthesia is necessary for procedures in the mandible anterior to the mental foramen, such as the following:Soft tissue biopsies, Suturing of soft tissues


Lingual soft tissue and bone
Tongue
Alveolar mucous membrane
Mental foramen
Extraoral soft tissue



Incisive Nerve Block:

The incisive nerve is a terminal branch of the inferior alveolar nerve. Originating as a direct continuation of the inferior alveolar nerve at the mental foramen, the incisive nerve travels anteriorly in the incisive canal, providing sensory innervation to those teeth located anterior to the mental foramen. The nerve is always anesthetized when an inferior alveolar or mandibular nerve block is successful; therefore the incisive nerve block is not necessary when these blocks are administered. The premolars, canine, and lateral and central incisors, including their buccal soft tissues and bone, are anesthetized when the incisive nerve block is administered. * An important indication for the incisive nerve block is when the contemplated procedure involves both the right and left sides of the mandible


Lingual soft tissue and bone
Tongue
Alveolar mucous membrane
Mental foramen
Extraoral soft tissue


Thank you

complications of local anesthesia

a number of complications are associated with the administration of local anesthesia and those complications could be classified into ***local*** and ***systemic***

- **Local complication of local anesthesia include:**

1-pain on injection

2- burning on injection

3- failure to obtain anesthesia

4-persistent anesthesia

5-needle breakage

6-facial nerve paralysis

7- Trismus

8-Soft tissue injury

9- Hematoma

10- Infection

(1) **—pain on injection** ; - pain on injection increases patient anxiety and may lead to sudden unexpected movement which may lead to increasing the risk of needle breakage

Causes:-

1- careless injection technique

2- *rapid* deposition of the local anesthetic solution may cause tissue damage and pain

3- low PH of the solution could irritate the tissue

4- Temp of the solution : warmer solution is more comfortable to the patient than the cold one

5- aggressive insertion of the needle can tear the soft tissue ,blood vessel ,nerve ,and periosteum and cause more pain

Prevention: -

1- Follow the technique Of local anesthesia properly

2- Use sharp needle

3- Use sterile local anesthetic solution which stored in correct temperature

4- Inject local anesthesia slowly

Management : - no management is necessary. however steps should be taken to prevent recurrence of pain associated with injection of L.A.

- **(2} - Burning on Injection : -**
- A burning sensation occurring during injection of a local anesthesia is not uncommon.

Causes:-

- There are several potential causes as : -

1-- **PH** of the solution being deposited into the soft tissue . the PH of local anesthesia as prepared for injection is 5 , whereas that of solution containing a vasopressor is even more acidic.

2- rapid injection of local anesthesia especially in the denser more adherent tissues of the palate. produce a burning sensation

3- contamination of the local anesthetic cartridge can result when they are stored in alcohol or other sterilizing solutions leading to diffusion of these solutions into the cartridge Management.

Management : - Because most instances of burning on injection are transient and do not lead to prolonged tissue involvement no treatment is indicated.

(3) - failure to obtain anesthesia

- Although the incidence of this difficulty tend to decrease as the experience of the operator increases but it is still probably the most common problem seen during the use of local anesthesia . the problem is most common with block anesthesia especially in the lower jaw . the possible reasons behind this can be classified as;

1- poor technique : it is the most common cause for insufficient anesthesia in inferior nerve block and common mistakes are

A - injection of anesthesia too soon on the anterior ascending ramus

B - giving injection inferior to mandibular foramen

2- anatomical causes include:

A - accessory nerve supply.

B - abnormal course of the nerve.

C- variation in the foramen location.

D - some time the tooth is innervated by more than one nerve

3- pathological reason include :-

A - trismus (limited mouth opening) in these cases it is impossible to use conventional technique of inferior nerve block or there will be increased possibility of failure of achieving adequate anesthesia.

B - infection and inflammation : -if the pulp is inflamed the low PH may cause lack of effective anesthesia in that area the inflammation makes the nerve more sensitive . a minimal stimulation can cause pain perception ,in those patient to obtain proper anesthesia more solution has to be injected

for example by combining a block , infiltration and supplemental intraligamentary or intra osseous injection can be used if necessary.

4- Psychological reasons : -

- Fear and anxiety can cause failure in local anesthesia , to enable successful anesthesia relaxation of the patient is sometime needed . for this the use of a sedative like benzodiazepine may be helpful .

{4) persistent anesthesia

- It is the prolonged loss of sensation of part of the soft tissue of the face, (including tongue and lip }
- On occasion a patient reports feeling numb many hours after local anesthetic injection . when anesthesia persist for days , weeks , or months there is an increased potential for the development of problems as it could lead to self - inflicted injury ,biting ,or thermal or chemical insults which can occur without the patient awareness .

Causes:-

1- trauma to any nerve may lead to Parasthesia which means anesthesia beyond the expected duration . trauma to the nerve sheath can be produced by the needle during injection so Parasthesia is not un common complication of oral surgical procedures and mandibular dental implant

2- injection of local anesthetic solution contaminated by neurotoxic substance as alcohol or sterilizing solution near a nerve produces irritation , resulting in edema and increased pressure in the region of the nerve , leading to Parasthesia.

3- hemorrhage and infection in close proximity to a nerve may lead to transient Parasthesia which resolve within the removal of the cause .

Prevention

- Strict adherence to injection protocol and proper care and handling of dental cartridges help to minimize the risk of Parasthesia.

Management:-

- Most Parasthesia resolve within approximately 8 weeks without treatment we need to reassurance of the patient that the condition is transient and the dentist should note the sign and symptoms and follow up the patient .only if damage to the nerve is severe the Parasthesia will be permanent.

{ **5) needle breakage**

- Breakage and retention of needles within the tissue has become an extremely rare occurrences because of the introduction of disposable needles . however reports of needle breakage still appear.

Causes:-

1- the primary cause of needle breakage is weakening of the dental needle by bending it before its insertion into the patients mouth .

2- the sudden unexpected movement by the patient as the needle penetrates muscle or contacts periosteum .

3- smaller needles (as gauge 30) are far more likely to break than larger needles (as gauge 25)

4” re-usage of the needle which its not accepted in dentistry now a days , yet re - usage may occur for the same patient during the same appointment when giving additional dosage of local anesthesia to the same patient .repeated injection cause fatigue of the needle structure and increases the risk of needle breakage.

5-incorrect use of the needle as

A - aggressive insertion of the needle into the tissue

B - sudden change in the direction inside the tissue

C - too deep penetration as the needle goes up to its hub inside the tissue and might fracture at this *point* .the hub is considered the most common point of needle fracture

6- needles may prove to be defective in manufacture

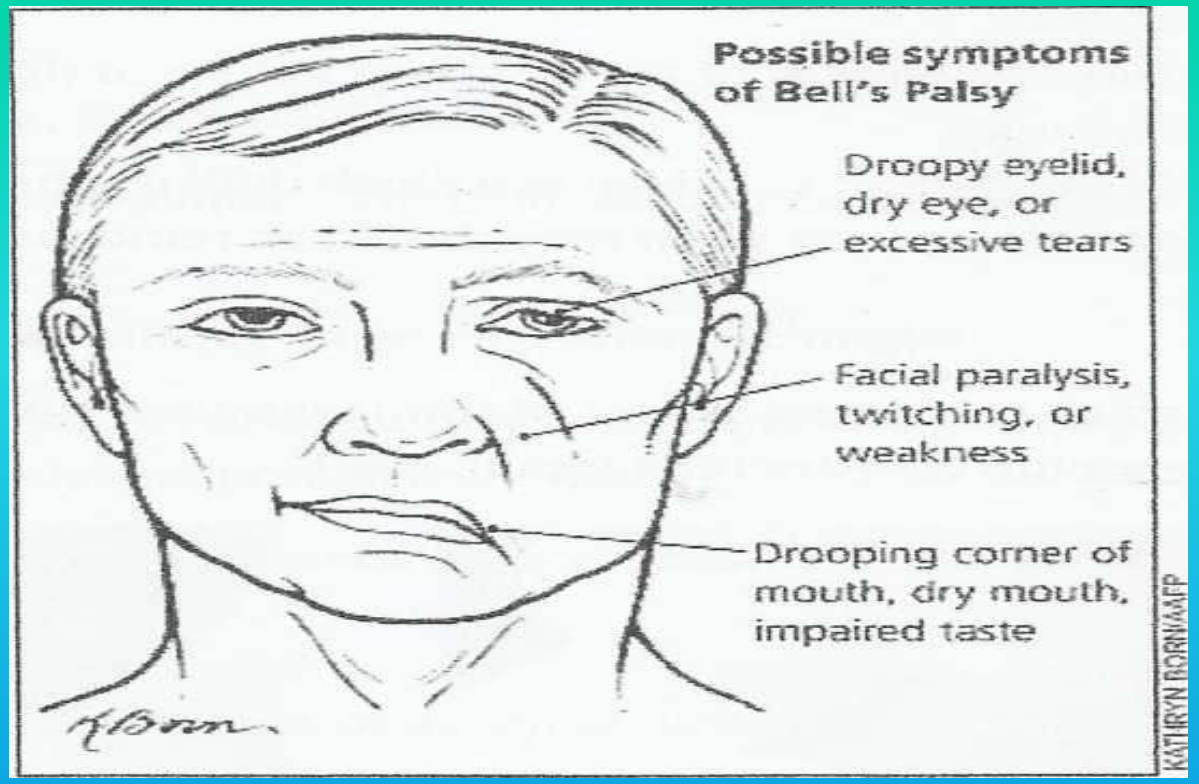
Prevention

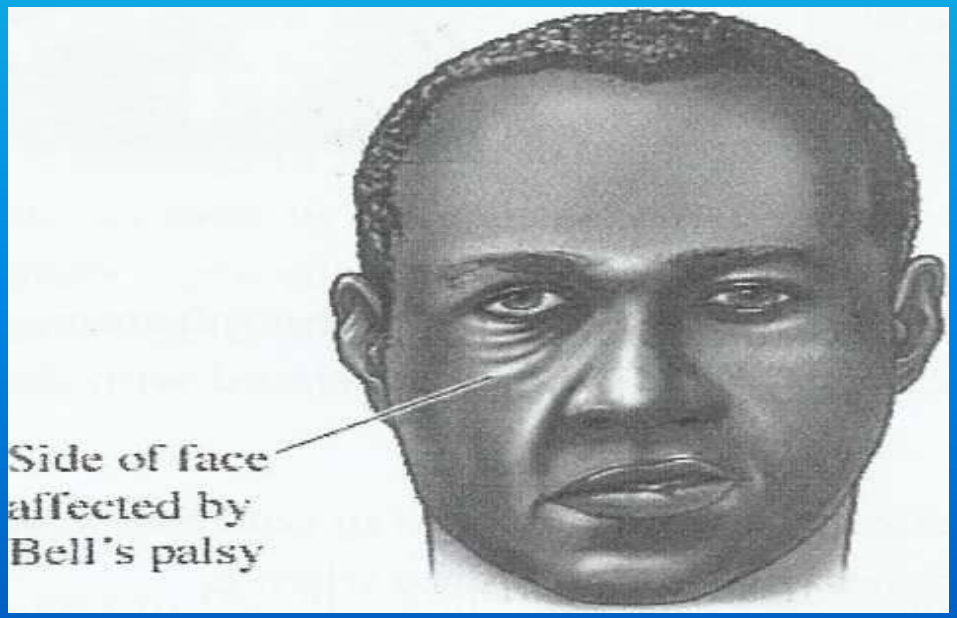
- The dentist should check the needle before using them . if there is any suspicion of inadequate product quality a new one should be used
- - use larger - gauge for techniques needing penetration of significant depths of soft tissue , gauae25 needle are appropriate for an inferior alveolar
- - *using* long needles for injection requiring penetration of significant depth of soft tissue,
- - do not insert a needle into tissues to its hub unless it is essential for the success of the technique
- - do not redirect a needle once it is inserted into tissues

- **Management**
- - stay calm and try to localize broken part in the tissue
- - tell the patient what has happened and try to relax and comfort him
- - stabilize the patient jaws in order that the needle stays in place ,if the patient move his jaw the tension from the muscle of masticatory system help the needle to penetrate the tissue
- - if a portion of the needle is visible, grasp it firmly with hemostat and remove it
- - if you cannot remove the broken part yourself, refer the patient to oral and maxillofacial surgeon . in the department of oral and maxillofacial surgery the patient is examined well and the needle is removed surgically under general anesthesia which provide complete immobility and muscle relaxation with the aid of some method that are used to localize the needle as x - ray, CT scan, ultrasonographic .

{ 6} facial nerve paralysis

Paralysis of the facial muscles on one side is an un - common complication of the inferior dental injection and may be either partial or complete depending upon which branches of the nerve are affected.


Possible symptoms of Bell's Palsy
Droopy eyelid, dry eye, or excessive tears
Facial paralysis, twitching, or weakness
Drooping corner of mouth, dry mouth, impaired taste
KATHRYN BORN/AAFP


Side of face affected by Bell's palsy

Cause: this complication arises if the tip of the needle is inserted too far back and behind the ascending ramus /the solution is then deposited in the substance of the parotid gland where it anesthetizes the branches of facial nerve causing paralysis of the muscle they supply .since the parotid gland is enveloped by a facial sheath there is also a failure to obtain anesthesia of the inferior dental nerve

Clinically the patient will immediately complain of transient paralysis of the muscle of the chin . lower lip .upper lip , eye lid { in ability to dose the eye } and inability to raise the eye brow of the affected side .

Management:

- Reassure the patient of the transient nature of the event and will last for few hours
- Advice the patient to use an eye patch until motor function returns
- if contact lenses are worn they should be removed


Thank you

complications of local anesthesia

7- Trismus

- Trismus defined as prolonged spasm of the jaw muscles by which the normal opening of the mouth is restricted (locked jaw).

Causes:-

- trauma to the muscles or blood vessels In the infratemporal fossa is the most common etiological factor in trismus associated with dental injection of local anesthetics

- local anesthetic solution into which alcohol or cold sterilizing solutions have diffused produce irritation of tissues leading to trismus

- hemorrhage is another cause of trismus large volumes of extra vascular blood can produce tissue irritation leading to muscle dysfunction as the blood is slowly resorbed

- a low -grade infection after injection can also cause trismus

- excessive volumes of local anesthetic solution deposited into a restricted area produce distention of tissues which may lead to post injection trismus

Prevention

- use sharp, sterile, disposable needle
- use aseptic technique; contaminated needle should be changed immediately
- practice a traumatic insertion and injection technique
- avoid repeat injections and multiple insertions into the same area through knowledge of anatomy and proper technique
- use minimum effective volumes of local anesthetic

Management

- heat therapy which consist of applying hot, moist towels to the affected area for approximately 20 min every hour or using warm saline rinse

- use analgesic to manage pain associated with trismus and muscle relaxants

- the patient is advised to initiate physiotherapy consisting of opening and dosing the mouth as well as lateral excursions of the mandible for 5 min every 3 to 4 hours chewing gum is another means of providing lateral movement of the tempro- mandibular joint.

{8} soft - tissue injury

Self-inflicted trauma to the lips and tongue is frequently cause by the patient biting or chewing these tissues while still anesthetized

Cause:

- Trauma occurs most frequently in younger children and in mentally restarted children or adults .the primary cause is the fact that soft - tissue anesthesia lasts longer than dose pulpal anesthesia

Prevention

- local anesthetic of appropriate duration should be selected

-A cotton roll can be placed between the lip and the teeth if they are still anesthetized

-Warn the patient against eating, drinking hot fluid, and biting on the lips or tongue to test for anesthesia

Management

Management of the patient with self - inflicted soft - tissue injury secondary to lip or tongue biting or chewing is asymptomatic

- analgesics for pain if necessary

-antibiotic if necessary

- cold saline rinses to aid in decreasing any swelling present

-use any jell form or any lubricant to cover the lip lesion and minimize the irritation

{9) hematoma

Hematoma is localized mass of extravasated blood that may become clinically noticeable following the injection . it is caused by penetration of the blood vessel with the needle during penetration or withdrawal of the needle in to the tissue leading to bleeding inside the tissue and the formation of hematoma . the patient will notice development of swelling and discoloration of a bruise . intra orally the blood vessels most commonly associated with hematoma are

- the pterygoid venous plexus
- posterior superior alveolar vessels
- the inferior alveolar vessels in the pterygomandibular space
-the mental vessels
- the infraorbital vessels

Prevention:

- learn anatomical landmark and injection technique
- avoid relocating the needle to different sites inside the tissue

management:

- if it is visible immediately following injection apply direct pressure if possible , once bleeding has stopped inform the patient of what happened an d re - evaluate the possibilities of continuing the treatment , instruct the patient to avoid application of heat over the area , prescribe analgesic and antibiotic if necessary
- if it is Invisible like in case of pterygomandibular space hematoma the patient will come in the 2 nd or 3 rd day complaining of trismus in this case treat the case as trismus.

(10} infection

- Infection after the local anesthetic administration has become rare complication since the introduction of sterile disposable needles and glass cartridges.

Causes

- contamination of the needle when touching the mucous membrane in the oral cavity before the administration of local anesthesia

- improper technique in handling of the local anesthetic equipment

- injecting of the solution into an area of infection which might transport bacteria into adjacent healthy tissues spreading infection,

prevention

- use sterile disposable needles

- proper handle of the needle to ovoid its contact with nonsterile surface

- use cartridges only once and store it in their original container , covered at all times

Management

- If an infection dose occur the patient will complain from pain and trismus , immediate treatment consist of those procedures used to manage trismus /if signs and symptom of trismus do not respond to treatment a course of antibiotic should be prescribe to the patient for 7 days

Periodontal ligament injection:

- Primary indications for the PDL injection include

(1) the need for anesthesia of but one or two mandibular teeth in a quadrant.

(2) treatment of isolated teeth in both mandibular quadrants (to avoid bilateral inferior alveolar nerve block).

(3) treatment of children (because residual soft tissue anesthesia increases the risk of self-inflicted soft tissue injury)

(4) treatment in which nerve block anesthesia is or soft tissue anesthesia contraindicated (e.g., in hemophiliacs).

(5) its use as a possible aid in the diagnosis (e.g., localization) of mandibular pain.

Contraindications:

Contraindications to the PDL injection include:

1-infection or severe inflammation at the injection site.

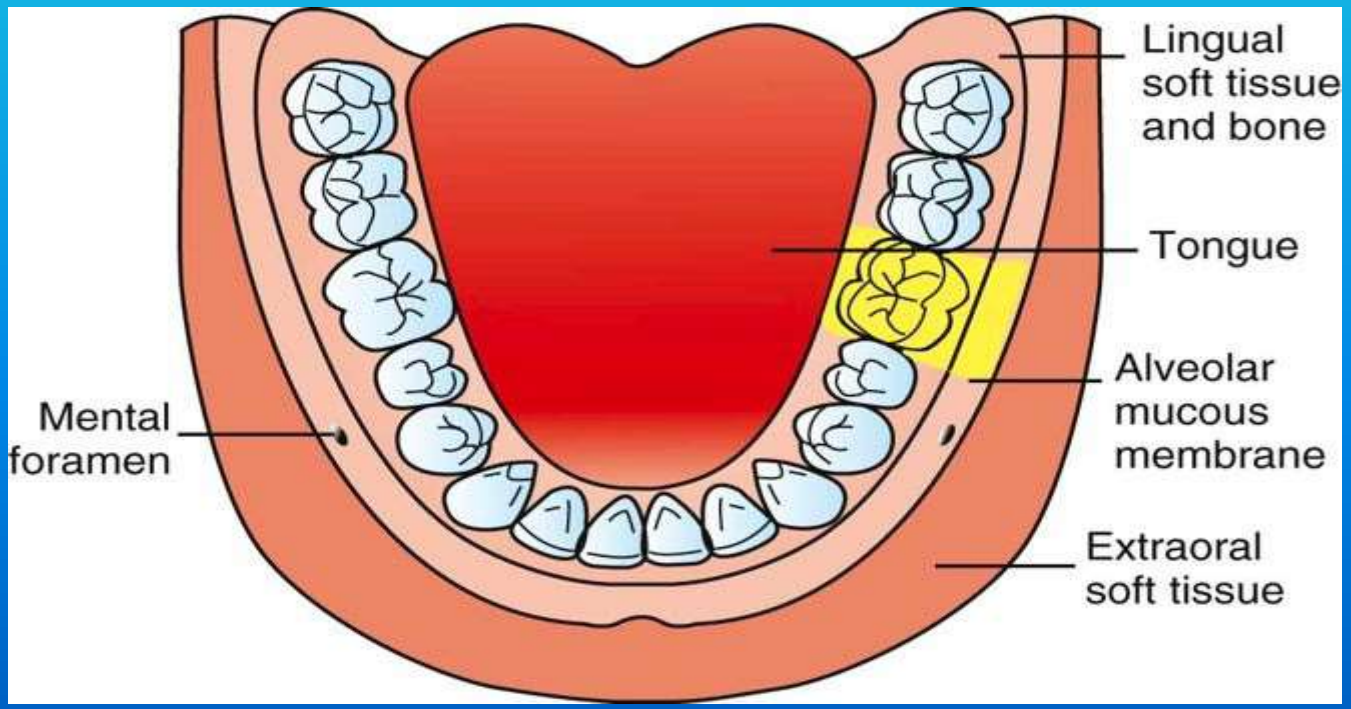
2-the presence of primary teeth(enamel hypoplasia or hypomineralization have been reported)

Nerves Anesthetized

- Terminal nerve endings at the site of injection and at the apex of the tooth.

Areas Anesthetized

- Bone, soft tissue, and apical and pulpal tissues in the area of injection.



Technique:

- *Area of insertion:* Long axis of the tooth to be treated on its mesial or distal root (one-rooted

tooth) or on the mesial and distal roots (of multirooted tooth) interproximally.

- *Target area:* depth of the gingival sulcus
- Landmarks:

- a Root(s) of the tooth
- b Periodontal tissues

- *Orientation of the bevel:* Although not significant to the success of the technique, it is recommended that the bevel of the needle face toward the root to permit easy advancement of the needle in an apical direction


A
B


Thank you

Basic principle of exodontia

Tooth extraction:

A surgical procedure of painless removal of whole tooth or root from their bony alveolar sockets in the oral cavity with minimum discomfort and trauma to the bone and surrounding soft structures, wound heals without postoperative complication.

- Subsequent to removal of teeth, the alveolar process undergo atrophy. The bundle bone will lose it's function and disappear. The greatest in the horizontal and mainly at facial aspect.
- The volume and shape of alveolar process is determined by form of the teeth,their axis of eruption and eventual inclination.

Indication :

- To resurface avascular recipient beds or beds with poor vascularity(bare bone, bare cartilage, bare tendon, irradiated bed
- Exposed joint or implant
- Full thickness reconstruction of the cheek ,ears, eyelid, lips and nose
- Provide durable cover over bony prominence and pressure points(calcaneum , pressure ulcer)
- For cosmetic reasons

Pain and anxiety control:

-Removal of even a loose tooth causes pain. Thus profound local anesthesia is required to prevent pain during extractions.

- Local anesthesia must be absolutely profound to eliminate sensation from the pulp, periodontal ligament, and adjacent soft tissues.

- Even with profound local anesthesia, patients will still experience discomfort from pressure placed on a tooth and surrounding tissues during most extractions.

-Control of patient anxiety is necessary to prevent psychological distress.

LOCAL ANESTHESIA:

Profound local anesthesia is needed if the tooth is to be removed without pain for the patient; therefore, it is essential that the surgeon remember the precise innervations of all teeth and surrounding soft tissue and the kinds of injection necessary to anesthetize those nerves completely.

-Dense local anesthesia results in the loss of all pain, temperature, and touch sensations, but it does not anesthetize the **proprioceptive fibers of the involved nerves**. Thus during an extraction the patient feels a sensation of pressure , especially when the force is intense.

Table 7-1 Sensory Innervation of Jaws

Nerve	Teeth	Soft Tissue
Inferior alveolar nerve	All mandibular teeth	Buccal soft tissue of premolars, canines, and incisors
Lingual nerve	None	Lingual soft tissue of all teeth
Long buccal nerve	None	Buccal soft tissue of molars and the second premolar
Anterosuperior alveolar nerve	Maxillary incisors and canine tooth	Buccal soft tissue of incisors and canines
Middle superior alveolar nerve	Maxillary premolars and a portion of the first molar tooth	Buccal soft tissue of premolars
Posterosuperior alveolar nerve	Maxillary molars except for a portion of the first molar tooth	Buccal soft tissue of molars
Anterior palatine nerve	None	Lingual soft tissue of molars and premolars
Nasopalatine nerve	None	Lingual soft tissue of incisors and canines

-Even with profound soft tissue anesthesia and apparent pulpal anesthesia, a patient may continue to have sharp pain as a tooth is luxated. This is especially likely when the teeth have a pulpitis or the surrounding soft and hard tissues are inflamed or infected. A technique that should be used in these situations is the periodontal ligament injection.

-The anesthesia is short-lived, so the surgical procedure should be one that can be accomplished with in 15-20 min.

-The surgeon must remember that pulpal anesthesia of maxillary teeth after local infiltration lasts a much shorter time than pulpal anesthesia of mandibular after block anesthesia. In addition, pulpal anesthesia disappears 60 to 90 minutes before soft tissue anesthesia.

