ANATOMY OF SCALP

Dr. Vaishali
Senior Lecturer
Department of Oral & MaxllioFacial Surgery
MGDCH

CONTENTS

INTRODUCTION

- It's the soft tissue covering the vault of the skull.
- **Extension:**

(a) Anteriorly:
Supra-orbital margins

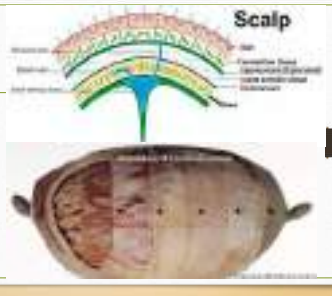
(b) Posteriorly:
Superior nuchal lines and
External occipital protuberance

(c) Laterally:
Superior temporal lines

LAYERS

- Five layers:

a) **S**kin
b) **C**onnective Tissue
c) Galea **A**poneurotica
d) **L**oose Areolar Tissue
e) **P**ericranium



SKIN:

- Thick and hairy except over the forehead
- Contains sweat glands and sebaceous glands.

CONNECTIVE TISSUE:

- More fibrous and dense in centre than at periphery.
- Provides proper medium for passage of vessels and nerves to the skin.
- Blood vessels are firmly attached to connective tissue.

GALEA APONEUROTICA:

- Fibrous, freely movable on pericranium
- Connects two bellies of Occipito-frontalis muscle.

LOOSE AREOLAR TISSUE:

- Extension:

a) Anteriorly- Into eyelids
b) Posteriorly- Superior nuchal line
c) Laterally- Superior temporal line

- Also known as Dangerous layer of the scalp as it gives passage to the emissary veins, therefore, may transmit infection from scalp to cranial venous sinuses.

PERICRANIUM:

- Loosely attached to the bones
- Firmly adherent to the sutures

MUSCLE

OCCIPITO-FRONTALIS MUSCLE

- The Epicranius (Occipitofrontalis) is a broad, Musculo-fibrous layer, which covers the whole of one side of the vertex of the skull, from the occipital bone to the eyebrow.
- It consists of two parts, the Occipitalis and the Frontalis, connected by an intervening tendinous aponeurosis, the galea aponeurotica.

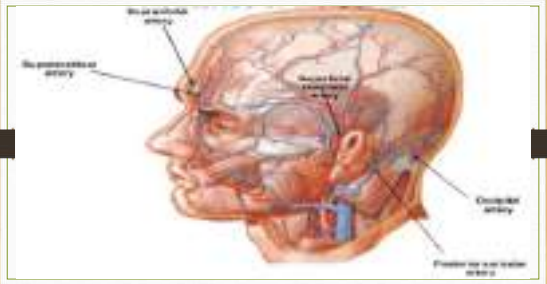
OCCIPITALIS:

- Thin and quadrilateral in form
- Small and separate
- Origin: Arises from the lateral two-thirds of the superior nuchal line of the occipital bone.
- Insertion: Galea aponeurotica
- Nerve Supply: Posterior auricular branch of the Facial Nerve

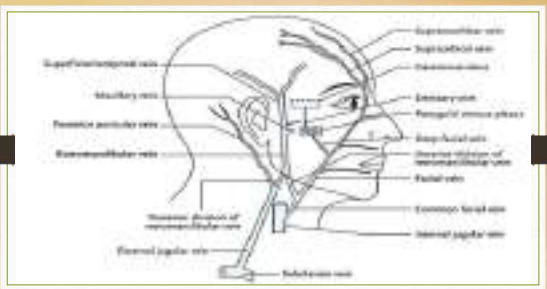
FRONTALIS:

- Thin and quadrilateral in form
- Longer, wider, partly united in median plane
- Origin: Arises from skin of forehead, mingling with orbicularis oculi and corrugator supercilli.
- Insertion: Galea aponeurotica
- Nerve Supply: Temporal branch of the Facial Nerve

ARTERIAL SUPPLY



VENOUS DRAINAGE

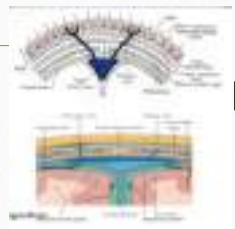


EMISSARY VEINS

- Connect the extracranial veins with the intracranial venous sinuses to equalise the pressure. Two sets:

(1) Parietal Emissary Vein:
Passes through parietal foramen and communicates the scalp veins with Superior Saggital Sinus.