SEDATION

-Management of patient anxiety must be a major consideration in oral surgical procedures.

-Patients are frequently already in pain and may be agitated and fatigued, both of which lower the patient's ability to handle pain or pain-producing situations.

- Anxiety is normal event in patients with positive past experiences with extractions because the procedure is truly Uncomfortable.

-although the sharp pain is eliminated by local anesthetic, a considerable amount of pressure sensation still exists. Other noxious stimuli are present during an extraction procedure, such as the sounds of cracking of bone and clicking of instruments. For these reasons, prudent dentists use a planned method of anxiety control to prepare themselves and their patients for the anxiety associated with tooth extraction

-Preoperatively orally administered drugs, such as diazepam, may provide a patient with rest the night before the surgery and some relief of anxiety in the morning. However, orally administered drugs are usually not profound enough to control moderate to severe anxiety.

-Sedation by the inhalation of nitrous oxide is frequently the technique of choice for anxious patients and may be the only technique required for many patients who have mild to moderate anxiety.

- An extremely anxious patient who is to have several complicated extractions may require deeper sedation, usually by the intravenous route. Sedation with anxiolytic drugs, such as using diazepam or midazolam

INDICATONS FOR REMOVAL OF TEETH

1-CARIES

Perhaps the most common and widely accepted reason to remove a tooth is that it is so severely carious that it cannot be restored.

2-PULPAL NECROSIS

A second, closely aligned rationale for removing a tooth is the presence of pulp necrosis or irreversible pulpitis that is not amenable to endodontics.

3-SEVERE PERIODONTAL DISEASE.

4-ORTHODONTIC REASONS

Patients who are about to undergo orthodontic correction of crowded dentition frequently require the extraction of teeth to provide space for tooth alignment.

5-MALPOSED TEETH

-If they traumatize soft tissue and cannot be repositioned by orthodontic treatment, they should be extracted

-hyper-erupted because of the loss of teeth in the opposing arch. If prosthetic rehabilitation is to be carried out in the opposing arch, the hyper-erupted teeth may interfere with construction of an adequate prosthesis.

An uncommon indication for extraction of teeth is a tooth with a cracked crown or a fractured root.

6-CRACKED TEETH

7-IMPACTED TEETH

Impacted teeth should be considered for removal

8-SUPERNUMERARY TEETH

A supernumerary tooth may interfere with eruption of succedaneous teeth and has the potential for causing their resorption and displacement.

9-Teeth Associated with Pathologic lesions

10-Radiation Therapy

11- Teeth Involved with Jaw Fractures

-Esthetics
-Economics

CONTRAINDICATIONS FOR THE REMOVAL OF TEETH

SYSTEMIC CONTRAINDICATIONS

1-Systemic contraindications preclude extraction because the patient's systemic health is such that the ability to withstand the surgical insult may be compromised

2-one systemic contraindication is a group of conditions called ***severe uncontrolled metabolic*** diseases. Brittle diabetes and end-stage renal disease with severe uremia are part of this group.

3-Patients who have uncontrolled leukemia and lymphoma should not have teeth removed until the malignancy can be brought under control.

4-Patients with any of a variety of severe uncontrolled cardiac diseases should also have their extractions deferred until the disease can be brought under control.

5-Pregnancy is a relative contraindication to extractions; patients who are in the first or third trimester should have their extractions deferred if possible.

6-Patients who have a severe bleeding diathesis, such as hemophilia, or severe platelet disorders should not have teeth extracted until the coagulopathy has been corrected.

7-Finally; patients who take or have taken a variety of medications should have surgery performed with caution. Drugs to watch for include corticosteroids, immunosuppressive agents, bisphosphonates, and cancer chemotherapeutic agents.

Local Contraindications

1-The most important and most critical is a history of therapeutic radiation for cancer. Extractions performed in an area of radiation may result in osteoradionecrosis and therefore must be done with extreme caution

2-Teeth that are located within an area of tumor, especially a malignant tumor, should not be extracted. The surgical procedure for extraction could disseminate malignant cells and thereby seed metastases.

3-Patients who have severe pericoronitis around an impacted mandibular third molar should not have the tooth extracted until the pericoronitis has been treated.

4-Finally, the acute dentoalveolar abscess must be mentioned.

Clinical evaluation of teeth for removal

A variety of factors must be examined to make appropriate assessment

1- ACCESS TO TOOTH

The first factor to be examined in preoperative assessment is the extent to which the patient can open the mouth. The location and position of the tooth to be extracted with in a dental arch should be examined.

2- MOBILITY OF TOOTH

The mobility of the tooth to be extracted should be assessed preoperatively. Teeth with severe periodontitis uncomplicated tooth removal is expected. Less than normal mobility should be carefully assessed for presence hypercementosis or ankylosis.

A, TOOTH WITH SEVERE PERIODONTAL DISEASE WITH BONE LOSS AND WIDE PERIODONTAL LIGAMENT SPACE. THIS KIND OF TOOTH IS STRAIGHTFORWARD TO REMOVE. B, RETAINED MANDIBULAR SECOND PRIMARY MOLAR WITH AN ABSENT SUCCEDANEOUS TOOTH. THE MOLAR IS PARTIALLY SUBMERGED, AND THE LIKELIHOOD FOR
ANKYLOSED ROOTS IS HIGH.

3- Condition of crown

The assessment of crown of tooth before extraction should be related to the presence of large caries or restoration in the crown.

Teeth with large carious lesions are likely to fracture during extraction, making extraction more difficult

Teeth with large amalgam restorations are likely to be fragile
and to fracture when extraction forces are applied.

Mandibular first molar. If the molar is to be removed, the surgeon must take care not to fracture amalgam in the second premolar with elevators or forceps.

RADIOGRAPHIC EXAMINATION OF TOOTH FOR REMOVAL

-Periapical radiographs provide the most accurate and detailed information concerning the tooth, its roots, and the surrounding tissue. Panoramic radiographs are used frequently, but their greatest usefulness is for impacted teeth as opposed to erupted teeth.

- **For radiograph to have their maximal value they must meet certain criteria:**

A- properly exposed with adequate penetration and good contrast.

B- the radiographic film should be properly positioned.

C- the radiograph must be properly processed with good fixation, drying and mounting.

A- Relation of Associated Vital Structure

When performing extractions of the maxillary molars, it is essential to be aware of the proximity of the roots of the molars to the floor of the maxillary sinus. If only a thin layer of bone exists between the sinus and the roots of the molar teeth, the potential for perforation of the maxillary sinus during the extraction increases. Thus the surgical treatment plan may be altered to an open surgical technique , with division of the maxillary molar roots into individual roots before the extraction proceeds

Maxillary molar teeth immediately adjacent to sinus present increased danger of sinus exposure

-The inferior alveolar canal may approximate the roots of the mandibular molars. If an impacted tooth is to be removed, it is important that the relationship between the molar roots and the canal be assessed. Such an extraction may lead to injury of the canal and cause consequent damage to the inferior alveolar nerve.

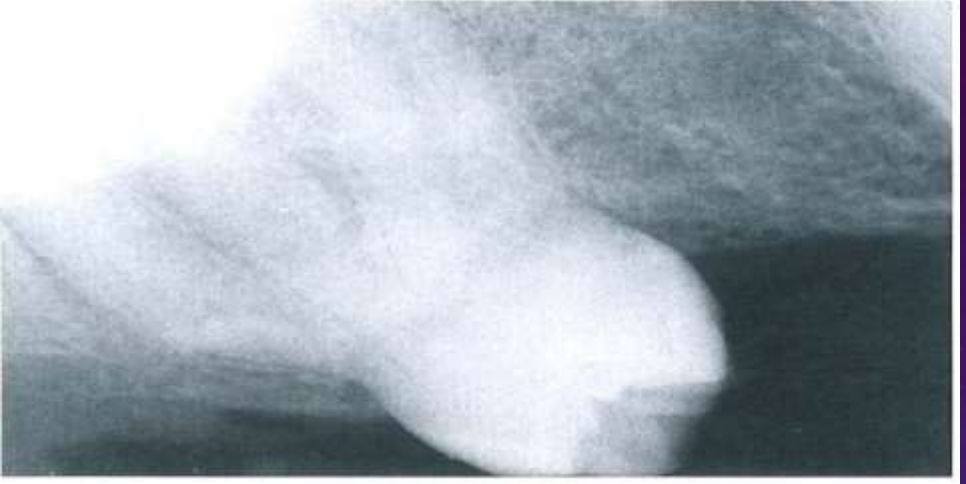
-Radiographs taken before the removal of mandibular premolar teeth should include the mental foramen.

Mandibular molar teeth that are close to inferior alveolar canal. Third molar removal is a procedure most likely to result in injury to nerve.

Before premolar extractions that require a surgical flap are performed, it is essential to know the relationship of the mental foramen to root apices. Note the radiolucent area at the apex of the second premolar, which represents the mental foramen.

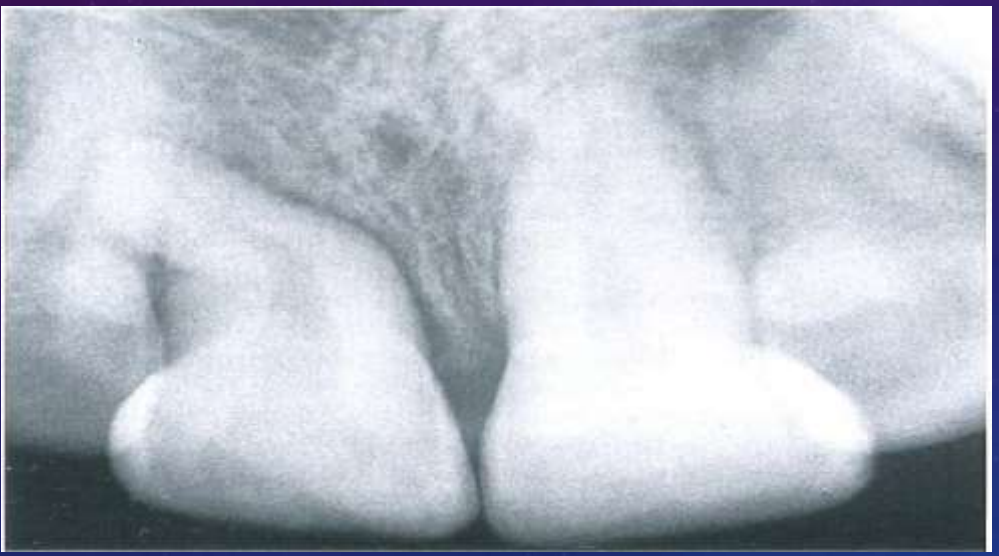
B- CONFIGURATION OF ROOTS

- The first factor to evaluate is the no. of roots on the tooth to be extracted.
- The surgeon should observe if caries extending in to roots.
- -The surgeon must know the curvature and degree of root divergence.
- -The shape of the individual root must be taken into consideration.
- The size of roots must be assessed.



The widely divergent roots of this maxillary first molar make extraction more difficult.

Hypercementosis increases the difficulty of these extractions because roots are larger at the apical end than at the cervical end. Surgical extraction will probably be required.



The curvature of the roots of this tooth is unexpected. Preoperative radiographs help the surgeon plan the extraction more carefully.

C- CONDITION OF SURROUNDING BONE

Careful examination of the periapical radiograph indicates the density of the bone surrounding the tooth to be extracted. Bone that is more radiolucent is likely to be less dense, which makes the extraction easier. However, if the bone appears to be radiographically opaque (indicating increased density) with evidence of condensing osteitis or other sclerosis-like processes, it will be more difficult to extract.

The surrounding bone should be examined carefully for evidence of apical pathology.


Thank you

Systemic complications of local anesthesia

- **Systemic complication of local anesthesia include**
- - fainting (vaso - vagal) attack.
- -hypersensitivity or allergy to local anesthesia.
- - over dosage and toxicity.
- drug interaction.

- ***(1) fainting (vaso -vagal attack)***

it is the most common systemic complication that occurs with local anesthesia in dental office, it refers to a sudden transient loss of consciousness usually secondary to cerebral ischemia . The cerebral ischemia is secondary to vasodilatation , or an increase in peripheral vascular bed, with a corresponding drop in blood pressure.

Collapse in the dental chair may occur suddenly and may not be accompanied by loss of consciousness in most instances these episodes are vaso -vagal attack and spontaneous recovery is usual . the patient often complains of feeling dizzy ,weak ,and nauseated ,the skin is pale , cold and

slow pulse is noticed .

Predisposing factors

The predisposing factors for this condition may be divided into two groups

- Psychogenic factors as:

A - Fright and anxiety

B - Emotional stress

C - Pain of sudden and unexpected nature

D -Sight of blood or of surgical or other dental instrument such as local anesthetic syringe, injection needle, etc

- Non - psychogenic factors as

A - Sitting in upright position or standing for prolonged period . it leads to pooling of the blood in periphery , thereby decreasing cerebral blood flow

B-Poor physical condition

C-Hot, humid and crowded environment

Prevention:

- The prevention is directed to the elimination of the predisposing factors as good preoperative assessment of the patient and his medical history, proper positioning of the patient, patient should be asked to take a light meal prior to the dental appointment, proper injection technique, use of sedation for relief of anxiety, etc

Management:

The first aid treatment should be instituted at once the head of the patient should be lowered quickly by adjusting the back of the dental chair so that the assume the supine position with legs elevated .tight belt and collar should be loosened and respiration is stimulated . spontaneous recovery is usual and it Is often possible to complete the treatment at the same visit .but if sign of recovery are not apparent within 30 - 40 second of the first aid the collapse probably is not a vaso - vagal attack the airway must be maintained .oxygen administered and in this case.

(2) hypersensitivity or allergy to local anesthesia

This occurs due to sensitivity of some people to certain substance known as allergen .any local anesthetic agent may cause such response. but it is more commonly seen with ester type agent (as procaine) than amide type { as lidocaine). hypersensitivity reaction could be due to ; -

- - local anesthetic agent
- - vasoconstrictor
- - additives as bisulphate which used as preservative

In general hypersensitivity reaction to local anesthesia is very rare and represent less than 1 % of all complications of focal anesthesia , true allergic response to local anesthesia may be localized or generalized and it may be immediate or delayed in onset. also the allergic reactions may vary from mild skin irritation or rashes to an anaphylactic reaction , local reactions are seen more frequently than systemic and usually resolve without active treatment. if any degree of allergic reaction is observed ,it is very important to determine the actual cause (allergen) . inadequate diagnosis and treatment can be life threatening to the patient.

Prevention:

- Proper pre - anesthetic evaluation which include proper personal history and the past dental history. particularly history of allergy to local anesthetic agent, or history of allergy to any other drug .

Management:

- Using antihistamines such as diphenydramine 20 -25 mg

- Using epinephrine 0 .5 ml of 1:1000 IM.

-Administer O2 if necessary

Substitution of the local anesthetic agent

The local anesthetic agent can be substituted with another type of agent . if the reaction was in response to ester-type of local anesthetic agents such as procaine , then a n amide type of local anesthetic agent such as lidocaine or bupivacaine can be substituted . if reaction was in response to an amide, then several alternatives are available .

Anaphylactic shock:

It is rarely occurs hypersensitivity reaction of a drug , but when it occurs it Is life threatening it is sudden , often unexpected and many times proves fatal , causing death within few minutes , it may develop following administration of an antigen by any rout. it is characterize by:

- profound fall in the blood pressure

-dyspnea and respiratory embarrassment 3-facial and laryngeal edema

-loss of consciousness

- urticaria

Management of anaphylaxis:

- If you suspect the anaphylactic reaction occurring , immediately seek medical help the treatment must begin before BP and breathing problem become life threatening
- Epinephrine is the most important medication for the treatment of anaphylaxis it is given as intra muscular injection it works rapidly to make blood vessel contract , preventing them from leaking more fluid it also relax air way .helping the individual breathe easier , relieves cramping in the GIT and stop itching , rapidly reverse the life threatening symptom f anaphylactic shock If given in time
- Even if the patient responds to the epinephrine, it is vitally important to go to an emergency room immediately
- O2 and medication may be given to improve breathing
- IV fluid may be necessary to restore adequate BP.
- Additional medication as antihistamine to contract the effect of histamine and help in prevention of delayed allergic reaction
- if the patient stops breathing start cardio pulmonary resuscitation immediately until the patient begins breathing again

(3) - over dosage and toxicity

It is relatively rare , a toxicity reaction can occur when the concentration of local anesthesia in circulation increases too rapidly within a short period of time as in injecting too rapidly into highly vascular area or when giving IV injection /the toxic effect Is primarily directed to the CNS and CVS because these tissues are composed of excitable membrane , The dose necessary to induce toxicity varies among patients and Is influenced by numerous factors which are : -

1- the patient general health, age . weight

- Age is a factor in younger and older patients , the lack of development or dysfunction of the liver and kidneys in these populations increased the level of local anesthetic in the bloodstream .

2- Rapidity of injection

3-Rout of administration

4- Amount of local anesthesia administered

- The patient will be with restlessness .retention of consciousness talkativeness , and agitation , which may end into convulsion along with increased BP , heart rate . respiratory rate .and classified according to the absorption and too large total dose There are two types of drugs that can exhibit toxic reactions in dental practice - which are the local anesthetic overdose and the vasoconstrictor overdose

- **Prevention:**

The best method to avoid toxic reactions is as follows

-Use smallest possible volume and lowest effective concentration

-local anesthetic solution should be injected slowly

- Avoid intravascular administration by the use of aspirating syringe

- **Management:**

- stop the dental procedure

-give reassurance to the patient

-administer 02 , IV anticonvulsant, and monitor vital signs

- allow the patient to recover then discharge

-if the patient fails to recover then transfer him to a general hospital having ICU facility .

Drug interaction:

- In some patients the administration of 2 drugs will counteract each other while in other potentiation occurs . in patient using tricyclic antidepressant variable degrees of potentiation of BP response to adrenaline and nor adrenaline will occur even to small doses therefore percussions should be taken during the use of these vasoconstrictor with patient using tricyclic antidepressant . the practitioners can minimize the risk of interaction by using an aspirating syringe , which reduces the likelihood of the local anesthetic being administered directly into a blood vessel


Thank you

Principle of complicated exodontia

The removal of most erupted teeth can be achieved by closed delivery, but occasionally these techniques does not suffice. The open or surgical extraction technique is the method used for removing roots that were fractured during routine extraction of teeth and cannot be extracted by the routine closed methods for a variety of reasons. The term flap indicates a section of soft tissue that

(1) is outlined by a surgical incision,

(2) carries its own blood supply,

(3) allows surgical access to underlying tissues

(4) can be replaced in the original position, and

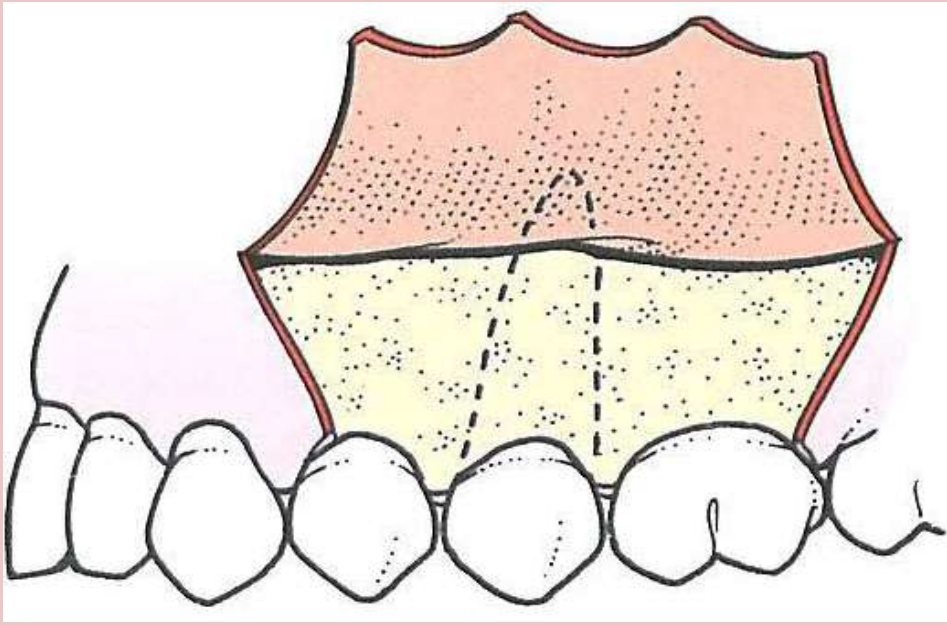
(5) can be maintained with sutures and is expected to heal.

Design parameters of soft tissue flaps:-

To provide adequate exposure and promote proper healing, the flap must be correctly designed.

1-When the flap is outlined, the base of the flap must usually be broader than the free margin to preserve an adequate blood supply. This means that all areas of the flap must have a source of uninterrupted vasculature to prevent ischemic necrosis of the entire flap or portions of it.

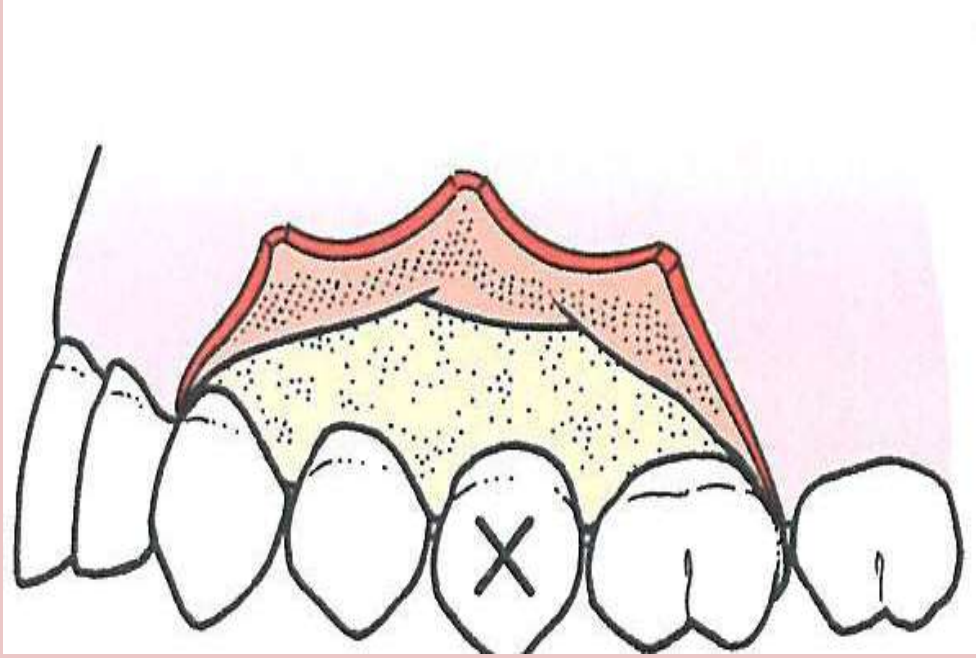
2-The flap must be of adequate size for several reasons.



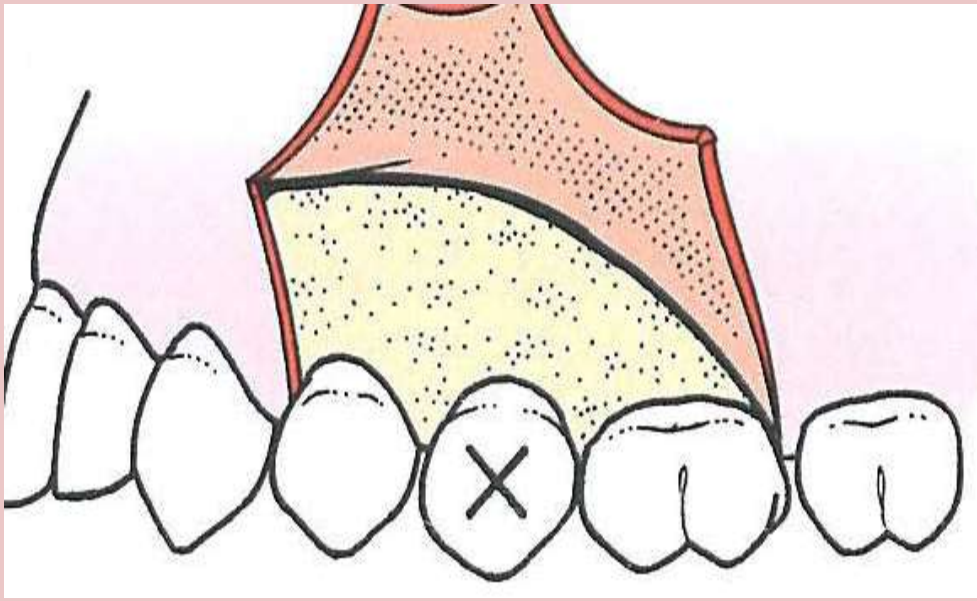
3-Sufficient soft tissue reflection is required to provide necessary visualization of the area.
4-Adequate access also must exist for the insertion of instruments required to perform the surgery.
5-In addition, the flap must be held out of the operative field by a retractor that must rest on intact bone.
6-There must be enough flap reflection to permit the retractor to hold the flap without tension.
7-Furthermore, soft tissue heals across the incision, not along the length of the incision, and sharp incisions heal more rapidly than torn tissue.