(2) Mastoid Emissary Vein:
Passes through mastoid foramen and communicates the scalp veins with Sigmoid Sinus.

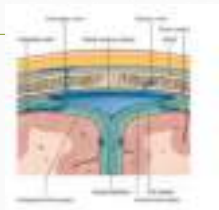


DIPLOIC VEINS

- Two sets:

(1) Frontal Diploic Vein:
Emerges at supra-orbital notch and drains into supra-orbital vein.

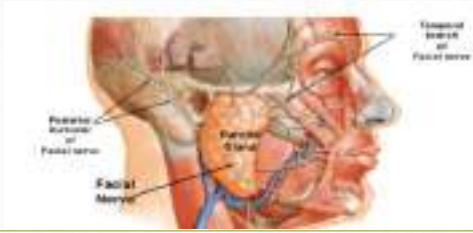
(2) Occipital Diploic Vein:
Drains into occipital vein by piercing outer table or drains into transverse sinus by piercing inner table.



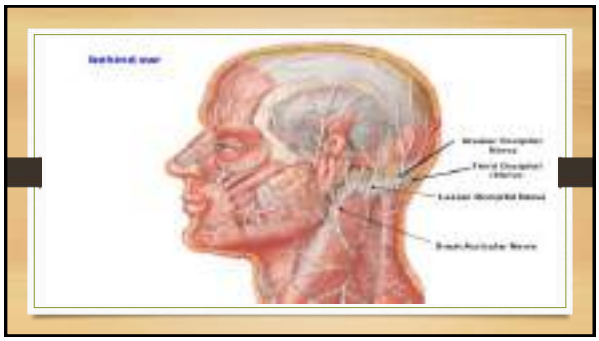
LYMPHATIC DRAINAGE

NERVE SUPPLY

MOTOR NERVE SUPPLY



SENSORY NERVE SUPPLY



APPLIED ASPECT

SURGICAL LAYERS OF SCALP

- First three layers of the scalp, i.e., skin, connective tissue layer, and aponeurotic layer are firmly adhered to each other and cannot be separated from each other. These layers are termed surgical layers of the scalp and form the scalp proper.
- The layer of loose areolar tissue beneath the aponeurotic layer accounts for the free mobility of the scalp proper on the underlying bone. Further, it provides an easy plane of cleavage in injury and a plane in which blood from severed blood vessels can spread for a long distance.

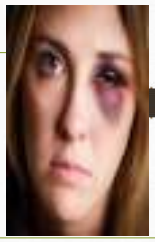
- When the hairs are caught in machinery, the scalp proper is avulsed.
- It is in this plane that surgeons mobilize scalp flaps.

DANGEROUS AREA OF SCALP

- The layer of loose areolar tissue is called dangerous layer of scalp because blood and pus freely tend to collect in this layer.
- If pus collects in this layer, the infection may travel readily along emissary veins into the intracranial dural venous sinuses leading to their thrombosis, which may be fatal.

ECCHYMOSIS

- The blood and fluid collecting in the layer of loose areolar tissue following a blow on head tracks freely under the scalp producing generalized swelling over the dome of the skull, but cannot pass into either occipital or temple regions because of the bony attachments of the occipitofrontalis.
- The blood and fluid can, however, track forward into the eyelids because occipitofrontalis has no bony attachment anteriorly.