>>Therefore a long, straight incision with adequate flap reflection heals more rapidly than a short, torn incision, which heals slowly by secondary intention.

*For an envelope flap to be of adequate size, the length of the flap in the antero-posterior dimension usually extends two teeth anterior and one tooth posterior to the area of surgery.



*If a relaxing incision is to be made, the incision should extend one tooth anterior and one tooth posterior to the area of surgery .



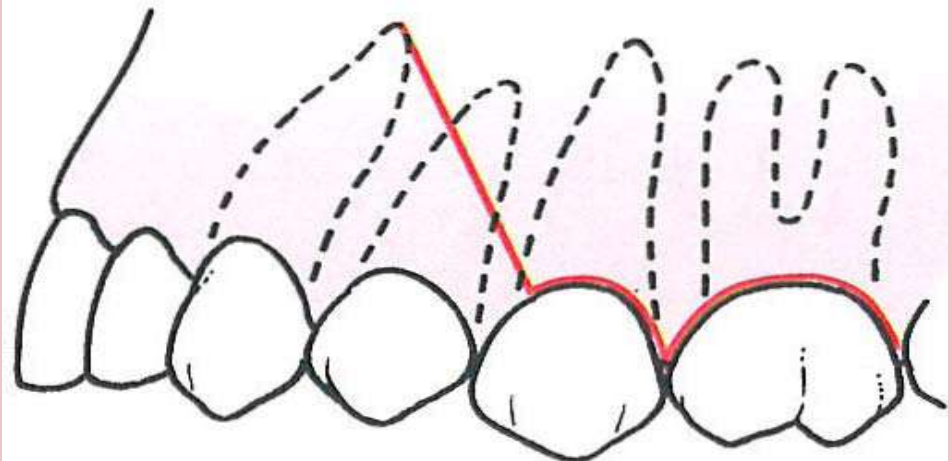
Flaps for tooth removal should be full-thickness mucoperiosteal flaps. This means that the flap includes the surface mucosa, submucosa, and periosteum. Because the goal of the surgery is to remove or reshape the bone, all overlying tissue must be reflected from it. In addition, full-thickness flaps are necessary because the periosteum is the primary tissue responsible for bone healing, and replacement of the periosteum in its original position hastens that healing process. In addition, torn, split, and macerated tissue heals more slowly than a cleanly reflected, full-thickness flap .The tissue plane between bone and periosteum is relatively avascular, so less bleeding is produced when a full-thickness flap is elevated.

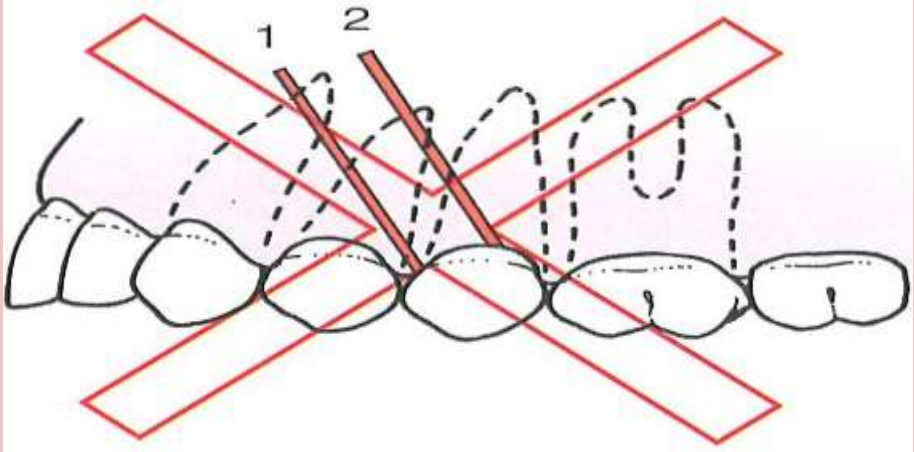
The incisions that outline the flap must be made over intact bone that will be present after the surgical procedure is complete. If the pathologic condition has eroded the buccocortical plate, the incision must be at least 6 or 8 mm away from it. In addition, if bone is to be removed over a particular tooth, the incision must be sufficiently distant from it so that after the bone is removed, the incision is 6 to 8 mm away from the bony defect created by surgery. If the incision line is unsupported by sound bone, it tends to collapse into the bony defect, which results in wound dehiscence and delayed healing.

The flap should b e designed to avoid injury to local vital structures in the area of the surgery. The two most important structures that can be damaged are located in the mandible; these are the lingual nerve and the mental nerve. When reflecting a palatal flap, the surgeon must remember that the major blood supply to the palatal soft tissue comes through the greater palatine artery, which emerges from the greater palatine foramen at the posterior lateral aspect of the hard palate. vertical-releasing incisions in the posterior aspect of the palate should be avoided because

they usually sever the greater palatine artery within the tissue, which results in bleeding that may be difficult to control.

Releasing incisions are used only when necessary and not routinely. When vertical-releasing incisions are necessary, only a single vertical incision is used, which is usually at the anterior end of the envelope component. The vertical-releasing incision is not a straight vertical incision but is oblique, to allow the base of the flap to be broader than the free gingival margin. A vertical releasing incision is made so that it does not cross bony prominences, such as the canine eminence; to do so would increase the likelihood of tension in the suture line, which would result in wound dehiscence. Vertical-releasing incisions should cross the free gingival margin at the line angle of a tooth and should not be directly on the facial aspect of the tooth nor directly in the papilla.

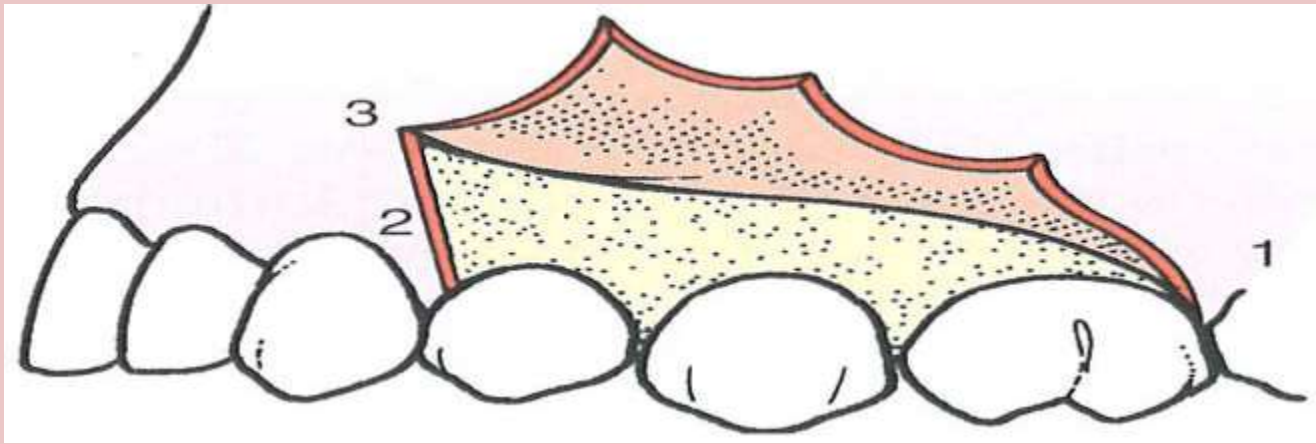




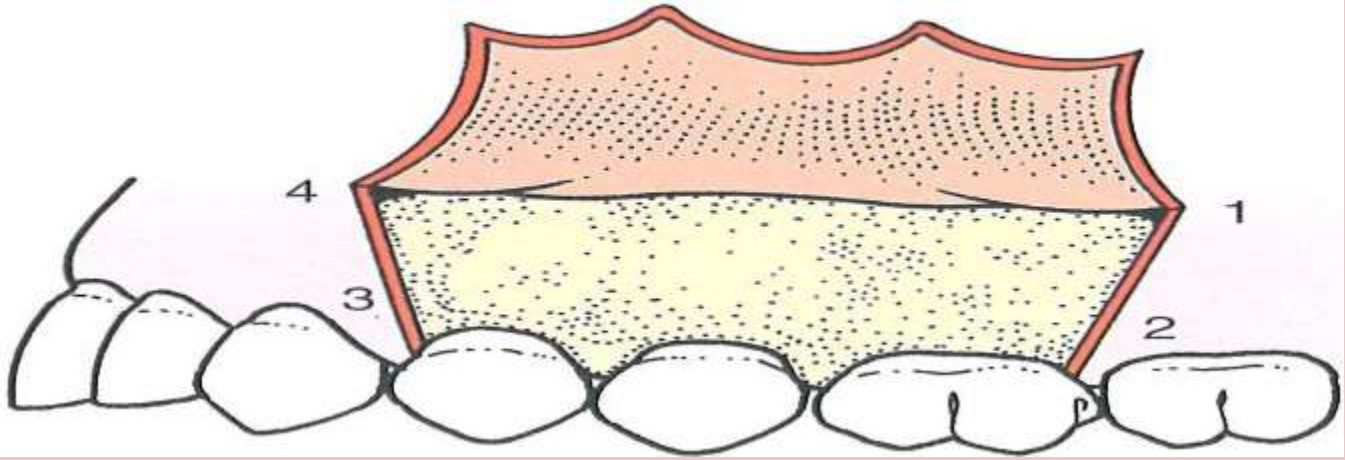
Types of mucoperiosteal flaps

The most common incision is the **envelope** or **sulcular incision** which, when not combined with releasing incision, produces the envelope flap.

In the dentulous patient the incision is made in the gingival sulcus to the crestal bone, through the periosteum, and the full-thickness mucoperiosteal flap is reflected apically. This flap usually provides sufficient access to perform the necessary surgery. If the patient is edentulous, the envelope incision is usually made along the scar at the crest of the ridge. If the sulcular incision has a vertical-releasing incision, it is a **three-cornered flap**, with corners at the posterior end of the envelope incision, at the inferior aspect of the vertical incision, and at the superior aspect of the vertical-releasing incision..

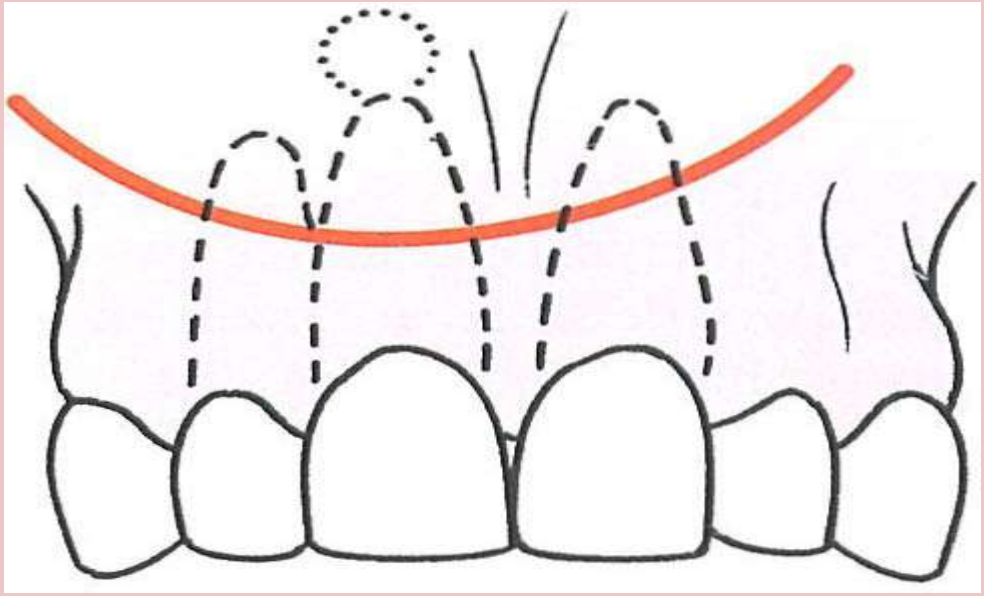


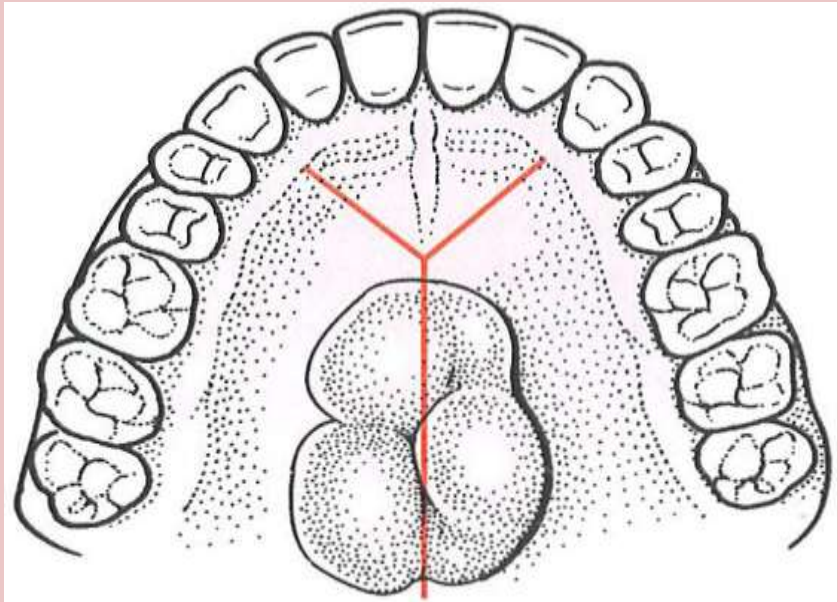
The four-cornered flap is an envelope incision with two releasing incisions. Two corners are at the superior aspect of the releasing incision, and two corners are at either end of the envelope component of the incision



An incision that is used occasionally to approach the root apex is a semilunar incision . This incision avoids trauma to the papillae and gingival margin but provides limited access because the entire root of the tooth is not visible.

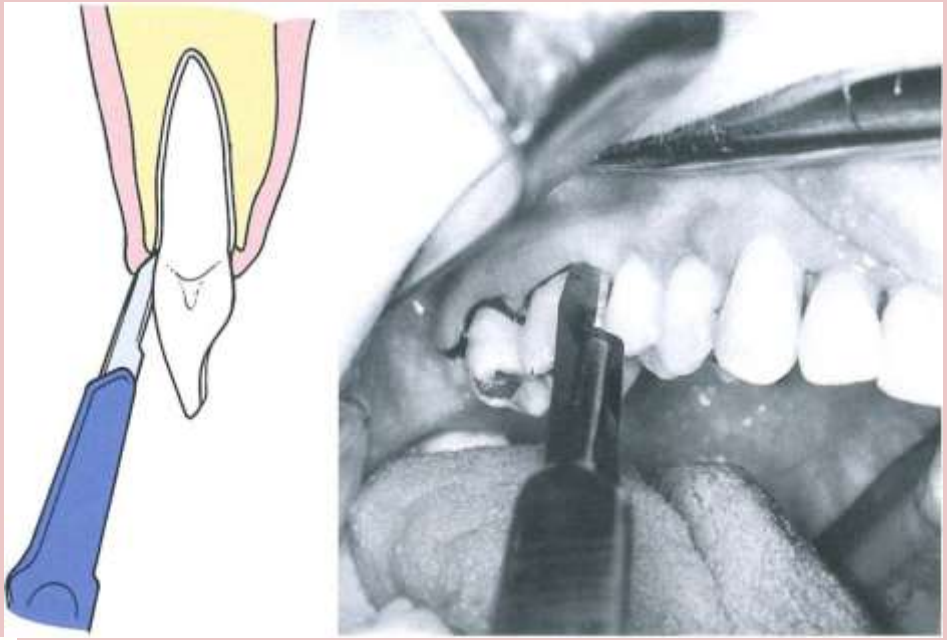
An incision useful on the palate is the Y incision, which is named for its shape. This incision is useful for surgical access to the bony palate for removal of a palatal torus.

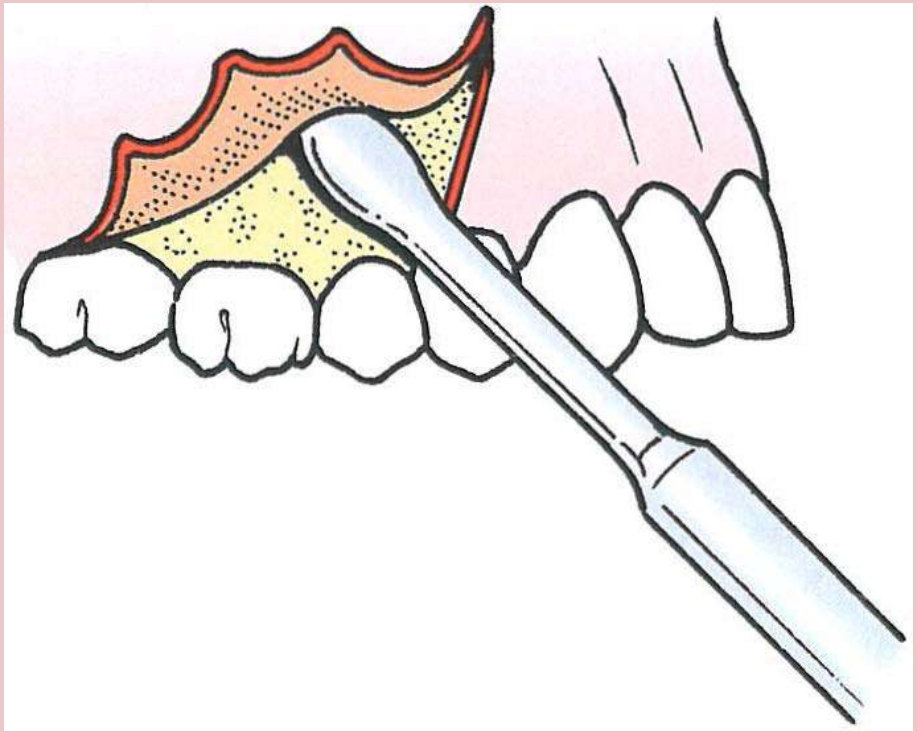




Developing a Mucoperiosteal Flap

The first step is to incise the soft tissue to allow reflection of the flap, the scalpel is held in the pen grasp .The blade is held at a slight angle to the teeth, and the incision is made posteriorly to anteriorly in the gingival sulcus by drawing the knife toward the operator. One smooth continuous stroke is used while keeping the knife blade in contact with bone throughout the entire incision. If a vertical-releasing incision is made, the tissue is apically reflected, with the opposite hand tensing the alveolar mucosa so that the incision can be made cleanly through it. If the alveolar mucosa is not tensed, the knife will not incise cleanly through the mucosa, and a jagged incision will result. Reflection of the flap begins at a papilla. The sharp end of the periosteal elevator begins a reflection.





Principle and techniques for surgical extraction

Surgical or open extraction o f an erupted tooth is a technique that should not be reserved for the extreme situation. A prudently used open extraction technique may be more conservative and cause less operative morbidity than a closed extraction. Forceps extraction techniques that require great force may result not only in removal of the tooth but also of large amounts of associated bone and occasionally the floor of the maxillary sinus. The morbidity of fragments of bone that may be literally torn from the jaw by the "conservative" closed technique greatly exceeds the morbidity of controlled surgical extraction.

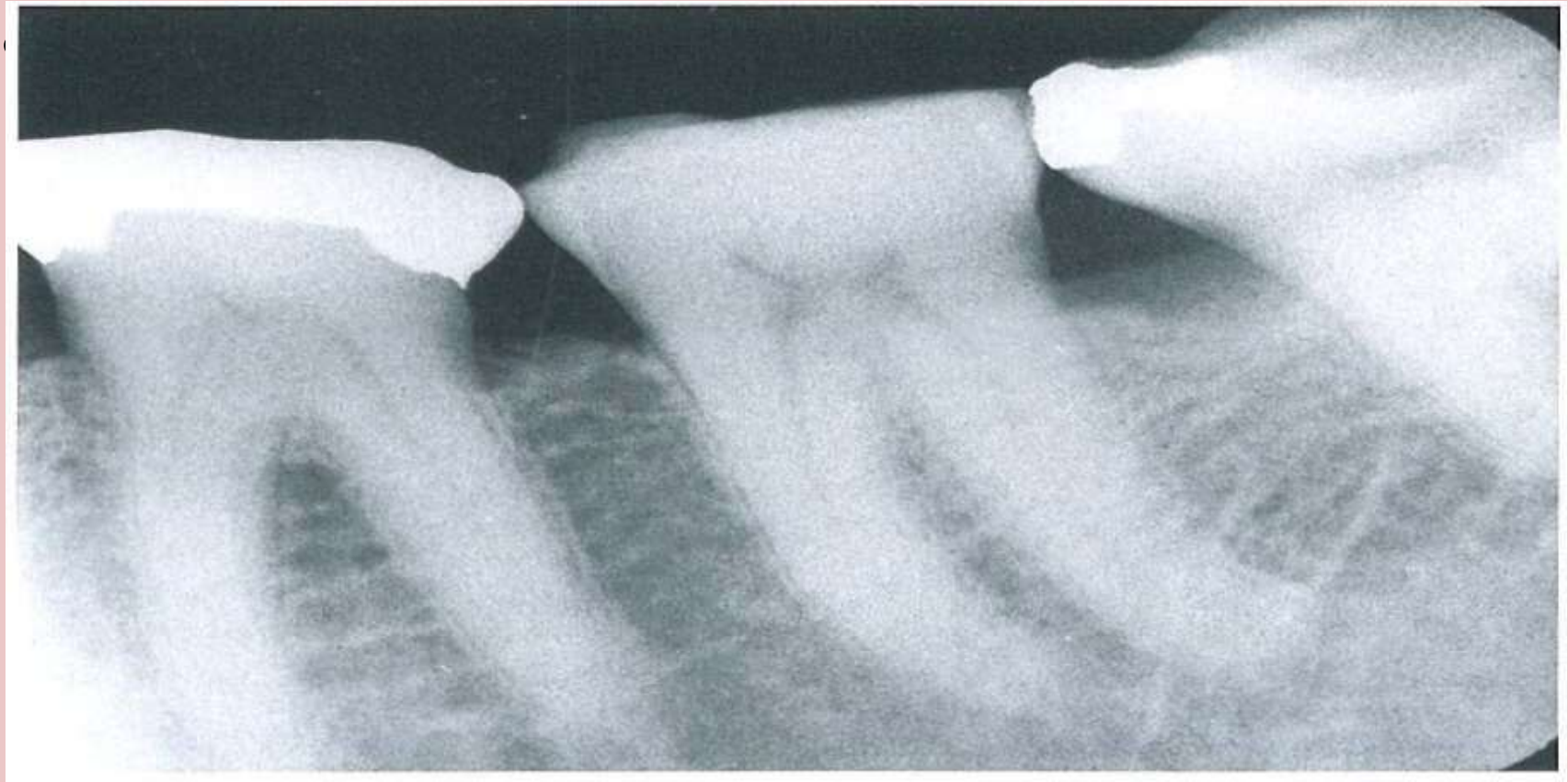
Indication for surgical extraction

-As a general guideline, surgeons should consider performing an elective surgical extraction when they perceive a possible need for excessive force to extract a tooth. The term excessive means that the force will probably result in a fracture of bone, a tooth root, or both.

- After initial attempts at forceps extraction have failed.

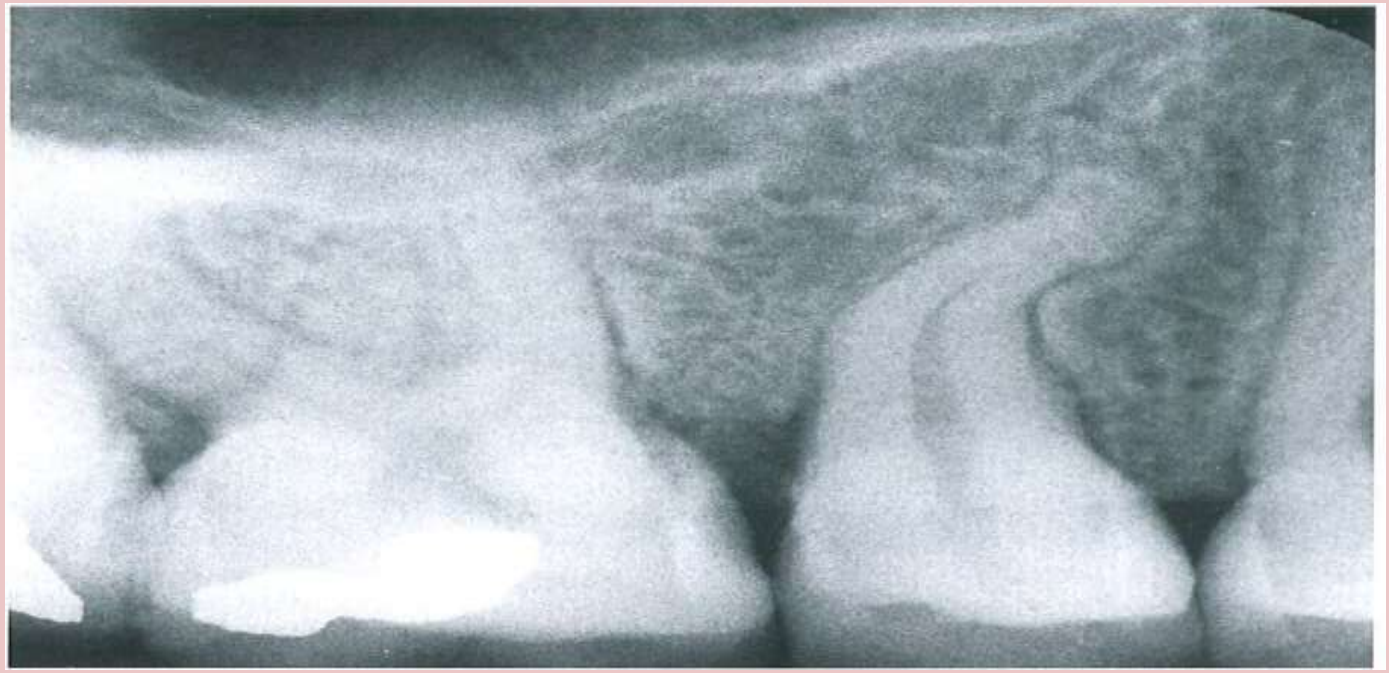
- If the preoperative assessment reveals that the patient has thick or especially dense bone, particularly on the buccocortical plate, surgical extraction should be considered.