- This leads to formation of hematoma few hours after a head injury or cranial operation causing black discoloration of skin around the eyes, a condition called black eye.
- The commonest cause of black eye is local violence, such as fist fight causing subcutaneous extravasation of blood into the eyelids.

SAFETY- VALVE HEMATOMA

- Fracture of cranial vault in children may be associated with the tearing of dura mater and pericranium. In such cases the blood from intracranial hemorrhage communicates with the subaponeurotic space of the scalp through the fracture lines.
- The signs of cerebral compression do not develop until the subaponeurotic space is fully filled with blood. For this reason the collection of blood in the fourth layer is called a safety-valve hematoma.

CEPHALHEMATOMA

- It's a subperiosteal collection of blood.
- Since the periosteum of skull loosely covers the bones of skull except at the sutural lines where it is firmly attached to the sutural membranes, the hematoma is bound by suture lines and assumes the shape of related bones.

- It is firm and its edges are well-defined.
- Commonly found in the parietal region.

CAPUT SUCCEDANEUM

- It is a subcutaneous edema over the presenting part of the head at delivery.
- It takes place during the passage of head through the birth canal due to interference of the venous return.

- It is the most common form of birth trauma of the scalp and usually occurs over the occiput and crosses the suture lines.
- The affected parts of the scalp feel soft and margins are partly defined.
- Generally the edema subsides, in a few days.

- Scalp is the commonest site of sebaceous cysts.
- The walls of the vessels are adherent to the fibrous network in the connective tissue layer; hence when blood vessels are torn or cut during an injury, they are unable to retract and cause profuse bleeding. The bleeding, however, can be stopped by pressing against the underlying bone.

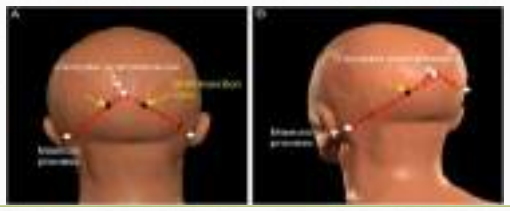
- The scalp wounds bleed profusely but heal quickly due to high vascularity. The avulsed portions of scalp, therefore, should not be cut away rather they should be placed in position and sutured.
- In infants, the veins of the scalp are easily seen deep to the skin, hence they are the favored sites for intravenous infusion.
- The wounds of the scalp do not gape unless epicranial aponeurosis is cut transversely because the aponeurosis is under tension in the anteroposterior direction by the tone of occipitofrontalis muscle.

SCALP ANESTHESIA

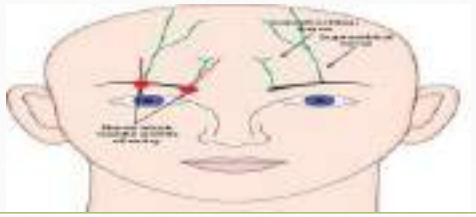
- The nerve blocks used to anesthetize the scalp are:

a) Greater Occipital Nerve Block
b) Supraorbital and Supratrochlear Nerve Block
c) Zygomatico-temporal Nerve Block
d) Auriculo-temporal Nerve Block

GREATER OCCIPITAL NERVE BLOCK



SUPRAORBITAL AND SUPRATROCHLEAR NERVE BLOCK



ZYGOMATICO-TEMPORAL NERVE BLOCK

AURICULO-TEMPORAL NERVE BLOCK

PLATELET-RICH PLASMA

- It's an autologous concentration of platelets in plasma.
- Growth factors stored in platelet-alpha granules which are released on activation are Platelet-Derived Growth Factor (PDGF), Transforming Growth Factor- Beta (TGF-β), Vascular Endothelial Growth Factor (VEGF).
- Method of Injection: Direct Intradermal injections of PRP at amount of 0.05-0.1 ml are given at each site in the interfollicular spaces at 1 cm distance.

SCALP RECONSTRUCTION- LOCAL FLAPS

- The various local flaps are:

1) Rotation Flap
2) Transposition Flap
3) Z-Plasty Flap
4) Island Flap

ROTATION FLAP

➢ Indications:

Circular defect and defects which can be converted to a triangle.

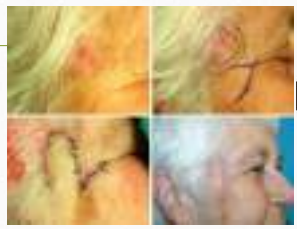
➢ Technique:

- A curvilinear incision is made, from the base of the defect, and the flap is raised in the sub-galeal plane.
- The length of the flap is designed to be at least six times the width of the defect.

- The margins of the defect are widely undermined, and, if necessary, the galea is scored to gain additional extensibility of the flap.
- Care should however be taken, not to compromise the vascular supply, by damaging the vessels that run within the galea.
- The wounds are closed in layers and a pressure dressing/drain employed as necessary.

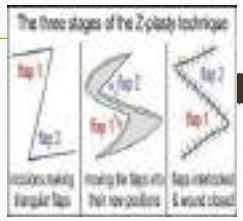
TRANSPOSITION FLAP

- Most versatile of the local flaps.
- The side of the defect becomes the leading edge of the flap.
- This flap is created so that it can be moved over the intervening tissue to the defect.
- The maximal possible arc of movement is 90 degrees.



Z-PLASTY FLAP

- The Z-plasty is a double-opposing transposition flap.



- Technique:
- The scar to be excised lies along the central limb of the Z-plasty with two peripheral limbs of equal length placed parallel to each other, at an angle of 60 degrees usually with the central limb to maximize size yet facilitate insetting.

- The resulting central limb will be perpendicular to the original scar.
- It could simplify the closure or release the tension in a wound or scar.

ISLAND FLAP

- It's a transposition flap in which the vascular supply is based on subcutaneous tissue or a definite blood vessel that allows a longer pedicle and a more extensive arc of rotation.
- A Doppler probe may be a useful tool for identifying the location of that vessel.
- The pedicle should not be too long without the inclusion of a definite vessel.

Flap based on the Superficial Temporal Artery

Source:
https://www.researchgate.net/publication/341604255_Reconstruction_of_Scalp_Defects_Using_Non-Microsurgical_Techniques

TECHNIQUE:

- Surgery was performed under general anesthesia.
- Skin incision was beveled at an angle parallel to the hair shafts to avoid a linear hairless scar.
- The flap was outlined adjacent to the defect respecting the dopplered arterial course. The pedicle was visualized and prepared.
- The venous drainage of the flap was sustained by the perivascular fascial network for the islanded STA flaps.

- A fascial extension around the artery of 2–3 cm was maintained. This could assure an adequate venous drainage through the venous network of the temporal region.
- The flap, including skin and galea, was elevated over the pericranium and moved to fill the defect without tension.
- After the ablation surgery was completed, the recipient defect was converted in a triangular area.
- The flap was outlined adjacent to the defect in rotation flaps, but also distant to the defect for transposition flaps. The shape of the rotation flap was an arc of circle, the radius being equal to the diameter of the wound.

- The main arteries were checked by Doppler ultrasonography and marked on the skin.
- The dissection was then carried through at the level of the avascular subgaleal plane. The width of the skin pedicle was 4–6 cm large at the base of the transposition flap, to preserve the superficial temporal artery and veins.
- The flap was then elevated and positioned to fill the defect. For STA islanded flap the arteries were checked by Doppler ultrasound and marked on the skin.
- The skin paddle was centered on the pedicle.

- The flap size was large enough to allow its edges to comfortably reach and inset into the defect. The length of the STA before entering the flap was calculated to reach the defect with ease.
- The skin was incised and lifted all around the flap.
- A fascial extension of 2 cm on each side around the artery was maintained. This assured an adequate venous drainage through the venous network around the STA. Care was given to free as much as possible the subcutaneous pedicle at the temporal level.
- The flap was then transferred to the defect site.