-Occasionally, the dentist treats a patient who has very short clinical crowns with evidence of severe attrition. If such attrition is the result of bruxism, it is likely that the teeth are surrounded by dense, thick bone with strong periodontal ligament



-One condition commonly seen among older patients is hypercementosis. In this situation, cementum has continued to be deposited on the tooth and has formed a large bulbous root that is difficult to remove through the available tooth socket opening. Great force used to expand the bone may result in fracture of the root or bucco cortical bone.

Roots that are widely divergent, especially the maxillary first molar roots or roots that have severe dilaceration or hooks are also difficult to remove without fracturing one or more of the roots.



-If the maxillary sinus has expanded to include the roots of the maxillary molars, extraction may result in removal of a portion of the sinus floor along with the tooth. If the roots are divergent, then such a situation is even more likely to occur

-Teeth that have crowns with extensive caries, especially root caries, or that have large amalgam restorations are candidates for open extraction.

-Teeth with crowns that have already been lost to caries and that present as retained roots should also be considered for open extraction.

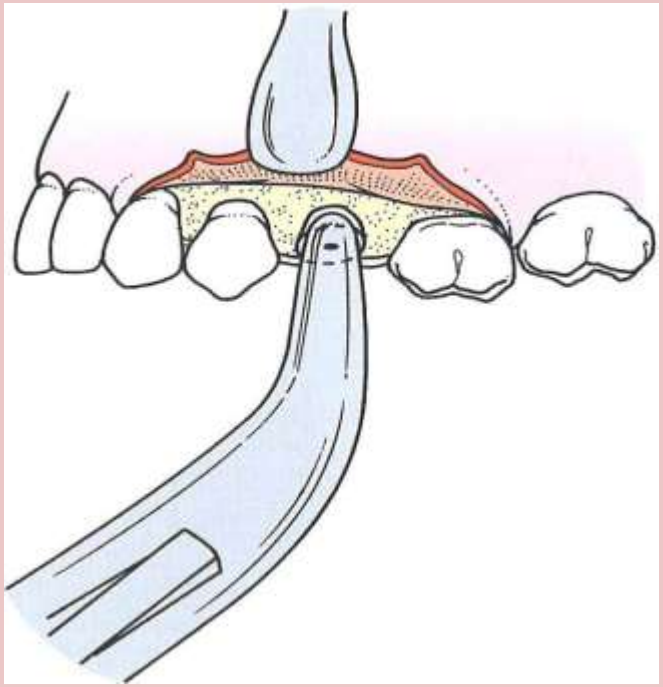
Technique for Open Extraction of Single Rooted Tooth

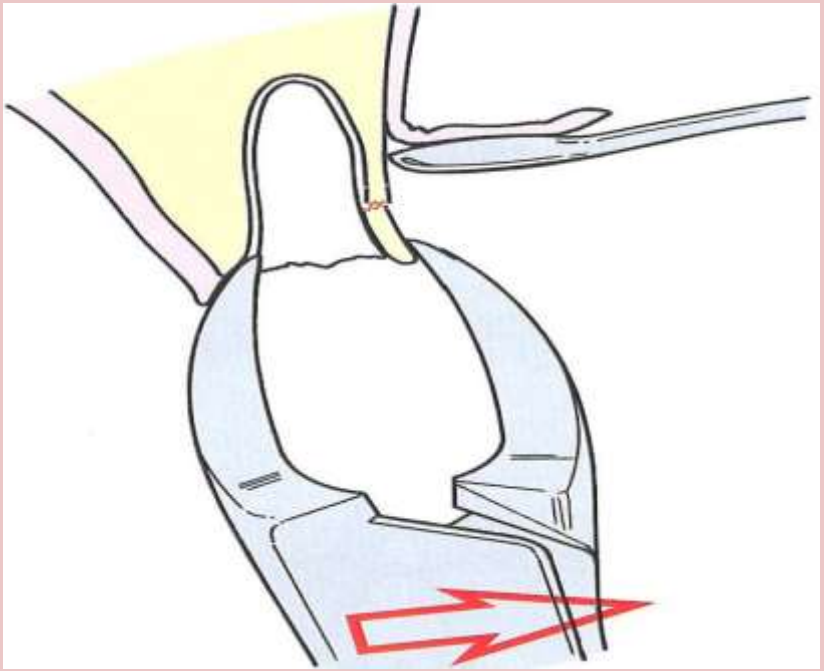
*First, the surgeon may attempt to reseat the extraction forceps under direct visualization and therefore achieve a better mechanical advantage and remove the tooth with no bone removal at all .

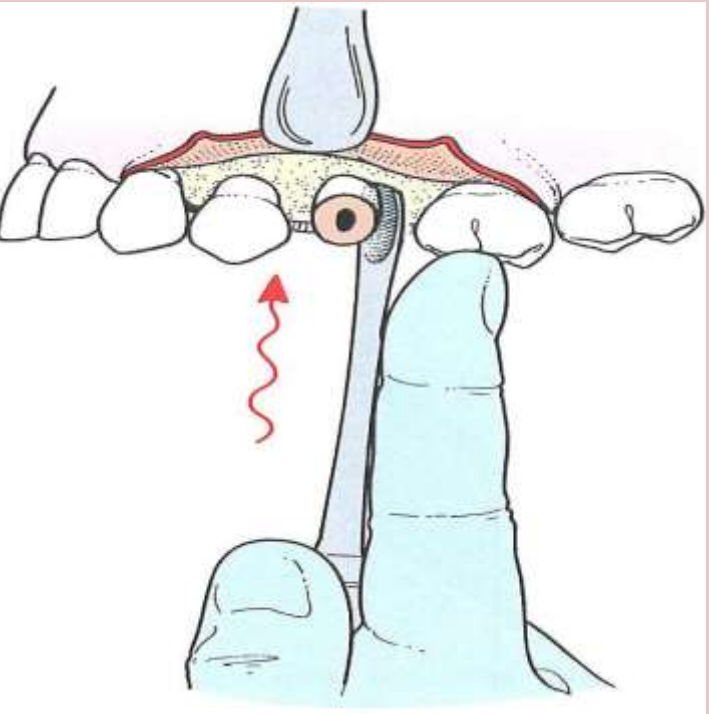
**The second option is to grasp a bit of buccal bone under the buccal beak of the forceps to obtain a better mechanical advantage and grasp of the tooth root. This may allow the surgeon to luxate the tooth sufficiently to remove it without any additional bone removal as small amount of buccal bone is pinched off and removed with the tooth.

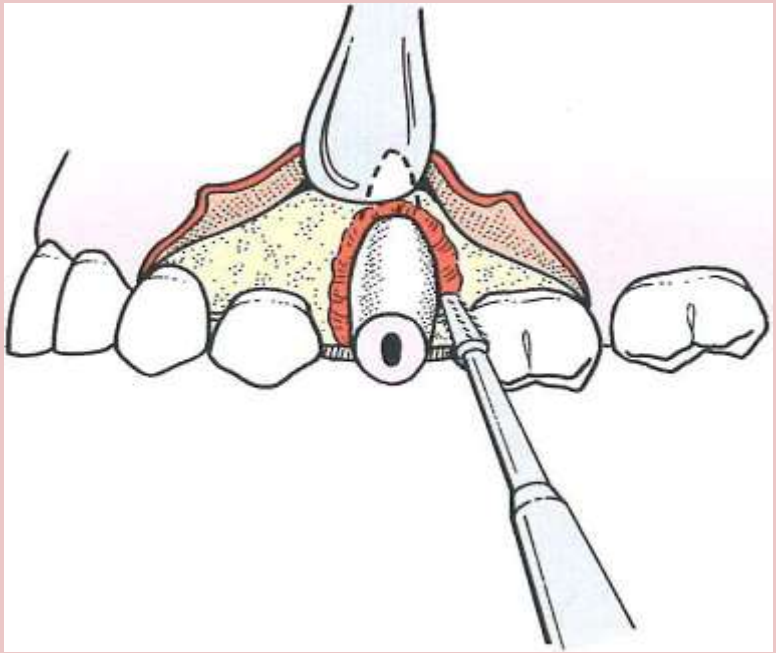
***The third option is to use the straight elevator, pushing it down the periodontal ligament space of the tooth

****The fourth and final option is to proceed with bone removal over the area of the tooth



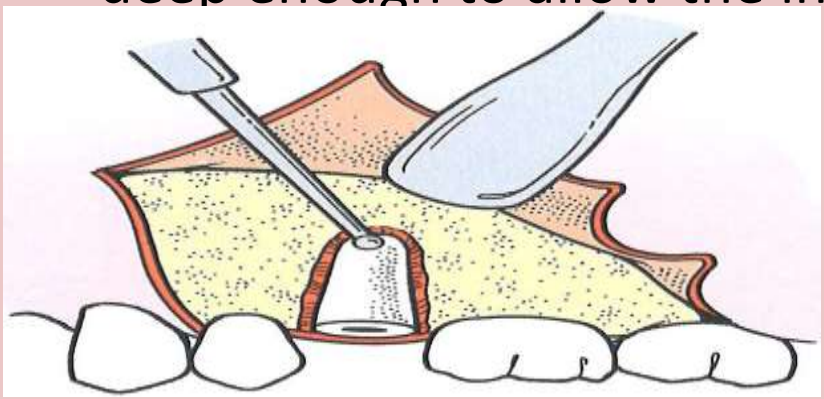


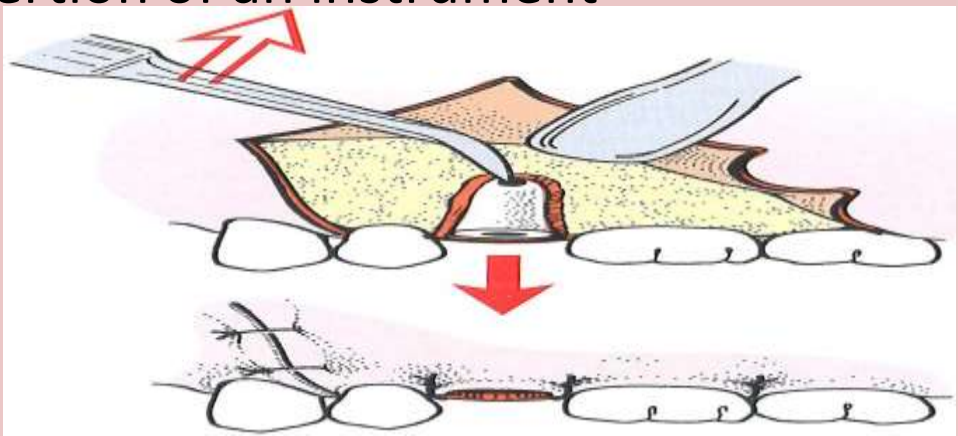




-The width of buccal bone that is removed
is essentially the same width as the tooth in a mesiodistal direction . In a vertical dimension, bone should be removed approximately one half to two thirds the length of the tooth root

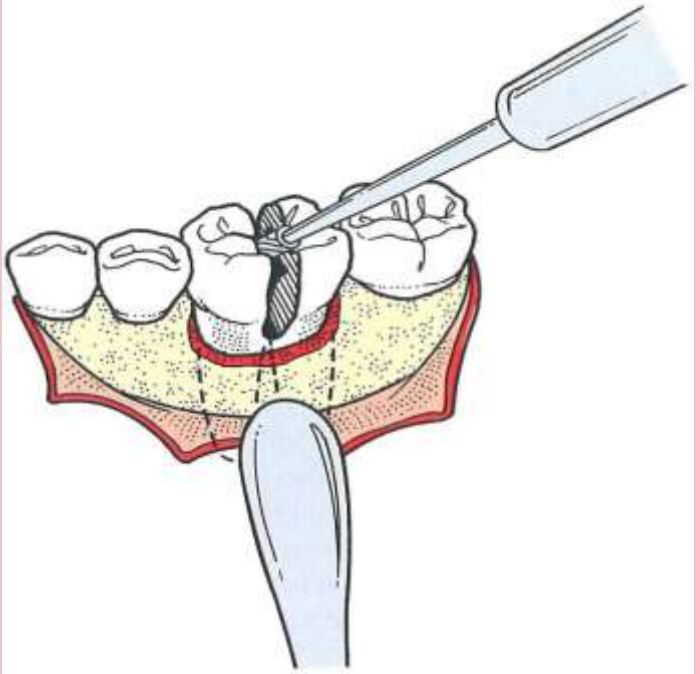
-If the tooth is still difficult to extract after removal of bone, a purchase point can be made in the root with the bur at the most apical portion of the area of bone removal .
Care should be taken to limit bone removal to only that needed to remove the root to preserve bone for possible implant placement. This hole should be about 3 mm in diameter and deep enough to allow the insertion of an instrument

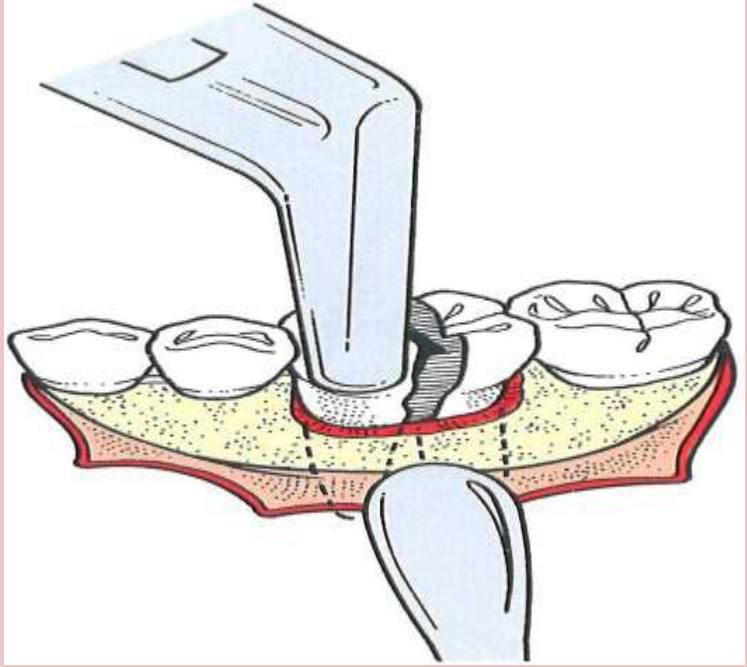




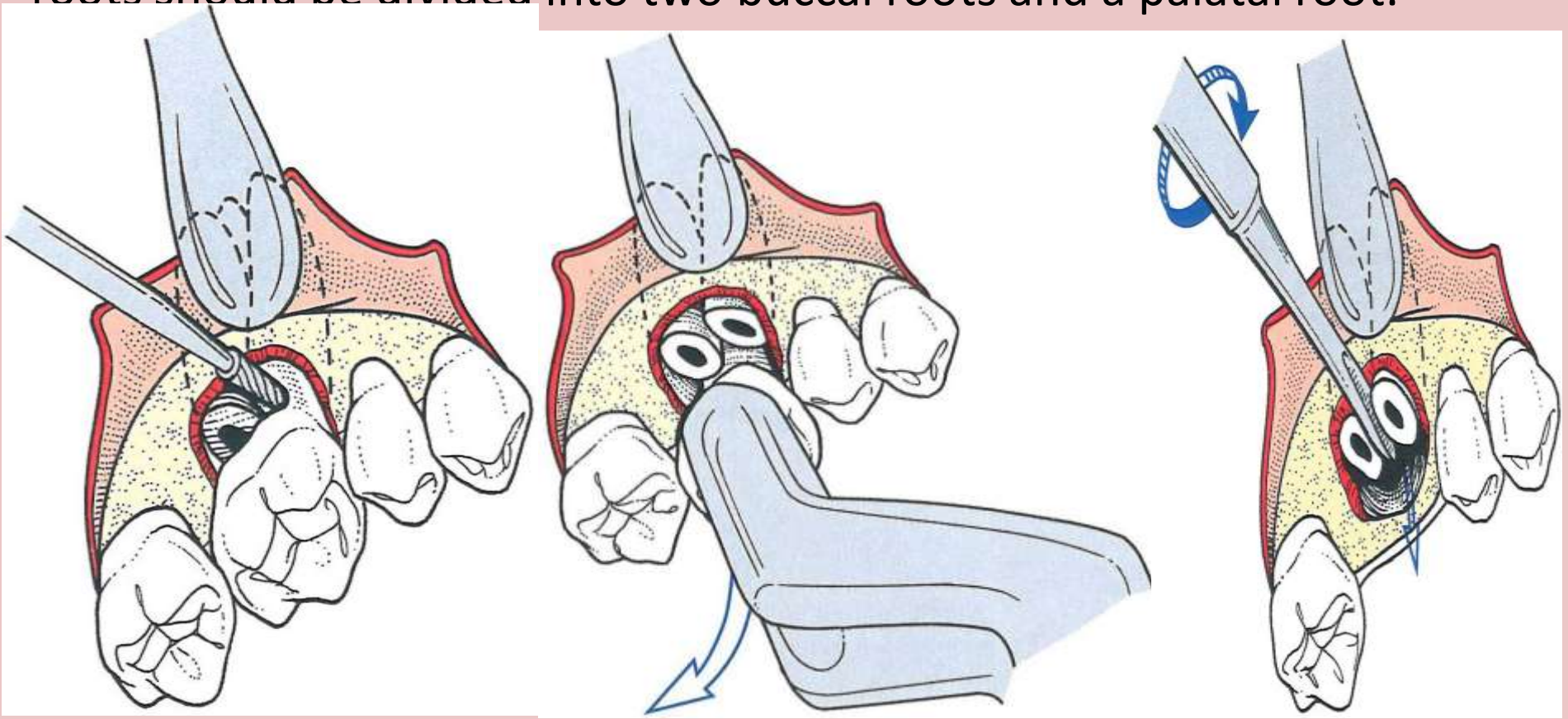
Technique for Open Extraction of Multirooted Teeth

-Removal of the lower first molar with an intact crown is usually done by sectioning the tooth buccolingually and thereby dividing the tooth into a mesial half (with mesial root and half of the crown) and a distal half. An envelope incision is also made, and a small amount of crestal bone is removed. Once the tooth is sectioned, it is luxated with straight elevators to begin the mobilization process.





If straight elevators are used, the surgeon should remember that the maxillary sinus might be close to these roots, so apically directed forces must be kept to a minimum and carefully controlled. The entire force of the straight elevator should be in a mesiodistal direction or toward the palate, and only slight pressure should be applied apically.if the crown of the maxillary molar is missing or fracture the roots should be divided into two buccal roots and a palatal root.



Removal of Root Fragments and Tips

*If fracture of the apical one third (3 to 4 mm) of the root occurs during a closed extraction, an orderly procedure should be used to remove the root tip from the socket.

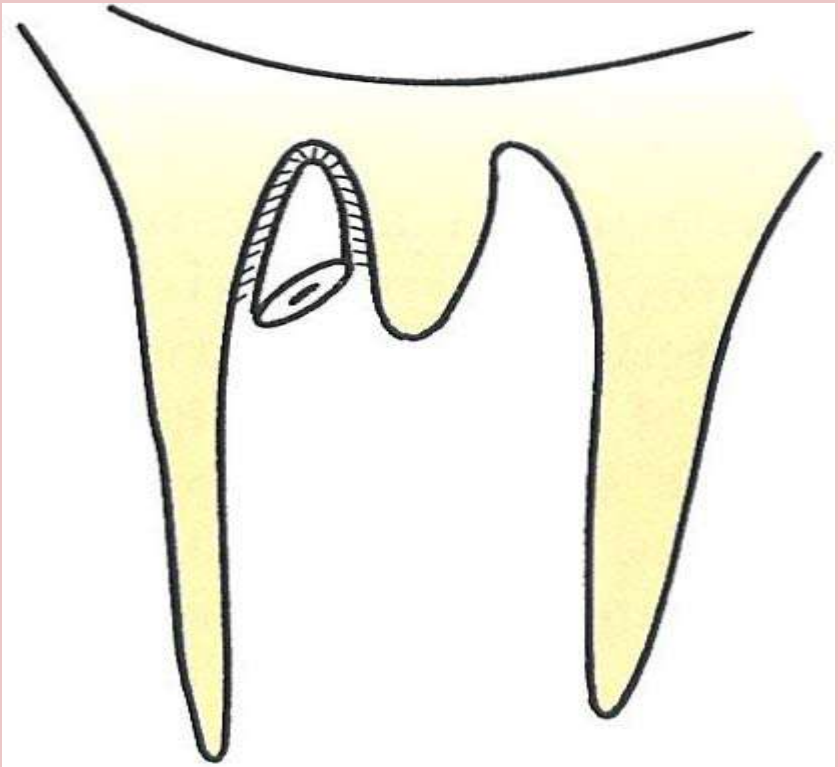
Initial attempts should be made to extract the root fragment by a closed technique ,but the surgeon should begin a surgical technique if the closed technique is not immediately successful. Whichever technique is chosen, two requirements for extraction are critically important: excellent light and excellent suction.Open technique indicated when tooth not mobilized before fracture and in case bulbous or dilacerated roots.

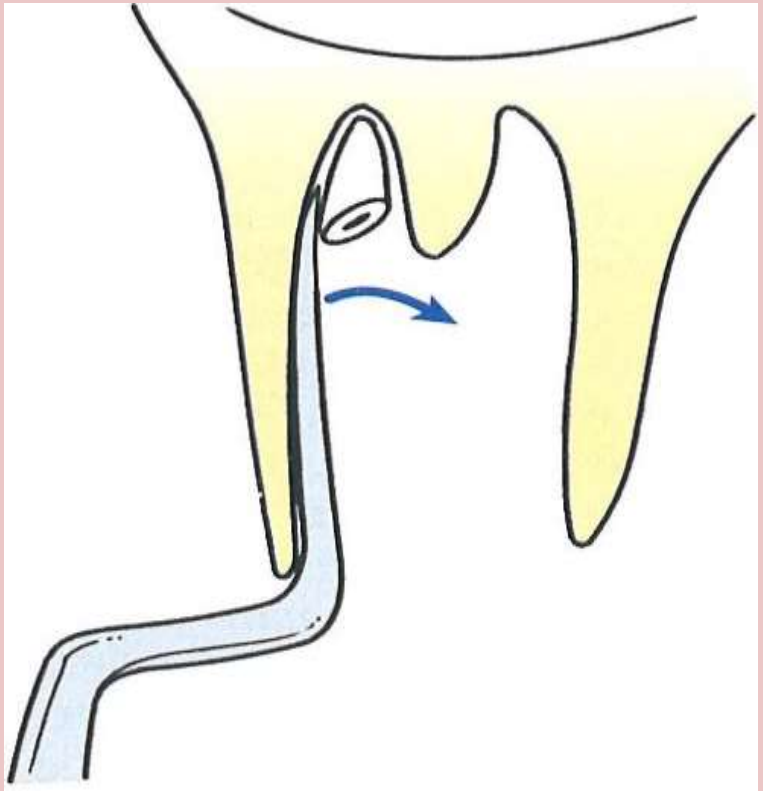
-If the irrigation-suction technique is unsuccessful, the next step is to tease the root apex from the socket with a root tip pick.

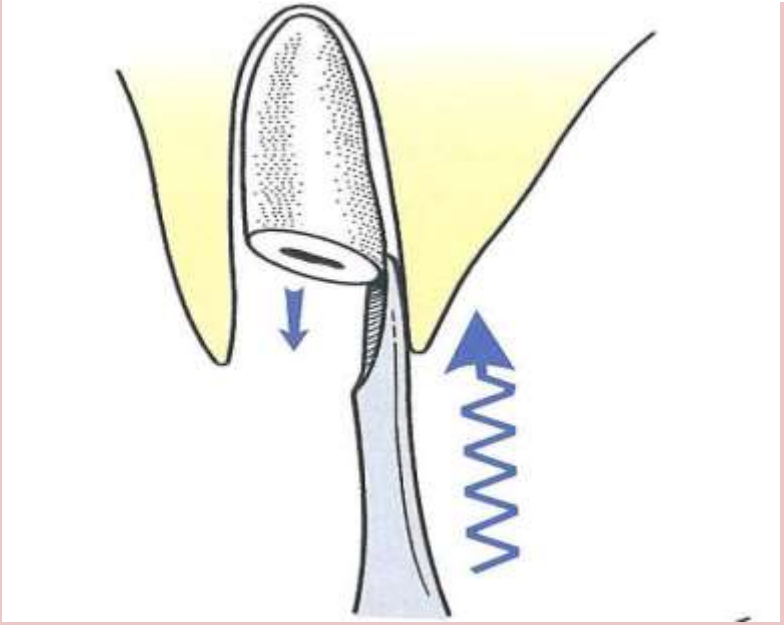
-A root tip pick is a delicate instrument and cannot be used as the Cryer elevator can to remove bone and elevate entire roots.