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- https://www.researchgate.net/publication/341604255_Reconstruction_of_Scalp_Defects_Using_Non-Microsurgical_Techniques

THANK YOU

Antimicrobial agents

Dr. Vaishali
Senior Lecturer
Department of Oral & MaxIlioFacial Surgery
MGDCH

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Introduction

- An antimicrobial is an agent that kills or inhibits the growth of microorganisms without harming the cells of the host. The antimicrobial agent may be a chemical compounds and physical agents. These agents interfere with the growth and reproduction of causative organisms like bacteria, fungi, parasites , virus .

Classification of antimicrobial agents

- **Drugs by susceptible organisms**
  - **Antibacterial**
  - **Antiviral**
  - **Antifungal**
  - **Antiprotozoal**
  - **Anthelmintic**

Selection Of Antimicrobial Agents

- Organisms identity and its sensitivity to particular organism
- The site of infection
- The safety of the agent
- Patient factors
- The cost of the therapy

Empiric therapy prior to organism identification

- Acutely ill patient
- Selecting a drug

Identification and sensitivity of the organism

Laboratory methods of identification

- Disk diffusion method

The effect of site of infection on therapy

- Blood brain barrier ,prostate

Status of the patient
1.Immune system
2.Renal dysfunction
3.Hepatic dysfunction
4.Poor Perfusion
5.Pregnancy
6.Lactation
7.age
Safety of the agent
Cost of therapy

Chemotherapeutic spectra

Narrow spectrum

- Agents acting on a single or limited group of microorganisms .

Extended spectrum

- Active against gram+ve and significant number of gram-ve microorganims

Broad spectrum

- Affect a wide variety of microbial species

Antibiotics

- A substance produced by which selectively suppress the growth of or kill other microorganisms at low concentrations and has the capacity to inhibit the growth of bacteria. It has a high chemotherapeutical index to reduce the active process in bacteria .

Classification of antibiotics

1. Based on chemical structures
2. Based on the sources
3. Based on mechanism of action
4. Based on spectrum of action / activity
5. Based on modes of action

1. Based on chemical structures

1. Groups of sulfonamides
- Sulfamethoxazole, sulfadiazine

2. Groups of Penicillin
- Penicillin G (Benzyl penicillin), Penicillin V, Ampicillin, amoxicillin, nafcillin

3. Groups of cephalosporin's
- cefalotin, cefazolin, cefamandole, cefuroxime,cefotaxime, ceftriaxone.

4. Groups of aminoglycosides
- streptomycin,neomycin, kanamycin, gentamycin, tobramycin

5. Groups of chloramphenicol
- chloramphenicol, tiamphenicol

6. Groups of tetracyclines
- chlortetracycline,oxytetracycline, doxycycline, minocycline

7. Groups of macrolides
- erythromycin,roxithromycin, spiramycin, azithromycin

8. Groups of polyenes
- amphotericin B, nystatin

9. Groups of Lincomycins
- lincomycin, clindamycin

10. Groups of polymixins
- Polymyxin B, Polymyxin E

II. *Based on the sources*

a. Antibiotic from microbes
- A.B. from fungi - Penicillin from P. notatum
- A.B. from bacteria
  - A.B. from eubacteria - polymyxin from bacillus polymyxa
  - A.B. from micromonosporaceae - gentamyicin from micromonospora purpurea

b. Antibiotics from algae - Usnat Acid

c. Antibiotics from higher plants - Garlisina from Allium sativum

d. Antibiotics from animals - Eritrina from hemoglobin of cow

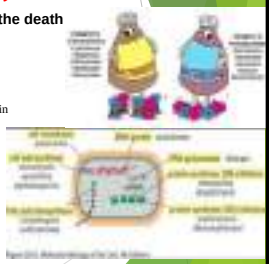
III. *Based on mechanism of action*

A. Inhibition of cell wall synthesis leads to the death of the bacteria lysis (bactericidal effect)
- penicillin, cycloserine, vancomycin, bacitracin

B. Disruption of cell membrane function
- polymyxin (polymyxin B, polymyxin E), polyenes, nystatin

C. Inhibition of protein synthesis:
- This antibiotics inhibit one of the reactions in the process of transcription

1. Inhibition of translation process of microbes



- Inhibit ribosome on the 30 S subunit
  -streptomycin, tetracyclines, netilmycin, kanamycin
- Inhibit ribosome on the 50 S subunit
  -chloramphenicol, clindamycin, lincomycin
- Inhibits the transcription process of microbes
  -Rifampin, actinomycin

D. Inhibits specific metabolic reaction
- Inhibits the enzymatic reactions
  -sulfonamides, INH, PAS, trimethoprim

IV. Based on spectrum of action

- **Broad spectrum:** Effective to Gram +, Gram - bacteria, mycoplasmas, chlamydiae, rickettsiae, sometimes protozoa
  -chloramphenicol, tetracyclines
- **Narrow spectrum:** Effective to Gram +ve / Gram -ve bacteria only
  - penicillins, cephalosporins, erythromycins, polymyxins

Antimicrobial resistance - WHO (2017)

- Antimicrobial resistance occurs when microorganisms such as bacteria, viruses, fungi and parasites change in ways that render the medications used to cure the infections they cause ineffective.
- When the microorganisms become resistant to most antimicrobials they are often referred to as "superbugs". This is a major concern because a resistant infection may kill, can spread to others, and imposes huge costs to individuals and society.

- Lack of government commitment to address these issues, poor surveillance and a diminishing arsenal of tools to diagnose, treat and prevent also hinder the control of antimicrobial drug resistance.

Some approaches to solve resistance problems

1. Reduce the usage of prophylactic antibiotics
2. Use narrow spectrum antibiotics
3. Always follow directions for use of antibiotics
4. Prescribe antibiotics based on clinical situation and not on patient's will or pharmaceutical advertisements.

- **Rational drug:** drugs given after accurate diagnosis. It will be effective with minimal side effects .

Factors involved in the usage of AB rationally, effectively and safely.

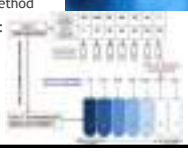
1. Accurate diagnosis
2. Accurate choices of antibiotics
3. Deliver accurate dose
4. Accurate dosing interval
5. Accurate examinations of pathophysiologic conditions of the patient

Ideal antibiotics :

- Effective even in the presence of body fluids exudate, protein or enzymes.
- Ability to reach the infected tissue, enough drug concentration during the span of a dosing interval in blood / infected area.
- Do not cause resistance
- Have a minimal toxic effects for the patient
- Safe for pregnancy and pediatric patients
- cost effective

Sensitivity tests / resistance tests

- **Qualitative** :
  - Stokes method
  - Ericcson method
  - Kirby-Bauer method
  - Comparison method
- **Quantitative** :
  - MIC

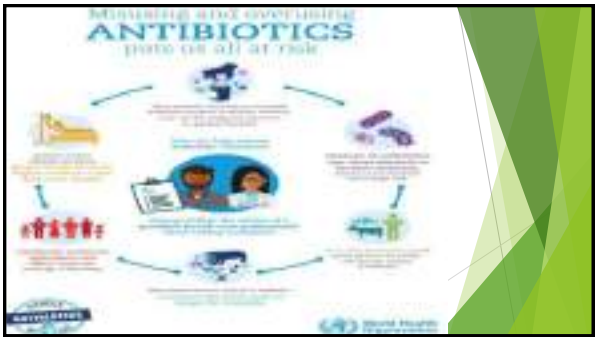


Antibiotic Combinations :

- The result may be addictive , potentiative or antagonistic
- **Addictive response :**one in which the antimicrobial effect of the combination is equal to the sum of the effects of the two drugs alone.
- **Potentiative interaction:** one in which the effect of the combination is GREATER than the sum of the effects of the individual agents.
- **Antagonistic response :** in certain cases the combination of two antibiotics may be less effective than one of the agents by itself .