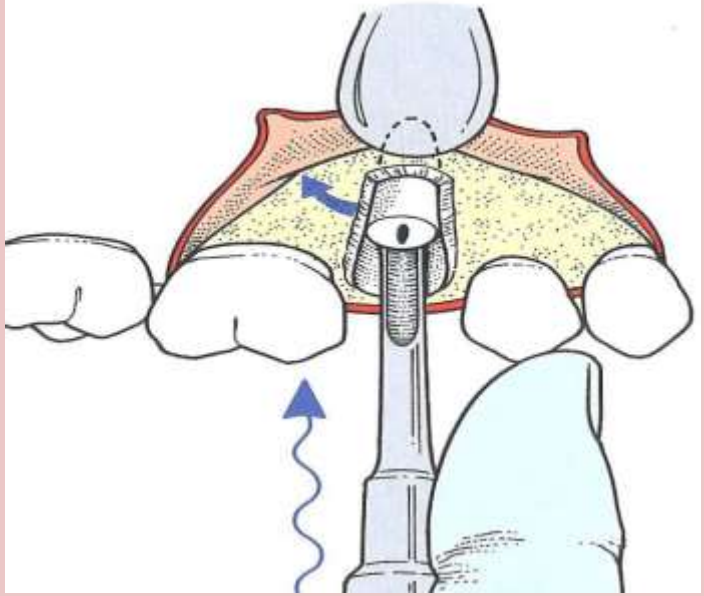
-The root tip also can be removed with the small straight elevator. This technique is indicated more often for the removal of larger root fragments

-If the closed technique is unsuccessful, the surgeon should switch without delay to the open technique. It is important for the surgeon to recognize that a smooth, efficient, properly performed open retrieval of a root fragment is less traumatic than a prolonged, time-consuming, frustrating attempt at closed retrieval.Two main open techniques are used to remove root tips The first is simply an extension of the technique described for surgical removal of Single-rooted teeth.



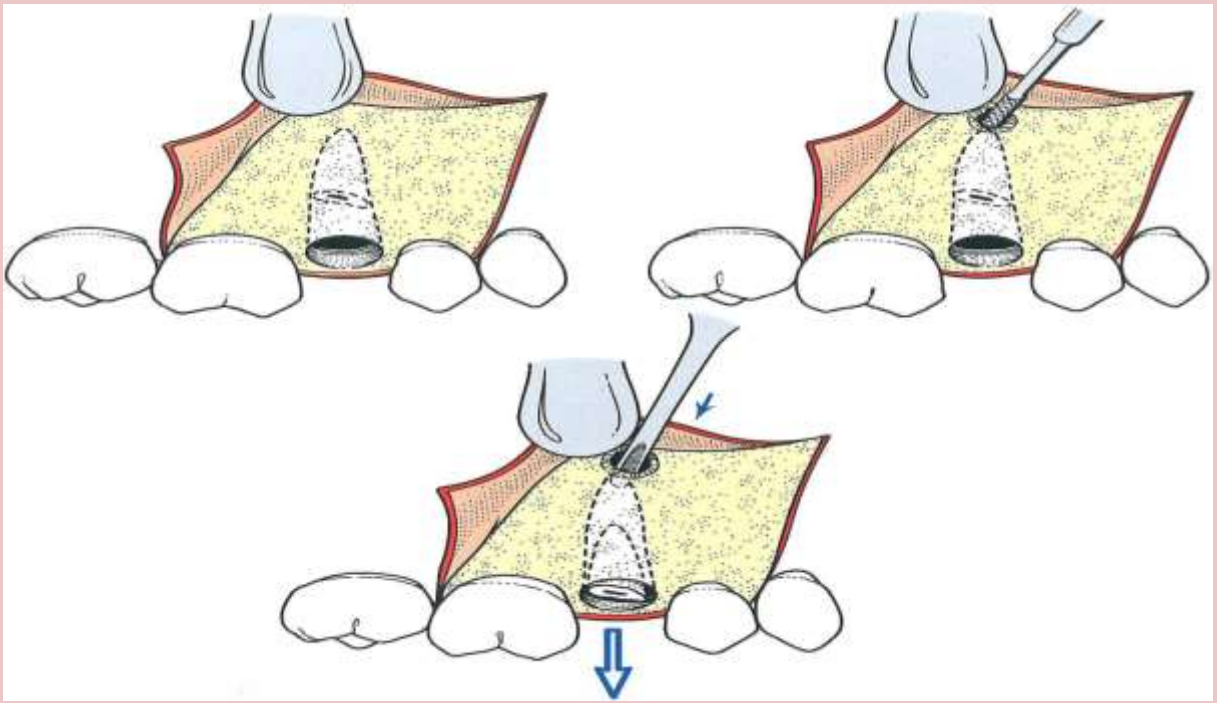






-The 2nd technique is known as the open-window technique. A soft tissue flap is reflected in the same fashion as for the approach just covered, and the apex area of the tooth fragment is located. A dental bur is used to remove the bone overlying the apex of the tooth exposing the root fragment. A root tip pick or small elevator is then inserted into the window, and the tooth is displaced out of the socket.

The preferred flap technique is the three-cornered flap because of a need for more extensive exposure of the apical areas.



Justification for leaving Root Fragment

-When a root tip has fractured and closed approaches of removal have been unsuccessful, and when the open approach may be excessively traumatic, the surgeon may consider leaving the root in place.

Three conditions must exist for a tooth root to be left in the alveolar process.

* First, the root fragment must be small, usually no more than 4 to 5 mm in length.

*Second, the root must be deeply embedded in bone and not superficial, to prevent subsequent bone resorption from exposing the tooth root and interfering with any prosthesis that will be constructed over the edentulous area.

*Third the tooth involved must not be infected there must be no radiolucency around the root apex.

Multiple extraction

Extraction sequencing:

Maxillary teeth should usually be removed first for several reasons. First, an infiltration anesthetic has a more rapid onset and also disappears more rapidly. This means that the surgeon can begin the surgical procedure sooner after the injections have been given; in addition, surgery should not be delayed because profound anesthesia is lost more quickly in the maxilla. In addition, maxillary teeth should be removed first because during the extraction process, debris such as portions of amalgams, fractured crowns, and bone chips may fall into the empty sockets of the lower teeth if the lower surgery is performed first. In addition, maxillary teeth are removed

with a major component of buccal force. Little or no vertical traction force is used in removal of these teeth, as is commonly required with mandibular teeth. A single minor disadvantage for extracting maxillary teeth first is that if hemorrhage is not controlled in the maxilla before mandibular teeth are extracted, the hemorrhage may interfere with visualization during mandibular surgery.

Tooth removal usually begins with extraction of the most posterior teeth first. This allows for the more effective use of dental elevators to luxate and mobilize teeth before the forceps are used to extract the tooth. The two teeth that are the most difficult to remove, the first molar and canine, should be extracted last. Removal of the teeth on either side weakens the bony socket on the mesial and distal side of these teeth, and their subsequent extraction is made more straightforward.

Thus, for example, if teeth in the maxillary and mandibular left quadrants are to be extracted, the following order is recommended: (1) maxillary posterior teeth, leaving the first molar; (2) maxillary anterior teeth, leaving the canine; (3) maxillary first molar; (4) maxillary canine; (5) mandibular posterior teeth, leaving the first molar; (6) mandibular anterior teeth, leaving the canine; (7) mandibular first molar; and (8) mandibular canine.

Thank you

complication of extraction

-Complications can arise during the procedure of extraction or may manifest themselves sometime following the extraction so we have immediate complications and post operative one.

-All these complications arise from error in judgment, *misuse* of instruments, *exertion* of extensive force or from anatomic causes or factors.

-By careful diagnosis and planning of the procedures many complications can be avoided.

The possible complications:-

1-failure to secure anesthesia:

Failure to secure profound or good anesthesia may be due to:-

- Faulty technique.
- insufficient dosage of anesthesia.
- Expired anesthesia.
- The presence of acute infection.

2-Failure to remove the tooth with either forceps or elevator;

failure to remove the tooth after applying a reasonable amount of force without movement or yielding of the accused tooth need further clinical and radiological evaluation, because the tooth may be need surgical extraction.

3-**Fracture of (#}:-**

A- Crowns and roots.

B- Alveolar bone.

C- Maxillary tuberosity.

D- Adjacent or apposing tooth.

E- Mandible.

A- fracture of crowns and roots:-

The most common complication during tooth extraction is fracture of the tooth crown or roots.

The factors that may lead to fracture of crown or roots may be classified into three groups:-

- Factors related to the tooth itself.
- Factors related to the bone Investing that tooth.
- Factors related to the operator (dentist).

-factors related to the tooth itself means that the tooth may be badly carious, or heavily filled, brittleness of the tooth due to age, or non vitality, root canal filled tooth. Also peculiar root or crown formation like dilacerated tooth, geminated tooth, severely curved root, divergent roots, convergent roots, hyper-cementosis, accessory root and complex root shape, malposed tooth, insufficient space for the application of the extraction instrument, internal & external resorption.

-Factors related to the investing bone, means the surrounding bone might be excessively dense or sclerotic due to localized or systemic causes.

-factors related to the operators includes improper application of the' beaks of the dental forceps or elevator on the tooth to be extracted; *like* the placement of the beaks of the dental forceps on the crown instead of the root or below the cemento-enamel junction, also the beaks are not parallel to the long axis of the tooth, also the use of wrong type of forceps.

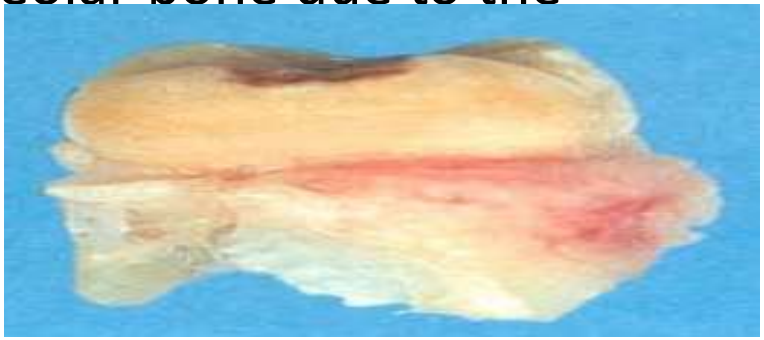
Incorrect application of force during extraction by wrong direction in addition to that the use of twisting or rotational movement when not indicated like the use of twisting movement in extraction of upper 1^{st} premolar or upper 1^{ST} and 2^{nd} molar for example.

B- alveolar bone fracture:-

Fracture of alveolar bone frequently occurs when extraction Is difficult.The fractured bone may be removed with tooth to which it is firmly attached or it may be remain attached to the periosteum or it may be completely detached in the socket or wound.

It is a common complication that especially occurs on labio-buccal area during extraction or upper canine and upper and lower molar teeth.This complication might be due to:

- The alveolar bone is very thin.
- Accidentai inclusion of the alveolar bone within forceps blades
- Configuration of the roots.
- Pathological or physiological changes in the bone itself like ankylosis (boney communication between the tooth and bone), the presence of destruction in the alveolar bone due to the presence of discharging sinus



C- fracture of maxillary tuberosity:

- The maxillary tuberosity is important for the construction of a stable retentive maxillary denture. If a large portion of this tuberosity is removed along with the maxillary tooth, denture stability is likely to be compromised. Sometime the tuberosity is completely fractured when we try to remove maxillary 3rd or 2nd molar. Fracture of maxillary tuberosity may lead to a wide opening into the antrum called Oro-antral communication with irregular tearing in the covering soft tissue lead to profuse bleeding and post- operativeiy may lead to difficulties in the retention of upper denture. This complication might occur if the molar tooth to be *extracted* is isolated and subjected to full force of bite leading to seclerosis of the surrounding bone, or due to downward extension of the maxillary sinus to the near by edentulous alveolar bone or due to large abnormal size of the maxillary sinus extended to involve the maxillary tuberosity; in addition to that the use of excessive force or wrong positioning of the elevator in the extraction of upper 3rd molars.

Management of max. tuberosity fracture:

-If a tuberosity fracture occurs during an extraction, the treatment is similar to that just discussed for other bony fractures. The surgeon, using finger support for the alveolar

- process during the fracture (if the bone remains attached to the periosteum) , should take measures to ensure the survival of that bony segment. If at all possible, the bony segment should be dissected away from the tooth, and the tooth should be removed in the usual fashion. The tuberosity is then stabilized with mucosal sutures.

-However, if the tuberosity is excessively mobile and cannot be dissected from the tooth, the surgeon has several options. The first option is to splint the tooth being extracted to adjacent teeth and defer the extraction for 6 to 8 weeks, allowing time for the bone to heal. The tooth is then extracted with an open surgical technique. The second option is to section the crown of the tooth from the roots and allow the tuberosity and tooth root section to heal. After 6 to 8 weeks the surgeon can reenter the area and remove the tooth roots in the usual fashion. If the maxillary molar tooth was infected before surgery, these two techniques should be used with caution.

If the maxillary tuberosity is completely separated from the soft tissue, the usual steps are to smooth the sharp edges of the remaining bone and to reposition and suture the remaining soft tissue. The surgeon must carefully check for an oroantral communication and treat as necessary.

D-Fracture of the adjacent and opposing tooth: -
Adjacent teeth occasionally may be damaged during extraction procedures, this may include loosening or dislocation or fracture of the adjacent teeth.
This misshapes occur mostly due to careless use of the dental forceps or elevator by wrongfully using the adjacent tooth as a fulcrum during the use of elevator or the application of the beaks of dental forceps.
In addition to that opposing teeth may be chipped or fractured if the tooth being extracted yield suddenly to uncontrolled force of the forceps striking the opposing tooth leads to this complication

E- Mandibular fracture:-

This is a rare complication, but it might occur almost exclusively with the surgical removal of impacted teeth.

- A mandibular fracture is usually the result of the application of a force exceeding that needed to remove a tooth and often occur during the use of dental elevators, but sometimes pathological or physiological changes may lead to weakened mandible like:
- Senile atrophy and osteoporosis of the bone.
- Osteomyelitis e.g. osteo-radionecrosis.
- Cystic lesion.
- Impacted teeth.
- Tumors, malignant or non-malignant.

So; preoperative clinical and radiographic evaluation is very important to avoid such complication or preventing it.

4- Dislocation of tempro-mandibular joint:-

Exertion of high amount of force during extraction of lower teeth especially posterior teeth may lead to dislocation of the condyle of the mandible and the patient became unable to close his/her mouth, especially in patient who had a history of recurrent dislocations in TMJ.

If this dislocation occur it should be reduced immediately by the operator by standing in front of the patient and his thumbs placed Intra-orally on the external oblique ridge lateral to the molar teeth and other fingers outside the mouth under the lower border of the mandible, downward pressure with the thumbs and upward pressure with the other fingers may reduce the dislocation, if reduction is delayed it become difficult to reduce It because of muscle spasm and the patient may need general anesthesia to reduce the dislocation, also the patient may complaining of traumatic arthritis of the TMJ. Post-operatively due to high pressure applied to the joint during extraction, so supporting the mandible during extraction prevents such complication.

5- **Displacement of a root into the soft tissue and tissue spaces and the maxillary antrum:-**

During extraction especially on use of elevator, a root or piece of root may be dislodged into the soft tissue through a very thin bony plate overlying the socket and disappear buccally or lingually into the soft tissue between periosteum and bone in the vestibule, but sometimes a root or even a tooth may be displaced into the tissue spaces surrounding the jaws e.g. a retained root in the lower molar teeth may be displaced into the sublingual or submandibular space or e.g. upper third molar may displaced into the infratemporal space.

So the extraction with high force without direct vision on the retained root may lead to such complications, also retained root may be displaced into the **maxillary antrum** during the extraction of upper molar or sometimes premolar teeth especially palatal root of upper molar teeth.

The presence of large antrum or the use of excessive force during extraction or due to pathological conditions like periapical pathology.

All these factors may assist or predispose to such complication, so pre-operative radiology and clinical evaluation may assist in the prevention of such complication.

6- Excessive bleeding after extraction:-

At the beginning one must understand that some slight oozing of blood for several hours following tooth extraction is considered normal. But sometime excessive or abnormal bleeding may occur following tooth extraction. Extraction o f teeth is a surgical procedure that presents a severe challenge to the hemostatic mechanism of the body. Several reasons exist for this challenge: First, the tissues of the mouth and jaws are highly vascular. Second, the extraction of a tooth leaves an open wound, with soft tissue and bone open, which allows additional oozing and bleeding. Third, it is almost impossible to apply dressing material with enough pressure and sealing to prevent additional bleeding during surgery. Fourth, patients tend to explore the area of surgery with their tongues and occasionally dislodge blood clots, which initiates secondary bleeding. The tongue may also cause secondary bleeding by creating small negative pressures that suction the blood clot from the socket. Finally, salivary enzymes may lyse the blood clot before it has organized and before the ingrowth of granulation tissue.

The causes of excessive bleeding may be due to:-

- ✓ Local factors.
- ✓ Systemic factors.
- The local causes which are the commonest causes for prolonged bleeding as in usually due to gross tissue damage, when there is severe bone injury and tearing of the periosteum many vessels are opened also severe gingival laceration, also damage to large arteries like inferior dental vessel or greater palatine vessels may lead to profuse bleeding, also the presence of hemangioma (central) and other vascular abnormalities may lead to such complication.
- Also post-operative infection of the extraction wound causing erosion of the blood vessel leading to secondary hemorrhage, also the working in acutely inflamed area may assist in the prolonged bleeding.
- For the systemic causes like systemic hematological disorders like thrombocytopenia, reduction in the clotting factors, anticoagulant drugs, hereditary blood disease like hemophilia , all these factors may lead to severe bleeding; so good history and clinical examination and blood investigation is very important and essential before any extraction especially if the patient gives you a history of bleeding on previous extractions or trauma.

7- Damage to the **:-gum and lip.**

- tongue and floor of mouth.

- Nerves.

- Damage to the gum or gingiva like **laceration of the gum** during extraction occur if the gingival tissue not reflected before extraction so gum adhere to the tooth to be extracted from it's socket should be carefully dissected before any further attempts to deliver tooth are made, also the inclusion of the gum by forceps beaks or by blind application of the forceps may lead to crushing of the soft tissue, also the lower lip may be changed or crushed between the handle of the forceps and the lower on extraction of upper teeth if sufficient care not taken .

- Also slipping of elevator during extraction may lead to damage or wounds in the floor of the oral cavity, there are many vital structures in the floor of the oral cavity which might be damage like [sublingual gland , submandibular duct, lingual nerve & tongue]. So the operator should always keep in his mind that supporting of elevator during extraction is very important.

- Damage to nerves occur mostly on surgical extraction of teeth rather than simple extraction but one must always be aware of the risk when operating in the **region** of the (inferior dental nerve, lingual nerve *&* mental nerve). Inferior alveolar nerve injury is an uncommon occurrence in extraction of erupted mandibular teeth. In rare cases third molar root may **encircle the nerve** so that extraction of the tooth will cause nerve injury also **curration** or improper use of elevator to remove root apices may cause tearing or displace bone fragments so that will impinging or pressing the nerve in the canal "inferior dental canal" result in **paraesthesia** or anesthesia of half of lower lip. The mental branch of the alveolar nerve also may be injured during surgical procedures in the premolar *region.* The lingual nerve may be damaged during exodontias of the lower molar teeth especially the lower wisdom tooth by trapping the lingual soft tissue in the forceps beaks or by direct trauma from misusing of elevator or by using surgical extraction to remove impacted wisdom tooth.

8- post-operative pain:-

Post-operative pain and discomfort after extraction due to traumatized hard tissue may be from bruising of bone during instrumentation or from by using burs for removal of bone also damage and rough handling of soft tissue during extraction is another cause for postoperative pain.

The most common cause for the moderate to severe continuous pain after extraction is related to a well known cause called dry socket or acute localized alveolar osteitis. The patient presented with continuous moderate to severe pain after 24-72 hours after extraction which may last for 7 to 10 days clinically the patient may presented with empty socket (there is no clot in the socket) , exposed bone or empty socket with some evidence of broken-down blood clot and food debris within it; with intense bad odor.

The etiology of this condition is incompletely understood but many predisposing factors exist like infection, trauma, blood supply, site, smoking, sex, vasocontrictors or systemic factors

which lead to high levels of fibrinolytic activity in and and around the tooth extraction. This activity lead to lysis of clot and exposure of bone. Prevention of the dry socket syndrome requires that the surgeon minimize trauma and bacterial contamination in the area of surgery. The surgeon should perform atraumatic surgery with clean incisions and soft tissue reflection. After the surgical procedure, the wound should be irrigated thoroughly with large quantities of saline delivered under pressure, such as from a plastic syringe. Small amounts of antibiotics (e.g ,tetracycline) placed in the socket alone or on a gelatin sponge have been shown to help substantially to decrease the incidence of dry socket in mandibular third molars.

Treatment is straightforward and consists of irrigation and insertion of a medicated dressing. **First**, the tooth socket is gently irrigated with sterile saline. The socket should not be curetted down to bare bone because this increases the amount of exposed bone and the pain. Usually the entire blood clot is not lysed, and the part that is intact should be retained. The socket is carefully suctioned of all excess saline, and a small strip of iodoform gauze soaked with the medication is inserted into the socket. The medication contains the following principal **ingredients**: eugenol, which obtunds the pain from the bone tissue; a topical anesthetic, such as benzocaine; and a carrying vehicle, such as balsam of Peru. The medication can be made by the surgeon's pharmacist or can be obtained as a commercial preparation from dental supply houses . The medicated gauze is gently inserted into the socket, and the patient usually experiences profound relief from pain within 5 minutes. The dressing is changed every other day for the next 3 to 6 days, depending on the severity of the pain. The socket is gently irrigated with saline at each dressing change. Once the patient's pain decreases, the dressing should not be replaced, because it acts as a foreign body and further prolongs wound healing.

9- post- operative swelling:

After extensive surgical interference and exodontias some time may be associated with post operative swelling ,this swelling my be related to one or more of the following causes: {A-Oedema , B-Infection, C-Hematoma.)

- **Oedema:**oedema occurs after surgery as a result of tissue injury **(it is normal response).**when there is great damage to the tissue by using blunt instrument. And rough handling of tissue may *Increase* the chance of production large edema, so laceration of tissue during extraction, trauma to the bone& preiosteum " are some of the most common causes of edema and in other words **post operative swelling,** persistent post-extraction swelling or the development of swelling several days after is usually due to *infection* : swelling due to infection can be distinguished from postoperative edema by the *Increased* skin temperature .greater redness of the overlying tissues.^ the usual *presence* of fever and sometime fluctuation is present due to *presence* of pus. The infection should be always considered a serious complication and need urgent management.
- *Hematoma:* means a collection of blood *in* the extra-vascular spaces of the tissues. It is rare complication following extraction of the teeth, but some time hematoma or ecchymosis may develop postoperatively if hemostat not developed and persistent bleeding from either the socket or adjacent alveolar bone.

10- **Oro-antral communication**:-

On extraction of upper molar teeth and some times upper premolar a communication between the oral cavity and maxillary antrum my be created. This communication if not healed or closed after few days a chronic condition *occurs* called **Oro- antral fistula.** Close proximity of the maxillary cheek teeth to the maxillary antrum which are separated only by little amount of bone and some time even the soft-tissue lining of the maxillary sinus, the *presence* of periapical infection, the antrum itself my be abnormal in size, misjudgment of force used in extraction or the *presence* of pathological lesions ,all these factors may assist in the production of this complication/to confirm the presence of this complication by(nose blowing test) ,the patient is asked to pinch or close the nostrils together and blow air gently into the nose , the operator may see blood bubbling, or shooting of air through the communication is heard or a piece of cotton on twizzer may be defected. The p*resence* of this complication need surgical correction by well trained oral surgeon and surgical unit in which all instrument and qualified staff present.

Treatment depend on the size of communication:

-If the communication is small (2 mm in diameter or less) , no additional surgical treatment is necessary. The surgeon should take measures to ensure the formation of a high-quality blood clot in the socket and then advise the patient to take sinus precautions to prevent dislodgment of the blood clot.

-The surgeon must not probe through the socket into the sinus with a dental curette or a root tip pick. The bone of the sinus possibly may have been removed without perforation of the sinus lining. To probe the socket with an instrument might unnecessarily lacerate the membrane. Probing of the communication may also introduce foreign material, including bacteria, into the sinus and thereby further complicate the situation. Probing of the communication is therefore contraindicated.

-If the opening between the mouth and sinus is of moderate size (2 to 6 mm) , additional measures should be taken. To help ensure the maintenance of the blood clot in the area, a figure-of-eight suture should be placed over the tooth socket. Antibiotics- usually amoxicillin, cephalexin, or clindamycin- should be prescribed for 5 days. In addition, a decongestant nasal spray should be prescribed to shrink the nasal mucosa to maintain ostium patency.

-If the sinus opening is large (7 mm or larger) , the surgeon should consider having the sinus communication repaired with a flap procedure.

11- Trismus:-

Means inability to open the mouth, trismus is one of common complication following extraction of teeth especially the surgical removal of teeth especially the surgical removal of wisdom teeth. Trismus may be caused by post operative *oedema,hematoma, inflammation of the soft tissue. 'Trauma and arthritis* of the tempromandibular joint, it may be related to the **use of inferior dental block** local anesthesia so the management of the trismus depend on diagnosis of the cause of this complication.

12- Syncope:

Collapse in the dental chair is a common complication during extraction . The patient may often complaining of feeling dizzy , weak & nauseated ,and the skin is seen to be pale ,cold and sweating , these complains may be accompanied by loss of consciousness , and the patient if not noticed at the beginning of the fainting may shows episode of convulsion. The primary pathophysiological component of this situation is *cerebral ischemia* secondary to an inability of the heart to supply the brain with an adequate volume of oxygenated blood. In the presence of anxiety , blood flow is increasingly directed toward the skeletal muscles at the expense of other organ systems such as the gastrointestinal tract ,in the absence of muscular movement ,the increased volume of blood in the skeletal muscule remains there, decreasing venous return to the heart and decreasing the volume of blood available to be pumped by the heart (uphill) to the brain.

A slight decreased in cerebral blood flow is evidenced by the signs and symptoms of vasodepressor syncope (light headedness, dizziness, tachycardia, palpitation) . If this situation continues,cerebral blood flow declines still further and the patient loses consciousness.

When the operator notice these signs and symptoms a first aids treatment should be started by lowering the head of the patient by putting him in supine position by lowering the back of the dental chair.Care should be taken to maintain the airway and you have to notice the condition of the patient .if consiousness is returned within 1-2 minutes other wise one should consider that something serious like *respiratory arrest* or *cardiac arrest* may happen and the patient need medical emergency.


Thank you

Oral Surgery

Infection Control in Surgical Practice

Dr. Ali Mohammed

Communicable Pathogenic Organisms

Health care professionals must learn and practice protocols that limit the spread of contagions in the patient care setting. This is especially true for dentists performing surgery for two reasons: First, to perform surgery, the dentist typically violates an epithelial surface, the most important barrier against infection. Second, during most oral surgical procedures, the dentist, assistants, and equipment become contaminated with the patient's blood and saliva.

Therefore; it is necessary to know the sources of pathogenic organisms in the maxillofacial region which include: upper respiratory tract bacteria, maxillofacial skin bacteria, hepatitis, human immunodeficiency (HIV) viruses & Mycobacterium tuberculosis.

Aseptic Technique

Terminology

Sepsis is the breakdown of living tissue by the action of microorganisms and is usually accompanied by inflammation.
Medical asepsis is the attempt to keep patients, health care staff, and objects as free as possible of agents that cause infection.
Surgical asepsis is the attempt to prevent microbes from gaining access to surgically created wounds.
Antiseptics are substances applied to living tissues that can prevent the multiplication of organisms capable of causing infection.
Disinfectants are substances applied to inanimate objects that can prevent the multiplication of organisms capable of causing infection.
Sterility is the freedom from viable forms of microorganisms (bacteria, bacterial endospores, viruses …etc).

Sanitization is the reduction of the number of viable microorganisms to levels judged safe by public health standards. Sanitization should not be confused with sterilization.

Decontamination is similar to sanitization, except that it is not connected with public health standards.

Techniques of Instrument Sterilization

Chemical and physical agents are the two principal means of reducing the number of microbes on a surface. Antiseptics, disinfectants, and ethylene oxide gas are the major chemical means of killing microorganisms on surfaces. Heat, irradiation, and mechanical dislodgment are the primary physical means of eliminating viable organisms

Any means of instrument sterilization to be used in office-based dental and surgical care must be reliable, practical, and safe for the instruments. The three methods generally available for instrument sterilization are dry heat, moist heat, and ethylene oxide gas.

Dry Heat

Dry heat is a method of sterilization that can be provided in most dental offices because the necessary equipment is no more complicated than a thermostatically controlled oven and a timer. Dry heat is most commonly used to sterilize glassware and bulky items that can withstand heat but are susceptible to rust. The success of sterilization depends not only on attaining a certain temperature but also on maintaining the temperature for a sufficient time. Therefore, the following three factors must be considered when using dry heat: **(1) warmup time for the oven and the materials to be sterilized, (2) heat conductivity of the materials, and (3) air flow throughout the oven and through the objects being sterilized.** In addition, time for the sterilized equipment to cool after heating must be taken into consideration. The time necessary for dry heat sterilization limits its practicality in the ambulatory setting because it lengthens the turnover time and forces the dentist to have many duplicate instruments. The advantages of dry heat are the relative ease of use and the unlikelihood of damaging heat-resistant instruments. The disadvantages are the time required to achieve sterilization and the potential damage to heat-sensitive equipment.

Moist Heat

Moist heat sterilization is more efficient than dry heat sterilization because it is effective at much lower temperatures and requires less time. The reason for this is based on several physical principles. First, water boiling at 100°C takes less time to kill organisms than does dry heat at the same temperature because water is better than air at transferring heat. Second, it takes approximately seven times as much heat to convert boiling water to steam as it takes to cause the same amount of room temperature water to boil. When steam comes into contact with an object, the steam condenses and almost instantly releases that stored heat energy, which quickly denatures vital cell proteins. Saturated steam placed under pressure (autoclaving) is even more efficient than non-pressurized steam. This is because increasing pressure in a container of steam increases the boiling point of water so that the new steam entering a closed container gradually becomes hotter.

The container usually used for providing steam under pressure is known as an autoclave as shown in the figure below.

The autoclave works by creating steam and then, through a series of valves, increases the pressure so that the steam becomes super-heated. Instruments placed into an autoclave should be packaged to allow the free flow of steam around the instruments, such as by placing them in sterilization pouches or wrapping them in cotton cloth. Simply placing instruments in boiling water or free-flowing steam results in disinfection rather than sterilization because at the temperature of 100°C, many spores and certain viruses survive. The advantages of sterilization with moist

heat are its effectiveness, speed, and the relative availability of office-proportioned autoclaving equipment. Disadvantages include the tendency of moist heat to dull and rust instruments and the cost of autoclaves.

Guidelines for Dry Heat and Steam Sterilization

Temperature	Duration of Treatment or Exposure[a]
Dry Heat	
121°C (250°F)	6–12 h
140°C (285°F)	3 h
150°C (300°F)	2.5 h
160°C (320°F)	2 h
170°C (340°F)	1 h
Steam	
116°C (240°F)	60 min
118°C (245°F)	36 min
121°C (250°F)	24 min
125°C (257°F)	16 min
132°C (270°F)	4 min
138°C (280°F)	1.5 min

Comparison of Dry Heat Sterilization vs. Moist Heat Sterilization Techniques

	Dry Heat	Moist Heat
Principal antimicrobial effect	Oxidizes cell proteins	Denatures cell proteins
Time necessary to achieve sterilization	Long	Short
Equipment complexity and cost	Low	High
Tendency to dull or rust instruments	Low	High
Availability of equipment sized for office use	Good	Good

Sterilization with Gas

Certain gases exert a lethal action on bacteria by destroying enzymes and other vital biochemical structures. Of the several gases available for sterilization, ethylene oxide is the most commonly used. Ethylene oxide is a highly flammable gas, so it is mixed with carbon dioxide or nitrogen to make it safer to use. Ethylene oxide is a gas at room temperature and can readily diffuse through porous materials such as plastic and rubber. At 50°C ethylene oxide is effective for killing all organisms, including spores, within 3 hours. However, because it is highly toxic to animal tissue, equipment exposed to ethylene oxide must be aerated for 8 to 12 hours at 50°C to 60°C or at ambient temperatures for 4 to 7 days. The advantages of ethylene oxide for sterilization are its effectiveness for sterilizing porous materials, large equipment, and materials sensitive to heat or moisture. The disadvantages are the need for special equipment and the length of sterilization and aeration time necessary to reduce tissue toxicity.

Techniques of Instruments Disinfection

Many dental instruments cannot withstand the temperatures required for heat sterilization. Therefore, if sterilization with gas is not available and absolute sterility is not required, chemical disinfection can be performed.

Substances acceptable for disinfecting dental instruments for surgery include glutaraldehyde, iodophors, chlorine compounds, and formaldehyde; glutaraldehyde-containing compounds are the most commonly used.

Alcohols are not suitable for general dental disinfection because they evaporate too rapidly; however, they can be used to disinfect local anesthetic cartridges. Quaternary ammonium compounds are not recommended for dentistry because they are not effective against the hepatitis B virus and become inactivated by soap and anionic agents.

Certain procedures must be followed to ensure maximal disinfection, regardless of which disinfectant solution is used:

1. The agent must be properly reformulated and discarded periodically, as specified by the manufacturer.

2. Instruments must remain in contact with the solution for the designated period, and no new contaminated instruments should be added to the solution during that time.
3. All instruments must be washed free of blood or other visible material before being placed in the solution.
4. The instruments must be rinsed free of chemicals and used within a short time.

Maintenance of Sterility

- The use of disposable materials

Materials and drugs used during oral and maxillofacial surgery—such as sutures, local anesthetics, scalpel blades, and syringes with needles—are sterilized by the manufacturer with a variety of techniques, including use of gases, autoclaving, filtration, and irradiation. To maintain sterility, only the dentist must properly remove the material or drug from its container. Most surgical supplies are double wrapped. The outer wrapper is designed to be handled in a nonsterile fashion and usually is sealed in a manner that allows an ungowned and gloved individual to unwrap it and transfer the material still wrapped in a sterile inner wrapper. The ungloved individual may allow the surgical material to drop onto a sterile part of the surgical field or allow an individual gloved in a sterile fashion to remove the wrapped material in a sterile manner

Method of sterilely transferring double-wrapped sterile supplies from clean individual (ungloved hands) to sterilely gowned individual (gloved hands). The package is designed to be peeled open from one end without touching the sterile interior of the package.

- Surgical Field Maintenance

during oral-maxillofacial surgery, the goal is to prevent any organisms from the surgical staff or other patients from entering the patient's wound. Once instruments are sterilized or disinfected, they should be set up for use during surgery in a manner that limits the likelihood of contamination by organisms foreign to the patient's maxillofacial flora. A flat tray should be used, and two layers of sterile towels or waterproof paper should be placed on it. Then, the clinician or assistant should lay the instrument pack on the platform and open out the edges in a sterile fashion. Anything placed on the platform should be sterile or disinfected. Care should be taken not to allow excessive moisture to get on the towels or paper; if the towels become saturated, they can allow bacteria from the unsterile undersurface to wick up to the sterile instruments.

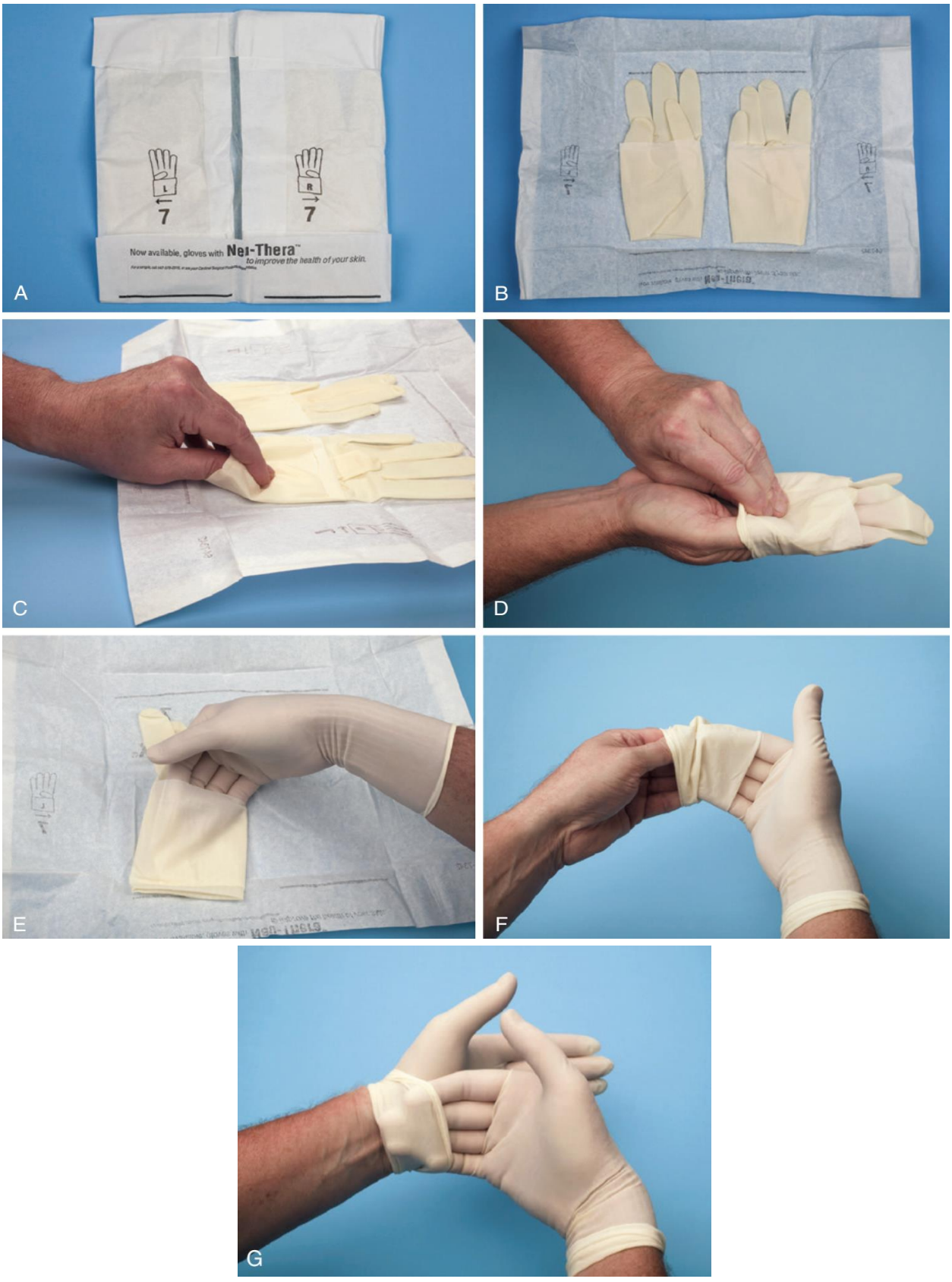
- Operatory Disinfection

This can be achieved by two basic methods:

- ✓ The first is to wipe all surfaces with a hospital-grade disinfectant solution.
- ✓ The second is to cover surfaces with protective shields that are changed between each patient.

Fortunately, many chemical disinfectants, including chlorine compounds and glutaraldehyde, can prevent transfer of the hepatitis viruses when used on surfaces in certain concentrations (0.2% for chlorine, 2% for glutaraldehyde). Headrests, tray tables, hosing and lines, controls for the chair, and light handles can be covered with commercially available, single-use, disposable covers; the rest of the dental chair can be quickly sprayed with a disinfectant. Countertops usually come into contact with patients only indirectly, so counters should be periodically disinfected, especially before surgical procedures.

The dentist should put on sterile gloves when performing oral surgery as shown in the figure below.


A
7
7
Now available, gloves with Nei-Thera™
to improve the health of your skin.
B
C
D
E
F
G

Articaine

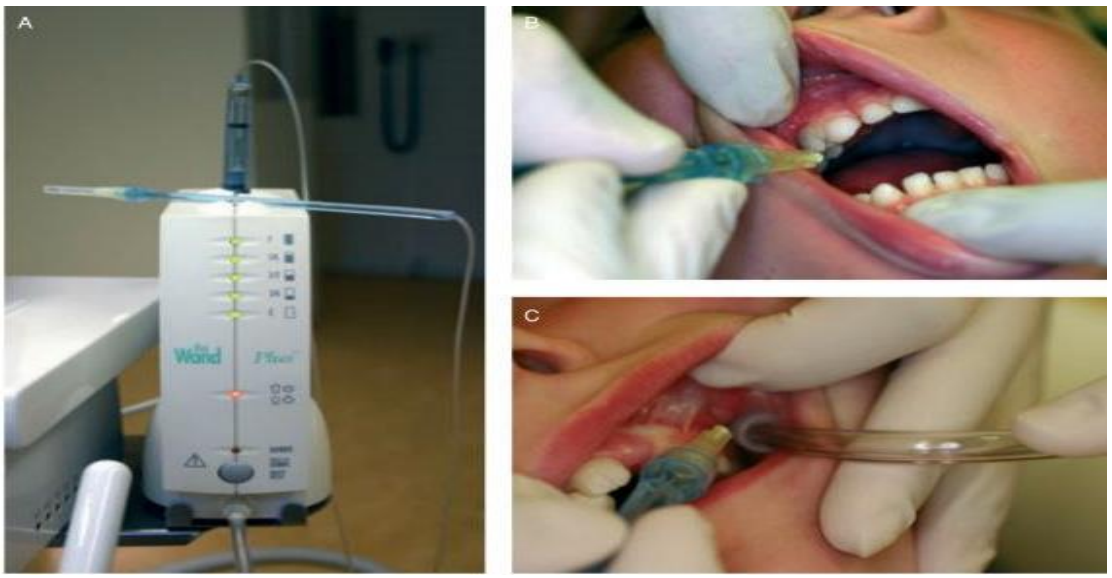
Articaine 2% with adrenalin 1 200000 was. firstly used in 1998 for dental and for ophthalmic areas. Articaine has both amide and ester linkages so the biotransformation of it occurs in both the plasma by pseudocholinestrase enzyme and in the liver, so the plasma level and risk of toxicity falls rapidly, because of that Articaine can be used in higher concentration 4% compared to 2% lidocaine in dental practise.

Property of Articaine is its ability to defuse through soft and hard tissues more reliable than other local anaesthetic agent so it can be used in upper teeth just in buccal injection that diffuse to palatal side and eliminate the need for palatal injection, or used in lower posterior teeth by infiltration technique instead of inferior alveolar nerve block. Compared with lidocaine, Articaine is faster in onset, more efficient and has low degree of toxicity.

Microprocessor controlled anesthesia

This apparatus is especially suited to those patient having anxiety and fear of dental syringe such as children and mentally retarded patient.

It composed of sterile and disposable hand piece in which standard local anesthetic cartridge can be inserted. It works by foot switch, the motor pump unite ensure that the pressure and the flowrate of the injected fluid remain low.



Buffering of local anesthesia

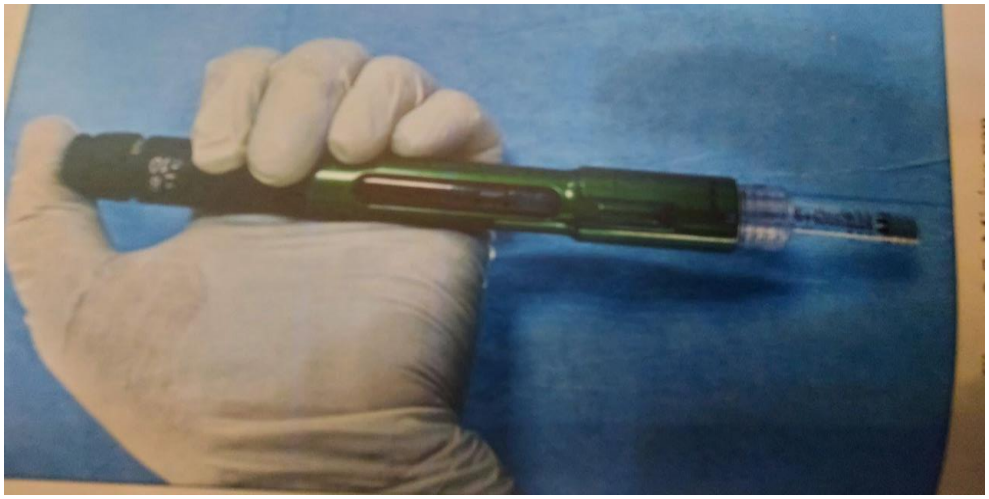
The majority of local anesthetic agents are acidic (PH 3.5 – 5) because the manufacturers supply the solution as hydrochloride salt to improve the solubility, stability and shelf life. The adding of vasoconstrictor will increase the acidity of the solution so decrease the PH of the solution which lead to some complications such as discomfort, burning sensation and increase the onset time buffering is done by adding sodium bicarbonate to local Anesthetic solution for alkalinisation (increase PH) to decrease pain , burning sensation and improve the onset time.

alkalinisation of local anesthesia should be made fresh as soon as possible because the precipitation increase with time and lead to decrease the efficacy of local anesthesia.

Buffering technique

1- Hand mixing technique by using tiny syringe such as insulin syringe and vial of sodium bicarbonate. a desired amount of local anesthesia solution is remove from the dental cartridge by insulin syringe and replaced by the same ratio of sodium bicarbonate.

2 - mixing system such as on pharma mixing system (pen).



Oral surgery

Complications of exodontia

Complications can arise during the procedure of extraction or may manifest themselves sometime following the extraction, so we have immediate complications and post-operative one.

All these complications arise from error in judgment, misuse of instruments, exertion of extensive force or from anatomic causes or factors.

By careful diagnosis and planning of the procedures many complications can be avoided but some of these complications may occur even when utmost, care is exercised, so that the dentist or the oral surgeon should be qualified to deal with each complication successfuly.

So, the possible complications are: -

1- Failure to secure anesthesia.

Failure to secure profound or good anesthesia may be due to:-

a- Faulty technique, or Insufficient dosage of anesthesia.

b- Expired anesthesia.

c- The presence of acute infection.

2- Failure to remove the tooth with either forceps or elevator.

failure to remove the tooth after applying a reasonable amount of force without movement or yielding of the accused tooth need further clinical and radiological evaluation, because the tooth may be need surgical extraction.

3- Fracture (#) of: -

A. Crowns and roots.
B. Alveolar bone.
C. Maxillary tuberosity.
D. Adjacent or apposing tooth. ,
E. Mandible.

a-Fracture of crowns and roots: -

The most common complication during tooth extraction is fracture of the tooth crown or roots.

The factors that may lead to fracture of crown or roots may be classified into three groups:

1.Factors related to the tooth itself.
2.Factors related to the bone investing that tooth.
3.Factors related to the operator (dentist).

1- factors related to the tooth itself

means that the tooth may be badly carious, or heavily filled, brittleness of the tooth due to age, or non-vitality, root canal filled tooth. Also peculiar root or crown formation like dilacerated tooth, geminated tooth, severely curved root, divergent roots, convergent roots, hyper-cementosis, accessory root and complex root shape, malposed tooth, insufficient space for the application of the extraction instrument, internal & external! resorption.

2-Factors related to the investing bone

means the surrounding bone might be excessively dense or sclerotic due to localized or systemic causes.

3-factors related to the operators

includes improper application of the beaks of the dental forceps or elevator on the tooth to be extracted; like the placement of the beaks of the dental forceps on the crown instead of the root or below the cemento-enamel junction, also the beaks are not parallel to the long axis of the tooth, also the use of wrong type of forceps.

Incorrect application of force during extraction by wrong direction in addition to that the use of twisting or rotational movement when not indicated like the use of twisting movement in extraction of upper 1^{st} premolar or upper 1^{st} and 2^{nd} molar for example.

b- Alveolar bone fracture: -

Fracture of alveolar bone frequently occurs when extraction is difficult. The fractured bone may be removed with tooth to which it is firmly attached or it may be remain attached to the periosteum or it may be completely detached in the socket or wound.

It is a common complication that especially occurs on labial(buccal) area during extraction of upper canine and upper and lower molar teeth.

This complication might be due to: -

1.The alveolar bone is very thin.
2. Accidental inclusion of the alveolar bone within forceps blades
3. Configuration of the roots.
4. The shape of the alveolus.
5.Pathological or physiological changes in the bone itself like Ankylosis (bony connection between the tooth and bone), the presence of destruction in the alveolar bone due to the presence of discharging sinus.

c- Maxillary tuberosity fracture: -

Sometime the tuberosity is completely fractured when we try to remove maxillary 3rd or 2nd molar.

Fracture of maxillary tuberosity may lead to a wide opening into the antrum called Oro-antrum communication with irregular tearing in the covering soft tissue lead to profuse bleeding and post- operatively may lead to difficulties in the retention of upper denture.

This complication might occur if the molar tooth to be extracted is isolated and subjected to full force of bite leading to sclerosis of the surrounding bone, or due to downward extension of the maxillary sinus to the nearby edentulous alveolar bone or due to large abnormal size of the maxillary sinus extended to involve the tuberosity; in addition to that, the use of excessive force or wrong positioning of the elevator in the extraction of upper 3rd molars

.

d-Fracture of the adjacent and opposing tooth; -

Adjacent teeth occasionally may be damaged during extraction procedures, this may include loosening or dislocation or fracture of the adjacent teeth.

This misshapes occur mostly due to careless use of the dental forceps or elevator by wrongfully using the adjacent tooth as a fulcrum during the use of elevator or the application of the beaks of dental forceps, also fracture of the crown of adjacent tooth or fracture and dislodgment of its filling.

In addition to that opposing teeth may be chipped or fractured if the tooth being extracted yield suddenly to uncontrolled force of the forceps striking the opposing tooth leads to this complication.

e-Mandible fracture: -

This is a rare complication, but it might occur almost exclusively with the surgical removal of impacted lower third molar tooth.

A mandibular fracture is usually the result of the application of a force exceeding that needed to remove a tooth and often occurs during the use of dental elevators (winters elevator), but sometimes pathological or physiological changes may lead to weakened mandible like: -

1.Senile atrophy and osteoporosis of the bone.

2. Osteomyelitis e.g. osteoradionecrosis.

3. cystic lesion.

4. Impacted teeth.

5. Tumour, benign or malignant..

So, preoperative clinical and radiographic evaluation is very important to avoid such complication or preventing it.

4. Dislocation of the tempro-mandibular joint (T.M.J.): - Exertion of high amount of force during extraction of lower teeth especially posterior teeth may lead to dislocation of the condyle of the mandible and the patient becomes unable to close his/her mouth, especially in patient who had a history of recurrent dislocations in TMJ.

if this dislocation occur it should be reduced immediately by the operator by standing in front of the patient and his thumbs placed intra-orally on the external oblique ridge lateral to the molar teeth and other fingers outside the mouth under the lower border of the mandible, downward pressure with the thumbs and upward pressure with the other fingers may reduce the dislocation, if reduction is delayed it become difficult to reduce it because of muscle spasm and the patient may need general anesthesia to reduce the dislocation, also the patient may complain of traumatic arthritis of the TMJ. Post-operatively due to high pressure applied to the joint during extraction, so supporting the mandible during extraction prevents such complication.

5. Displacement of a root into the soft tissue and tissue spaces and the maxillary antrum: -

During extraction especially on use of elevator, a root or piece of root may be dislodged into the soft tissue through a very thin bony plate overlying the socket and disappear buccally or lingually into the soft tissue between periosteum and bone in the vestibule, but sometimes a root or even a tooth may be displaced into the tissue spaces surrounding the jaws e.g. a retained root in the lower molar teeth may be displaced into the sublingual or submandibular space or e.g. upper third molar may displaced into the infratemporal space.

So the extraction with high force without direct vision on the retained root may lead to such complications, also retained root may be displaced into the maxillary antrum during the extraction of upper molar or sometimes premolar teeth especially palatal root of upper molar teeth.

The presence of large antrum or the use of excessive force during extraction or due to pathological conditions like periapical pathology. All these factors may assist or predispose to such complication, so pre-operative radiograph and clinical evaluation may assist in the prevention of such complication.

6- Excessive bleeding after extraction: -

At the beginning one must understand that some slight oozing of blood for several hours following tooth extraction is considered normal. But sometime excessive or abnormal bleeding may occur following tooth extraction.

The causes of excessive bleeding may be due to:-

A. Local factors

The local causes which are the commonest causes for prolonged bleeding as in usual, due to gross tissue damage, when there is severe bone injury and tearing of the periosteum many vessels are opened also severe gingival lacerations, also damage to large arteries like inferior dental vessel or greater palatine vessels may lead to profuse bleeding, also the presence of Hemangioma (central) and other vascular abnormalities may lead to such complication
Also post-operative infection of the extraction wound causing erosion of the blood vessel leading to secondary haemorrhage, also the working in acutely inflamed area may assist in the prolonged bleeding.

B. systemic factors

For the systemic causes like systemic haematological disorders like thrombocytopenia, reduction in the clotting factors, anticoagulant drugs, hereditary blood disease like haemophilia, all these factors may lead to severe bleeding; so good history and clinical examination and blood investigation is very important and essential before any extraction especially if the patient gives you a history of bleeding on previous extractions or trauma.

7-damage to the surrounding soft tissues.

a. Damage to the gum or lip.

like laceration of the gum during extraction occurs if the gingival tissue not reflected before extraction so gum adhere to the tooth to be extracted from its socket should be carefully dissected before any further attempts to deliver the tooth are made, also the inclusion of the gum by forceps beaks or by blind application of the forceps may lead to crushing of the soft tissue, also the lower lip may be pressed or crushed between the handles of the forceps and the lower lip on extraction of upper teeth if sufficient care is not taken .

b. damage to the tongue and floor of the mouth

Also slipping of elevator during extraction may lead to damage or wounds in the floor of the oral cavity, there are many vital structures in the floor of the oral cavity which might be damage like [sublingual gland , submandibular duct, lingual nerve & tongue]. So the operator should always keep in his mind that supporting of elevator during extraction is very important.

C. Damage to nerves

occur mostly on surgical extraction of teeth rather than simple extraction but one must always be aware of the risk when operating in the region of the (inferior dental nerve, lingual nerve & mental nerve). Inferior alveolar nerve injury is an uncommon occurrence in extraction of erupted mandibular teeth. In rare cases third molar roots may *encircle the nerve* so that extraction of the tooth will cause nerve injury also curration or improper use of elevators to remove root apices may cause tearing or displace bone fragments so that will be impinging or pressing the nerve in the canal "inferior dental canal" result in *Paraesthesia or anesthesia* of half of lower lip.

The mental branch of the alveolar nerve also may be injured during surgical procedures in the premolar region. The lingual nerve may be damaged during exodontias of the lower molar teeth especially the lower wisdom tooth by trapping the lingual soft tissue in the forceps beaks or by direct trauma from misusing of elevator or by using surgical extraction to remove impacted wisdom tooth.

8-post -operative pain:

Post-operative pain and discomfort after extraction due to traumatized hard tissue may be from bruising of bone during instrumentation or from using burs for removal of bone also damage and rough handling of soft tissue during extraction is another cause for postoperative pain.

The most common cause for the moderate to severe continuous pain after extraction is related to a well-known cause called ***dry socket*** *or acute localized alveolar Osteitis.* -The patient presented with continuous moderate to severe pain after 24-72 hours after extraction which may last for 7 to 10 days clinically the patient may presented with empty socket (there is no clot in the socket) , exposed bone or empty socket with some evidence of broken-down blood clot and food debris within it with intense bad odour. The aetiology of this condition is incompletely understood but many predisposing factors exist like infection, trauma, blood supply, site, smoking, sex, vasoconstrictors or systemic factors.

9-post- operative swelling:

After extensive surgical interference and exodontias some time may be associated with post-operative swelling, this swelling may be related to one or more of the following causes: (A-Oedema, B-Infection, C-Hematoma.)

a. Oedema*:*

oedema occurs after surgery as a result of tissue injury *(it is normal response)* when there is great damage to the tissue by using blunt instrument. And rough handling of tissue may Increase the chance of production large oedema.

So laceration of tissue during extraction, trauma to the bone or periosteum are some of the most common causes of oedema and in other words *post-operative swelling,* persistent post-extraction swelling or the development of swelling several days after surgery is usually due to infection.

b. infection

swelling due to infection can be distinguished from postoperative oedema by the increased skin temperature, greater redness of the overlying tissues, the usual presence of fever and sometime fluctuation is present due to presence of pus. The infection should be always considered a serious complication and need urgent management.

c. hematoma

means a collection of blood in the extra-vascular spaces of the tissues. It is rare complication following extraction of the teeth, but sometimes hematoma or ecchymosis (bruising) may develop postoperatively if haemostasis is not developed and persistent bleeding from either the socket or adjacent alveolar bone.

10-The creation of an oroantral communication.

On extraction of upper molar teeth and sometimes upper premolars a communication between the oral cavity and maxillary antrum may be created. This communication if not healed or closed after few days a chronic condition occurs called *Oro- antrum fistula.*

Close proximity of the maxillary cheek teeth to the maxillary antrum which are separated only by little amount of bone and sometime even the soft-tissue lining of the maxillary sinus, the presence of periapical infection, the antrum itself may be abnormal in size, misjudgement of the amount of force and its direction used in extraction or the presence of pathological lesions. all these factors may assist in the production of this complication.

to confirm the presence of this complication, the patient is asked to pinch or close the nostrils together and blow air **gently** into the nose, the operator may see blood bubbling, or shooting of air through the communication is heard or a piece of cotton on tweezer may be defected. The *presence of* this complication needs surgical correction by well-trained oral surgeon and surgical unit in which all instruments and qualified staff present.

11-Trismus:

Means inability to open the mouth, trismus is one of common complication following extraction of teeth especially the surgical removal of wisdom teeth.

Trismus may be caused by post-operative *oedema, hematoma, inflammation of the soft tissue. Trauma and arthritis* of the temporomandibular joint, it may be related to the use *of inferior dental block* local anesthesia so the management of the trismus depend on diagnosis of the cause of this complication

12-syncope(fainting): -

Collapse on the dental chair is a common complication during extraction. The patient may often complain of feeling dizzy, weak & nauseated, and the skin is seen to be pale, cold and sweating, these complains may be accompanied by loss of consciousness, and the patient if not noticed at the beginning of the fainting may shows episode of convulsion.

The primary pathophysiological component of this situation is *cerebral ischemia* secondary to an inability of the heart to supply the brain with an adequate volume of oxygenated blood. In the presence of anxiety, blood flow is increasingly directed toward the skeletal muscles at the expense of other organ systems such as the gastrointestinal tract, in the absence of muscular movement, the increased volume of blood in the skeletal muscle remains there, decreasing venous return to the heart and decreasing the volume of blood available to be pumped by the heart (uphill) to the brain.

A slight decreased in cerebral blood flow is evidenced by the signs and symptoms of vasodepressor syncope (i.e., light headedness, dizziness, tachycardia, palpitation) if this situation continues cerebral blood flow declines still further and the patient loses consciousness.

When the operator notices these signs and symptoms a first aids treatment should be started by lowering the head of the patient by putting him in supine position by lowering the back of the dental chair. Care should be taken to maintain the airway and you have to notice the condition of the patient. if consciousness is not returned within 1-2 minutes otherwise one should consider that something serious like *respiratory arrest* or *cardiac arrest* may happen and the patient need medical emergency.

د.صلاح جاسم

Sedation technique for dentistry

Traditionally dentistry has been carried out under local anesthesia. However, sedation is required for:

1. Uncooperative children,

2. Adult patients with simple genuine fear and phobia of dental treatment,

3. Medically compromised patients (cardiovascular disease, asthma, chronic epilepsy, spasticity, Parkinsonism)

4. Those having persisting fainting attacks or gagging.

As for general anesthesia, only patients who satisfy ASA I and II criteria should be considered for sedation. Since the early work of Langa with nitrous oxide and Jorgenson using intravenous agents, a variety of sedative techniques for dentistry have been described. Patients can remain fully conscious or can almost become anesthetized, when different techniques of deep sedation or ultralight anesthesia are used.

Definitions

Premedication

Premedication is given preoperatively to produce narcosis and the latent period may range from 15 to more than 30 minutes. Oral, rectal, and intramuscular techniques of sedation are referred to as premedication.

Conscious Sedation

It is a state of mind obtained by IV administration of combination of anxiolytics, sedatives and hypnotics and/or analgesics that render the patient relaxed, yet allows the patient to communicate, maintain patent airway and ventilate adequately

Deep Sedation

Deep sedation is a depressed level of consciousness with some blunting of protective reflexes, although it remains possible to arouse the patient. The ideal sedative medication for use during dental practice would provide for an easily titratable level of sleepiness (sedation), predictable amnesia and decreased anxiety (anxiolysis), while providing for a rapid recovery with minimal side effects.

The term sedation is used to describe techniques in which clinical actions develop more rapidly and this term is commonly applied to inhalational and intravenous techniques.

Sedation Techniques

1. Intravenous Sedation

The first generally accepted intravenous (IV) sedation regime was devised by Professor Jorgenson of California, who advocated the use of diluted solution of pentobarbitone, pethidine and hyoscine by slow IV injection in the management of mentally handicapped patients. This technique while effective, often produces quite deep levels of sedation with prolonged recovery. This was followed by the use of small incremental doses of methohexitone (Brevital) after an initial loading dose of the same drug to produce ultralight anesthesia. With this technique patient's comfort was obtained at the expense of the integrity of the respiratory and cardiovascular systems—a potentially dangerous situation.

For many years **diazepam** was the IV agent of choice, but concerns about active metabolites and recirculation leading to prolonged recovery and pain on injection with venous sequelae have led to it being superseded by **midazolam**, which is more potent and shorter-acting.

Midazolam is an excellent anxiolytic with a powerful anterograde amnesic effect. It must be titrated very carefully and slowly until the patient reaches a sedation 'endpoint', characterized by a delayed response to questions and commands and some slurring of speech. Verbal contact must be maintained. For most patients, this will require 0.07 to 0.14 mg/kg which will provide useful sedation for about 45 minutes. Midazolam has no analgesic properties and local anesthetic injections will be required for painful procedures. In sedative doses, midazolam causes minimal cardiovascular depression, but respiratory depression can be marked. Patients must be monitored carefully and use of pulse oximetry to monitor oxygen saturation is highly recommended. Oxygen should be administered via nasal cannulae at 1 to 2 liters per minute (LPM) to prevent hypoxia. Patients must fulfil set criteria for recovery before being discharged. Patients must be accompanied home by a responsible adult. Ideally, the sedative agent should be given in the morning and the patient may resume normal activities on the following day.

Flumazenil, is a specific benzodiazepine antagonist available to treat any inadvertent overdose of benzodiazepines.

Advantages of Intravenous Sedation

1. Highly effective technique
2. Rapid onset of action
3. Titration is possible
4. Patent vein is a safety factor
5. Control of salivary secretions possible
6. Nausea and vomiting less common

7. Gag reflex diminished

8. Motor disturbances (epilepsy, cerebral palsy) diminished.

Disadvantages of Intravenous Sedation

1. Venepuncture is necessary.

2. Venepuncture complications (infiltration, hematoma, thrombophlebitis) may occur.

3. More intensive monitoring required.

4. Delayed recovery.

5. Escort needed.

Since IV sedation techniques may produce major depression of cardiorespiratory parameters, it is not to be administered to the patient by any person, except those who have had training in anaesthesiology.

Drugs Commonly Available for IV Sedation

1 Sedative, hypnotics and antianxiety drugs

a. Benzodiazepines—diazepam, midazolam

b. Barbiturates—methohexitone

2. Nonbarbiturate hypnotics

a. Propofol

b. Ketamine

c. Innovar (droperidol and fentanyl combination)

3. Antihistaminics—promethazine

4. Narcotic agonists—pethidine, pentazocine, fentanyl.

2.Inhalational Sedation

In 1966, Langa popularized the descriptive term relative analgesia for painful dental surgery. The term originates from the concept that the first stage of anesthesia in Guedel‘s classification might be subdivided into three planes; the first two were relative analgesia and the last was complete analgesia.

Nitrous Oxide Sedation

Nitrous oxide is an odourless and colourless gas that is not irritating to airways. It is toxic to humans if given in very high concentrations, but, when properly mixed with pure oxygen and given appropriately, it can be an extremely potent analgesic and anxiolytic. This makes it useful when providing oral surgery as well as for patients who primarily fear local anesthetic injections.

Nitrous oxide concentrations of 6 to 25 percent, 26 to 45 percent and 46 to 55 percent correspond to the three planes. In the first plane, there is moderate sedation and some analgesia (moderate analgesia), in the second plane the sedation is described as dissociation and there is a greater element of analgesia (dissociative analgesia) and in the third there is total analgesia (analgesic anesthesia), preceding to loss of consciousness.

Nitrous oxide concentrations of 66 to 80 percent, give light anesthesia, where there is complete analgesia and amnesia and it is not possible to communicate with the patient. The term relative analgesia, however, is misleading because for complete dental work, relative analgesia is not necessary.

Langa believed that the nitrous oxide concentration (20 to 30%) should be sufficient in most patients to carry out treatment without local anesthesia, but the more recent view is that control of pain should be obtained essentially by local anesthesia and any analgesic effect of the nitrous oxide serves only to remedy minor deficiencies in the local block. Accordingly, a better descriptive term is ‘inhalational sedation’ if nitrous oxide is used in this way.

Indications

1. Uncooperative children of reasoning age.
2. Mildly apprehensive adult patients.
3. Medically compromised patients.
4. Patients with gagging problem.

Cardiovascular diseases: In patients with angina pectoris, congestive cardiac failure, severe cardiac dysrhythmias, myocardial infarction and high blood pressure inhalational sedation have been employed with great success, because nitrous oxide has analgesic, amnesic and sedative properties, helping the patient to relax and thus reducing the work load of the myocardium and providing the patient and myocardium with the oxygen enriched gas mixture.

Asthma: Any type of stress in these patients is a potential cause of an acute exacerbation of asthma and thus the use of inhalational sedation is frequently warranted in these patients.

Epilepsy: Nitrous oxide is not an epileptogenic agent and therefore may be employed in patients with a history of chronic seizure activity as long as hypoxia is avoided.

Hepatic dysfunction: Nitrous oxide does not undergo biotransformation and therefore be used without additional risk and with a high probability of success in a patient with hepatic dysfunction.

Gagging: Gagging is a potential problem during many dental procedures. Nitrous oxide sedation has proved to be a highly effective method of eliminating or at least minimizing severe gagging especially during short procedures.

Contraindications:

1. Patients with extreme anxiety.

2. Nasal obstruction, sinus problem, common cold, habitual mouth breathing.

3. Upper respiratory tract infections.

4. Patients with serious psychiatric disorders.

5. Chronic obstructive pulmonary disease (COPD). These patients have chronically elevated carbon dioxide blood levels, and the stimulus for breathing in these patients is a lowered blood oxygen content. Oxygen enriched mixture of gases with inhalational sedation technique, raises the oxygen saturation of the blood and removes the stimulus for involuntary breathing leading to respiratory apnoea in the patients.

6. First trimester of pregnancy.

Advantages

1. Easy to administer.

2. Onset of action is rapid.

3. Nitrous oxide has bland, pleasant, non-irritating odour.

4. Rapid uptake and elimination of nitrous oxide ensures that no hangover effect is experienced.

5. Recovery is fast.

6. Titration is possible.

7. There is a wide margin of safety.

8. There is cardio-respiratory stability.

9. Nausea and vomiting–uncommon.

10. Reflex integrity is maintained.

11. No preparation of patient is required.

12. No need for any escort

Disadvantages

1. Equipment is expensive.

2. In the absence of scavenging system, exposure to nitrous oxide may cause occupational hazards to dental and nursing staff. The abortion rate is higher in practicing female dental assistants, when this technique is used. Methods that aid in minimizing exposure of the office personnel to nitrous oxide levels are as follows:

a. Testing the equipment for leaks.

b. Venting of waste gases outside the building.

c. Use of scavenging nasal hoods.

d. Use of airsweep (portable electric fan).

e. Minimizing conversation with patient (avoid mouth breathing).

f. Monitoring of air with infrared (IR) nitrous oxide analyzer to prove the effectiveness of the control measures, at least 2 to 3 times in a year. Reasonable concentration of nitrous oxide appears to be approximately 50 parts per million (ppm).

General Protocol for Using Nitrous Oxide

Nitrous oxide-oxygen sedation will always begin and end with the patient receiving 100 percent oxygen. The patient should be advised to avoid a heavy meal prior to the use of nitrous oxide-oxygen sedation. The patient is requested to void if necessary, prior to treatment. If the patient is wearing contact lenses, they should be removed as gas leak around the bridge of the nose may produce drying of the eyes. Review baseline vital signs prior to sedation. During sedation keep verbal communication with the patient and monitor vital signs and oxygen saturation using pulse oxymeter and ECG.

The general protocol for administering nitrous oxide in the dental setting begins with giving the patient 100% oxygen. While this is being done, the clinician should check for proper mask adaptation to the patient's face as well as allow the patient a few minutes to become accustomed to the mask and thus able to tolerate the mask.

After a few minutes of pre oxygenation, the amount of nitrous oxide (N_2O)/oxygen (O_2) flows should be adjusted to deliver a 20%/80% N_2O:O_2 mix. For the vast majority of patients this will not produce any effect; nonetheless, after 2 minutes at this level the patient should be queried as to whether they are beginning to sense any changes in mood or other sensations. If they are not, the gas mix should be changed to 30%:70% N_2O:O_2. Again, after 2 minutes at this level the patient should be queried as to whether they are beginning to sense

any changes in mood or other sensations. If they are, they should be asked if the feelings are good or bad. If bad, the percentage of N2O should be lowered to 25%, and after 2 minutes the patient should be asked if they still feel any effect and whether it is positive or negative. If negative, it may be that the patient cannot tolerate even low levels of N2O and the attempt at inhalation sedation is then ended. However, if the patient feels no effect at 30% N2O or some positive effects, the clinician should raise the N2O percentage to 35%. Again, after 2 minutes the patients should be asked whether they can now feel some effects or if they previously felt some positive effects, whether or not the effects became more positive. If they became more positive and the patient is feeling relaxed, the practitioner can proceed with local anesthesia and the surgery. If the patient feels that the previously positive effects are not as positive as at 30%, the doctor can lower the N2O concentration to 32% or 33% to try to fine-tune the sedative effects. Titration of the gas mixture should continue until the patient feels relaxed and is enjoying the experience. Once a good level is reached, clinical care can move forward. Note that some patients who have regular experience being in mind-altering states may desire higher doses of N2O, but it is important to make sure their mask fits properly and that they are breathing in and out of their nose.

The clinician must use their judgment as to how high a concentration of N2O to provide in such circumstances. Generally, levels of N2O above 50% should be avoided, and when levels above 40% are in use, monitor the patient's mood since in some circumstances patients may suddenly become disoriented or even combative. In addition, for longer procedures the dentist should regularly check that the patient is still relaxed and feeling good. Patients can begin to find the nitrous oxide effects less comfortable and need a break from the sedation. Fortunately, once the patient begins to breathe 100% oxygen or room air, the effects of the N2O rapidly dissipate. This also occurs once the need for sedation ends and the patient is placed on 100% oxygen for about 5 minutes to recover.

Clinical Indicators of Oversedation

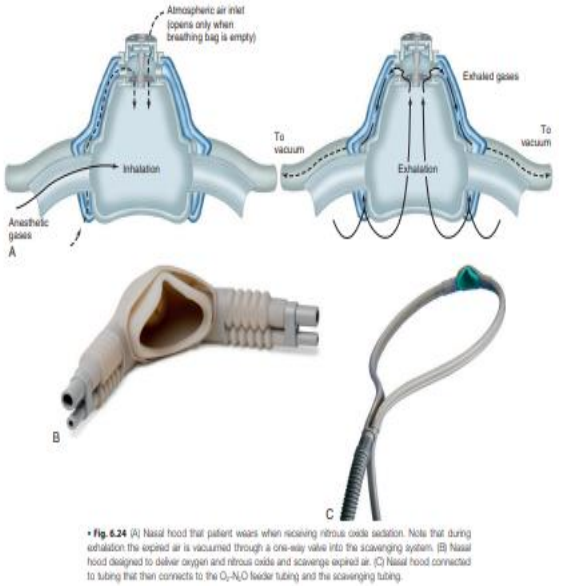
1. Patient uncomfortable.
2. Persistent closing of mouth.
3. Spontaneous mouth breathing.
4. Patient responds sluggishly to command.
5. Patient becomes uncooperative.
6. Patient laughs, cries, or feels giddy.
7. Patient has uncoordinated movements.
8. Patient talks incoherently

• Fig. 6.23 Examples of inhalation sedation control units.

• Fig. 6.20 Pressure gauges on tanks containing (A) oxygen and (B) nitrous oxide require different interpretations of how much remains in the tank. When an oxygen tank is full, the gauge shows the actual psi of the oxygen remaining in the tank. However, for nitrous oxide, the psi represented on the gauge only represents the pressure of the N_2O vapor floating above the liquid N_2O. It is only when the amount of liquid begins to run out that the psi on the N_2O gauge begins to fall below 750 psi. Until that time, the gauge will read 750 psi.

• Fig. 6.21 Pin index system is used to prevent attaching the wrong gas to the wrong port of the continuous-flow sedation unit/controller. Note the differing patterns of depression below the gas exit port for (A) oxygen and (B) nitrous oxide.

• Fig. 6.22 Example of a continuous-flow sedation unit/controller used to create the desired N_2O-O_2 blend. (1) Master control (on–off), (2) controls for O_2 and N_2O, (3) flowmeters, (4) O_2 flushing button, (5) attachment site for reservoir bag, (6) one-way valve to patient.



• Fig. 6.24 (A) Nasal hood that patient wears when receiving nitrous oxide sedation. Note that during exhalation the expired air is vacuumed through a one-way valve into the scavenging system. (B) Nasal hood designed to deliver oxygen and nitrous oxide and scavenge expired air. (C) Nasal hood connected to tubing that then connects to the O_2-N_2O feeder tubing and the scavenging tubing.

Examples of inhalation sedation control units4 (A) Nasal hood that patient wears when receiving nitrous oxide sedation. Note that during exhalation the expired air is vacuumed through a one-way valve into the scavenging system. (B) Nasal hood designed to deliver oxygen and nitrous oxide and scavenge expired air. (C) Nasal hood connected to tubing that then connects to the O2-N2O feeder tubing and the scavenging tubing.

GENERAL ANAESTHESIA

د. صلاح جاسم

General anesthesia is commonly described as the triad of unconsciousness (loss of awareness), analgesia (pain relieve) and muscle relaxation.

Induction of general anesthesia is most frequently done by intravenous agents. Propofol considered as the most widely used induction agent and can be used for maintenance of anesthesia. Other infrequently used intravenous agents include ketamine. Newer agents based on benzodiazepine receptor agonist, etomidate derivatives and fospropofol are still in the experimental stage.

Inhalational induction using agents such as non-pungent sevoflurane is useful in children, needle-phobic adults and those in whom a difficult airway is anticipated. These patients will have a higher risk of developing airway obstruction

Another method used in the induction of the General anesthesia is the **Rapid sequence induction** (RSI) is a technique that allows the airway to be rapidly secured. It is used when there is a high risk of regurgitation that may lead to pulmonary aspiration by using a predetermined dose of intravenous an aesthetic agent together with rapidly acting muscle relaxant is used in those with high risk of regurgitation in order to secure the airway quickly. Commonly needed in emergency surgery, it is also a technique of choice in any non-emergency surgery in a patient with delayed emptying of stomach.

However, nowadays the **Total intravenous anesthesia** (TIVA) is becoming popular following the introduction of propofol and ultra-short acting opioid remifentanil due to

1- The lack of a cumulative effect,
2- better hemodynamic stability
3- excellent recovery profile and concerns over the environmental effects of inhalational agents

Total intravenous anesthesia is routinely used in neuro-surgery, in airway laser surgery, during cardiopulmonary bypass and for day-case anesthesia.

Management of airway during anesthesia

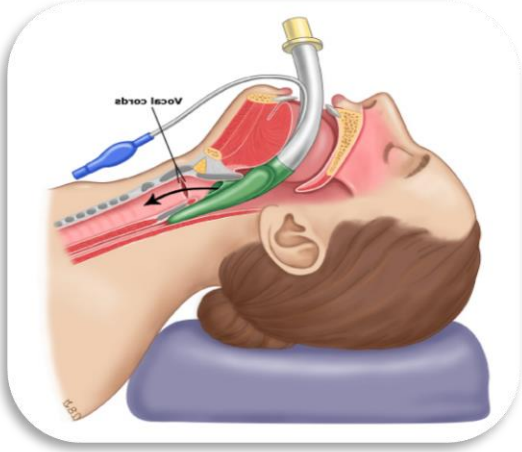
Loss of muscle tone as a result of general anesthesia means that the patient can no longer keep their airway open. Therefore, the patients need their airway maintained for them. The use of muscle relaxants will mean that they will also be unable to breathe for themselves and so will require artificial ventilation.

Different approaches used to manage the airway during anesthesia including

1- Chin lift and jaw thrust: suitable for short term when no aid available
2- Guedel airway: holds tongue forward but does not prevent aspiration
3- Laryngeal mask: easy insertion, reliable airway, allows ventilation
4- Endotracheal intubation: secure and protected airway

Laryngeal mask airway or endotracheal tube is then inserted and the patient is allowed to breathe spontaneously or is ventilated during the procedure. The addition of a cuff to the endotracheal tube facilitates positive pressure ventilation and protects the lungs from aspiration of regurgitated gastric contents.

Laryngeal mask airway (LMA). Developed by Dr Archie Brain in the UK, the mask with an inflatable cuff is inserted via the mouth and produces a seal around the glottic opening, providing a very reliable means of maintaining the airway. Its placement is less irritating and less traumatic to a patient's airway than endotracheal intubation. The technique can be easily taught to non-anesthetists and paramedics and can be used as an emergency airway management tool. Several varieties of LMA are available including reinforced, I-gel and an intubating LMA that aids endotracheal intubation.



Difficult intubation: Endotracheal intubation is feasible in most patients, but in a certain proportion of patients this may be difficult or impossible; if compounded by inability to ventilate the patient by bag-mask, the consequences can be catastrophic hypoxia. Many devices have been developed to aid intubation if difficulty is anticipated and protocols have been created by specialized societies to deal with such situations. The gold standard for intubation in difficult situations is the use of the fiberoptic intubating bronchoscope, facilitated by topical local anesthetic in awake patients or using general anesthesia. The anesthetist places the endotracheal tube in the trachea by threading the tube over the bronchoscope and so places the tube in the trachea under direct bronchoscopic vision.

Muscle relaxation and artificial ventilation

Pharmacological blockade of neuromuscular transmission provides relaxation of muscles allowing easy surgical access, but the patient requires artificial ventilation.

Neuromuscular blocking agents are broadly classified into depolarizing and non-depolarizing groups according to their mode of action.

Suxamethonium is the most commonly used depolarizing agent. It binds to the nicotinic acetylcholine receptors resulting in opening of the cation channel leading to depolarization and rapid relaxation of muscles. Despite its adverse effects, such as hyperkalemia, muscle pain, anaphylaxis and potentially lifethreatening malignant hyperthermia, suxamethonium is still widely used because of its quick onset and short duration of action. These properties are useful where rapid endotracheal intubation is necessary to protect the patient's airway or short duration surgery is performed.

Ventilation during anesthesia

Mechanical ventilation is required when the patient's spontaneous ventilation is inadequate or when the patient is not breathing because of the effects of the anesthetic, analgesic agents or muscle relaxants.

In volume control ventilation, a preset volume is delivered by the machine irrespective of the airway pressure. The pressure generated will be in part dependent on the resistance and compliance of the airway. In laparoscopic surgery requiring the Trendelenburg position (the patient is positioned head down), and in morbidly obese patients and those with lung disease, this may result in excessive pressures being developed, which may lead to barotrauma (pneumothorax).

In pressure control mode, the ventilator generates flow until a preset pressure is reached. The actual tidal volume delivered is variable and depends on airway resistance, intra-abdominal pressure and the degree of relaxation.

-The End-

Oral Surgery

3rd Grade
Dr. Ali Mohammed

Medical Emergencies During Dental Treatment

Patients with medical conditions sometimes require modifications of their perioperative care when oral surgery is planned. This lecture discusses those considerations for the major categories of health problems.

Cardiovascular Problems

1. **Ischemic Heart Diseases.**
   - **Angina Pectoris:**

     It is a progressive narrowing or spasm (or both) of one or more of the coronary arteries. narrowing of myocardial arteries is one of the most common health problems that dentists encounter. This condition occurs primarily in men older than age 40 years and is also prevalent in postmenopausal women.

     This condition leads to a mismatch between myocardial oxygen demand and the ability of the coronary arteries to suppl oxygen carrying blood. Myocardial oxygen demand can be increased, for example, by exertion or anxiety, the attack occurs because there is insufficient oxygen supply that meet the demand by the myocardium.

Signs & Symptoms:

a) Heavy pressure or squeezing sensation in the patient's substernal region that can radiate into the left shoulder and arm and even into the mandibular region.
b) Intense sense of being unable to breathe adequately.
c) Nausea.
d) Sweating.
e) Bradycardia.

Once the decision is made to perform elective oral surgery, the patient with a history of angina should be prepared for surgery, and the patient's myocardial oxygen demand should be lowered or prevented from rising. The increased oxygen demand during oral surgery is primarily the result of patient anxiety; thus, an anxiety-reduction protocol should be used as mentioned below.

General Anxiety-Reduction Protocol

Before Appointment

• Hypnotic agent to promote sleep on night before surgery (optional)
•Sedative agent to decrease anxiety on morning of surgery (optional)
•Morning appointment and schedule so that reception room time is minimized

During Appointment

Nonpharmacologic Means of Anxiety Control

• Frequent verbal reassurances
•Distracting conversation
• No surprises (clinician warns patient before doing anything that could cause anxiety)
•No unnecessary noise
•Surgical instruments out of patient's sight
•Relaxing background music

Pharmacologic Means of Anxiety Control

- Local anesthetics of sufficient intensity and duration
- Nitrous oxide
- Intravenous anxiolytics.

Management of patient with history of Angina Pectoris:

1. Consult the patient's physician.
2. Use an anxiety-reduction protocol.
3. Have nitroglycerin tablets (sublingual) or spray readily available. Use nitroglycerin premedication, if indicated.
4. Ensure profound local anesthesia (best reducer of anxiety) before starting surgery.
5. Consider the use of nitrous oxide sedation.
6. Monitor vital signs closely.
7. Consider possible limitation of amount of epinephrine used (0.04 mg maximum)(4ml of LA with 1:100,000 epinephrine).
8. Maintain verbal contact with patient throughout the procedure to monitor status.

❖ **Myocardial Infarction (MI):**

MI occurs when ischemia (resulting from an oxygen demand-supply mismatch) is not relieved and causes myocardial cellular dysfunction and death.

MI usually occurs when an area of coronary artery narrowing has a clot form that blocks all or most blood flow. The infarcted area of myocardium becomes nonfunctional and eventually necrotic and is surrounded by an area of usually reversibly ischemic myocardium that is prone to serve as a nidus for dysrhythmias.

In general, it is recommended that elective major surgical procedures be deferred until at least 6 months after an infarction.

Management of Patient with a History of Myocardial Infarction

1. Consult the patient's primary care physician.
2. Check with the physician if invasive dental care is needed before 6 months since the myocardial infarction.
3. Check whether the patient is using anticoagulants (including aspirin).
4. Use an anxiety-reduction protocol.
5. Have nitroglycerin available; use it prophylactically if the physician advises.
6. Administer supplemental oxygen (optional).
7. Provide profound local anesthesia.
8. Consider nitrous oxide administration.
9. Monitor vital signs, and maintain verbal contact with the patient.
10. Consider possible limitation of epinephrine use to 0.04 mg.
11. Consider referral to an oral-maxillofacial surgeon.

2. Cerebrovascular Accident (Stroke)

Patients who have had a cerebrovascular accident (CVA) are always susceptible to further neurovascular accidents. These patients are often prescribed anticoagulants or antiplatelet medication depending on the cause of the CVA; if they are hypertensive, they are given blood pressure–lowering agents. CVAs are typically a result of an embolus from a history of atrial fibrillation, a thrombus due to a hypercoagulable state, or stenotic vessels.

In the case of a patient having an embolic or thrombotic stroke, the patient is likely taking an anticoagulant as opposed to an ischemic stroke secondary to stenotic vessels, in which case the patient would be taking an antiplatelet medication. If such a patient requires surgery, clearance by the patient's physician is desirable, as is a delay until significant hypertensive tendencies have been controlled. The patient's baseline neurologic status should be assessed and documented preoperatively.

The patient should be treated by a nonpharmacologic anxiety reduction protocol and have vital signs carefully monitored during surgery. If pharmacologic sedation is necessary, low concentrations of nitrous oxide can be used. Techniques to manage patients taking anticoagulants are discussed later in this lecture.

3. Congestive Heart Failure (Hypertrophic Cardiomyopathy)

CHF (HCM) occurs when a diseased myocardium is unable to deliver the cardiac output demanded by the body or when excessive demands are placed on a normal myocardium.

The heart begins to have an increased end-diastolic volume that, in the case of the normal myocardium, increases contractility through the Frank-Starling mechanism (FOR YOUR INFORMATION (FYI) The Frank-Starling mechanism is an intrinsic cardiac autoregulatory mechanism that represents the relationship between stroke volume and end-diastolic volume. The law states that the stroke volume of the heart increases in response to an increase in the volume of blood in the ventricles before contraction (the end-diastolic volume), when all other factors remain constant. As a larger volume of blood flows into the ventricle, the blood stretches cardiac muscle, leading to an increase in the force of contraction. This mechanism ensures that stroke volume changes in proportion to the change in end-diastolic volume). However, as the normal or diseased myocardium further dilates, it becomes a less efficient pump, causing blood to back up into the pulmonary, hepatic, and mesenteric vascular beds. This eventually leads to pulmonary edema, hepatic dysfunction, and compromised intestinal nutrient absorption. The lowered cardiac output causes generalized weakness, and impaired renal clearance of excess fluid leads to vascular overload.

Sings & Symptoms:

a) Orthopnea: shortness of breath in supine position.
b) Paroxysmal nocturnal dyspnea: similar to orthopnea. The patient has respiratory difficulty 1 or 2 hours after lying down.
c) Lower extremity edema: which usually appears as a swelling of the foot, the ankle, or both, is caused by an increase in interstitial fluid. The edema is detected by pressing a finger into the swollen area for a few seconds; and the indentation in the soft tissue is left after the finger is removed.
d) Weight gain.
e) Dyspnea on exertion.

Management of the Patient with Congestive Heart Failure

1. Defer treatment until heart function has been medically improved and the patient's physician believes treatment is possible.
2. Use an anxiety-reduction protocol.
3. Consider possible administration of supplemental oxygen.
4. Avoid using the supine position.
5. Consider referral to an oral-maxillofacial surgeon.

Pulmonary Problems

1. Asthma

True asthma involves the episodic narrowing of inflamed small airways, which produces wheezing and dyspnea as a result of chemical, infectious, immunologic, or emotional stimulation or a combination of these. Patients with asthma should be questioned about precipitating factors, frequency and severity of attacks, medications used, and response to medications. The severity of attacks can often be gauged by the need for emergency room visits and hospital admissions.

Management of the Patient with Asthma

1. Defer dental treatment until the asthma is well controlled and the patient has no signs of a respiratory tract infection.
2. Listen to the chest with a stethoscope to detect any wheezing before major oral surgical procedures or sedation.
3. Use an anxiety-reduction protocol, including nitrous oxide, but avoid the use of respiratory depressants.
4. Consult the patient's physician about possible preoperative use of cromolyn sodium.
5. If the patient is or has been chronically taking corticosteroids, provide prophylaxis for adrenal insufficiency.
6. Keep a bronchodilator-containing inhaler easily accessible.
7. Avoid the use of NSAIDs in susceptible patients.

FYI: - Cromolyn is a synthetic compound that is used to prevent some allergic reactions. It is traditionally described as a mast cell stabilizer and is commonly marketed as the sodium salt sodium cromoglicate or cromolyn sodium. This drug prevents the release of inflammatory chemicals such as histamine from mast cells. It is available in multiple forms such as nasal spray, nebulizer solution for aerosol administration to treat asthma.

2. Chronic Obstructive Pulmonary Disease (COPD)

In the past, the terms emphysema and bronchitis were used to describe clinical manifestations of COPD, but COPD has been recognized to be a spectrum of pathologic pulmonary problems. It is usually caused by long-term exposure to pulmonary irritants such as tobacco smoke that cause metaplasia of pulmonary airway tissue. Airways are inflamed and disrupted, lost their elastic properties, and become obstructed because

of mucosal edema, excessive secretions, and bronchospasm, producing the clinical manifestations of COPD.

Sings & Symptoms:

1. dyspnea during mild to moderate exertion.
2. chronic cough that produces large amounts of thick secretions.
3. frequent respiratory tract infections.
4. barrel shaped chests.
5. they may purse their lips to breathe.
6. Have audible wheezing during breathing.
7. Patients may develop associated pulmonary hypertension and eventual right-sided heart failure.

Management of Patient With COPD

1. Defer treatment until lung function has improved and treatment is possible.
2. Listen to the chest bilaterally with stethoscope to determine adequacy of breath sounds.
3. Use an anxiety-reduction protocol, but avoid the use of respiratory depressants.
4. If the patient requires chronic oxygen supplementation, continue at the prescribed flow rate. If the patient does not require supplemental oxygen therapy, consult his/her physician before administering oxygen.
5. If the patient chronically receives corticosteroid therapy, manage the patient for adrenal insufficiency.
6. Avoid placing the patient in the supine position until you are confident that the patient can tolerate it.
7. Keep a bronchodilator-containing inhaler accessible.
8. Closely monitor respiratory rate and heart rate.
9. Schedule afternoon appointments to allow for clearance of secretions.

Renal Problems

1. Rental Failure

Patients with chronic renal failure require periodic renal dialysis. Elective oral surgery is best undertaken the day after a dialysis treatment has been performed. This allows the heparin used during dialysis to disappear and the patient to be in the best physiologic status with respect to intravascular volume and metabolic byproducts.

Management of Patient with Renal Insufficiency and Patient Receiving Hemodialysis

1. Avoid the use of drugs that depend on renal metabolism or excretion. Modify the dose if such drugs are necessary. Do not use an atrioventricular shunt for giving drugs or for taking blood specimens.
2. Avoid the use of nephrotoxic drugs such as nonsteroidal anti-inflammatory drugs.
3. Defer dental care until the day after dialysis has been given.
4. Consult the patient's physician about the use of prophylactic antibiotics.
5. Monitor blood pressure and heart rate.
6. Look for signs of secondary hyperparathyroidism.
7. Consider screening for hepatitis B virus before dental treatment. Take the necessary precautions if unable to screen for hepatitis.

2. Renal Transplantation and Transplantation of Other Organs

The patient requiring surgery after renal or other major organ transplantation is usually receiving a variety of drugs to preserve the function of the transplanted tissue. These patients receive corticosteroids and may need supplemental corticosteroids in the perioperative period.

Most of these patients also receive immunosuppressive agents that may cause otherwise self-limiting infections to become severe.
Therefore, a more aggressive use of antibiotics and early hospitalization for infections are warranted. The patient's primary care physician should be consulted about the need for prophylactic antibiotics. Cyclosporine A, an immunosuppressive drug administered after organ transplantation, may cause gingival hyperplasia. The dentist performing oral surgery should recognize this so as not to wrongly attribute gingival hyperplasia entirely to hygiene problems. Patients who have received renal transplants occasionally have problems with severe hypertension.

Management of Patient with Renal Transplant

1. Defer treatment until the patient's primary care physician or transplant surgeon clears the patient for dental care.
2. Avoid the use of nephrotoxic drugs.
3. Consider the use of supplemental corticosteroids.
4. Monitor blood pressure.
5. Consider screening for hepatitis B virus before dental care. take necessary precautions if unable to screen for hepatitis.
6. Watch for presence of cyclosporine-A–induced gingival hyperplasia. emphasize the importance of oral hygiene.
7. Consider use of prophylactic antibiotics, particularly in patients taking immunosuppressive agents.

3. Hypertension

According to the American Heart Association hypertension is a chronic elevation of blood pressure. when blood pressure consistently ranges from 130-139 systolic or 80-89 mm Hg diastolic, as illustrated in the table below:

Blood Pressure Categories

American Heart Association.

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120-129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130-139	or	80-89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

Management of Patient with Hypertension

Mild to Moderate Hypertension (Systolic >140 mm Hg; Diastolic >90 mm Hg)

1. Recommend that the patient seek the primary care physician's guidance for medical therapy of hypertension. It is not necessary to defer needed dental care.
2. Monitor the patient's blood pressure at each visit and whenever administration of epinephrine-containing local anesthetic surpasses 0.04 mg during a single visit.
3. Use an anxiety-reduction protocol.
4. Avoid rapid posture changes in patients taking drugs that cause vasodilation.
5. Avoid administration of sodium-containing intravenous solutions.

Severe Hypertension (Systolic >200 mm Hg; Diastolic >110 mm Hg)

1. Defer elective dental treatment until the hypertension is better controlled.

2. Consider referral to an oral-maxillofacial surgeon for emergent problems.

Hepatic Disorders

The patient with severe liver damage resulting from infectious disease, ethanol abuse, or vascular or biliary congestion requires special consideration before oral surgery is performed. An alteration of dose or avoidance of drugs that require hepatic metabolism may be necessary. The production of nearly all coagulation factors, therefore obtaining an international normalized ratio [INR] which is in a healthy person is typically between 0.8 and 1.2, prothrombin time [PT] (normally 11-13.5 sec.) or partial thromboplastin time [PTT] (normally 25-35 sec.) may be useful before surgery in patients with more severe liver disease who are undergoing surgery with the potential for heavy blood loss. Portal hypertension caused by liver disease may also cause hypersplenism and the sequestering of platelets, causing a relative thrombocytopenia. Thrombopoietin is also produced in the liver, and decreased production of thrombopoietin may result in a true thrombocytopenia. Finding a prolonged bleeding time or low platelet count reveals this problem. Patients with severe liver dysfunction may require hospitalization for dental surgery because their decreased ability to metabolize the nitrogen in swallowed blood may cause encephalopathy. Finally, unless documented otherwise, a patient with liver disease of unknown origin should be presumed to carry the hepatitis virus.

FYI: - Encephalopathy is a general term used to describe a disease that affects the function or structure of the brain. It can have many different causes, including infections, liver failure, kidney failure, lack of oxygen or blood flow to the brain, and exposure to toxins. Symptoms of encephalopathy can vary depending on the underlying cause and may

include confusion, memory loss, personality changes, seizures, and loss of consciousness.

Endocrine Disorders

1. Diabetes Mellitus

Diabetes mellitus is caused by an underproduction of insulin, a resistance of insulin receptors in end organs to the effects of insulin, or both. Diabetes is commonly divided into insulin-dependent (type 1) and non-insulin-dependent (type 2) diabetes.

Type 1 diabetes usually begins during childhood or adolescence. The major problem in this form of diabetes is an underproduction of insulin, which results in the inability of the patient to use glucose properly.

Patients with type 2 diabetes usually produce insulin but in insufficient amounts because of decreased insulin activity, insulin receptor resistance, or both. This form of diabetes typically begins in adulthood, is exacerbated by obesity, and does not usually require insulin therapy.

Hypoglycemia should be avoided in patients undergoing oral surgery since it can lead to coma while hyperglycemia rarely lead to ketoacidosis in patient with type 2 diabetes, therefore, any Signs of hypoglycemia—hypotension, hunger, drowsiness, nausea, diaphoresis, tachycardia, or mood change—occur, an oral or IV supply of glucose should be administered.

Persons with well-controlled diabetes are no more susceptible to infections than are persons without diabetes, but they have more difficulty containing infections. This is caused by altered leukocyte function or by other factors that affect the ability of the body to control an infection. Difficulty in containing infections is more significant in persons with poorly controlled diabetes. Therefore, elective oral surgery should be deferred in patients with poorly controlled diabetes until control is accomplished.

Insulin-Dependent (Type 1) Diabetes

1. Defer surgery until the diabetes is well controlled; consult the patient's physician.
2. Schedule an early-morning appointment; avoid lengthy appointments.
3. Use an anxiety-reduction protocol, but avoid deep sedation techniques in outpatients.
4. Monitor pulse, respiration, and blood pressure before, during, and after surgery.
5. Maintain verbal contact with the patient during surgery.
6. If the patient must not eat or drink before oral surgery and will have difficulty eating after surgery, instruct him or her not to take the usual dose of regular insulin; start intravenous administration of a 5% dextrose in water drip at 150 mL/h.
7. If allowed, have the patient eat a normal breakfast before surgery and take the usual dose of regular insulin.
8. Advise patients not to resume normal insulin doses until they are able to return to usual level of caloric intake and activity level.
9. Consult the physician if any questions concerning modification of the insulin regimen arises.
10. Watch for signs of hypoglycemia.
11. Treat infections aggressively.

Non–Insulin-Dependent (Type 2) Diabetes

1. Defer surgery until the diabetes is well controlled.
2. Schedule an early-morning appointment; avoid lengthy appointments.
3. Use an anxiety-reduction protocol.
4. Monitor pulse, respiration, and blood pressure before, during, and after surgery.
5. Maintain verbal contact with the patient during surgery.

6. If the patient must not eat or drink before oral surgery and will have difficulty eating after surgery, instruct him or her to skip any oral hypoglycemic medications that day.
7. If the patient can eat before and after surgery, instruct him or her to eat a normal breakfast and to take the usual dose of hypoglycemic agent.
8. Watch for signs of hypoglycemia.
9. Treat infections aggressively.

2. Adrenal Insufficiency

Diseases of the adrenal cortex may cause adrenal insufficiency. Symptoms of primary adrenal insufficiency include weakness, weight loss, fatigue, and hyperpigmentation of skin and mucous membranes. However, the most common cause of adrenal insufficiency is chronic therapeutic corticosteroid administration (secondary adrenal insufficiency).

Often, patients who regularly take corticosteroids have moon facies (moon-shaped face), buffalo (back) humps, and thin, translucent skin. Their inability to increase endogenous corticosteroid levels in response to physiologic stress may cause them to become hypotensive, syncopal, nauseated, and feverish during complex, prolonged surgery, which is consistent with an adrenal crisis.

Management of Patient With Adrenal Suppression Who Requires Major Oral Surgery

If the patient is currently taking corticosteroids:

1. Use an anxiety-reduction protocol.
2. Monitor pulse and blood pressure before, during, and after surgery.
3. Instruct the patient to double the usual daily dose on the day before, day of, and day after surgery.

4. On the second postsurgical day, advise the patient to return to a usual steroid dose.

If the patient is not currently taking steroids but has received at least 20 mg of hydrocortisone (cortisol or equivalent) for more than 2 weeks within the past year:

1. Use an anxiety-reduction protocol.
2. Monitor pulse and blood pressure before, during, and after surgery.
3. Instruct the patient to take 60 mg of hydrocortisone (or equivalent) the day before and the morning of surgery (or the dentist should administer 60 mg of hydrocortisone or equivalent intramuscularly or intravenously before complex surgery).
4. On the first 2 postsurgical days, the dose should be dropped to 40 mg and dropped to 20 mg for 3 days thereafter. The clinician can cease administration of supplemental steroids 6 days after surgery.