Disadvantages of antibiotic combinations

- Increased risk of toxic and allergic reactions
- Possible antagonism of antimicrobial agents
- Increased risk of superinfection
- Selection of drug resistant bacteria
- Increased cost



Penicillin

- **Mechanism of action:** the drugs weaken the cell wall, causing the bacterium to take up excessive amounts of water and then rupture
- **Penicillinases (beta- lactamases)** enzymes that cleave the beta-lactam ring and thereby render penicillin and other beta-lactam antibiotics
- **Classification :**
- Narrow-spectrum (penicillinase sensitive)
- Narrow-spectrum that are penicillinase resistant (antistaphylococcal)
- Broad spectrum penicillin's (aminopenicillins)
- Extended spectrum penicillin's (antipseudomonal)

PENICILLIN G

- **ANTIMICROBIAL SPECTRUM :** active against most gram +ve bacteria, gram –ve cocci (Neisseria, meningitis) and spirochetes . With few exceptions gram –ve bacteria are resistance .
- **Therapeutic uses:**
- Pneumonia and meningitis caused by streptococcus pneumonia
- Pharyngitis caused by streptococcus pyogens
- Infectious endocarditis(streptococcus viridans)
- Gangrene , tetanus
- Syphilis (treponema pallidum)
- **Side effects and toxicities :**
- Pain at the site of infection , neurotoxicity with too high plasma levels.
  Inadvertent intra-arterial injection can produce severe reactions (gangrene,necrosis) and must be avoided .

PENICILLIN ALLERGY

- Penicillin are the most common cause of drug allergy (1-10% of the patients will experience an allergic response) there is no direct relationship between size of dose and intensity of allergic response.
- Cross sensitivity :5-10% of patients allergic to penicillin's are also allergic to cephalosporin's
- **Types of allergic reactions:**
- Immediate (occurring 2-30 min after administration)
- Accelerated (occur within 1-72 hours)
- Late reactions (days or even weeks)
- Anaphylaxis (laryngeal edema, bronchoconstriction, severe hypotension) in 0.2% of patients ,treatment – epinephrine + respiratory support .

Skin tests for penicillin allergy

Penicillin skin testing , Solensky, Franklin Adkinson Jr, Feb 2014

Management of patients with history of penicillin allergy

- Ask patients for previous history of allergy to penicillin
- If the patient refers to a positive history of allergy AVOID PENICILLIN entirely
- If the allergy is mild a CEPHALOSPORINE is appropriate as alternative.
- If the allergy is severe avoid CEPHALOSPHORINS
- For many infections VANCOMYCIN AND ERYTHROMYCIN are effective and safe .

Penicillinase-resistant Penicillin's

- Antistaphylococcol

Resistance to beta lactamases .

Acid labile : Methicillin, nafcillin, cloxacillin, dicloxacillin

Acid resistant: flucloxacillin.

- Broad spectrum penicillin's
- Aminopenicillins
- Ampicillin :(SPECTRUM: bordetella pertussis , E coli , salmonella , shigella)

Adverse effects – rashes (4-10% with ampicillin)
diarrhoea

EXTENDED SPECTRUM PENICILLINS

- Used to treat infections with Pseudomonas Aeruginosa (ie Ticarcillin)
- Penicillins combined with beta lactamase inhibitor ie Amoxicillin + clavulanic acid = Augmentin

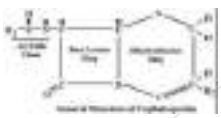
a.Carboxypenicillins : Carbenicillin, ticarcillin,

b. Aminopenicillin : Amipicillin, amoxicilllin.

c. Ureidopenicillin : Mezlocillin, piperacillin.

CEPHALOSPORINS

- Broad spectrum antibiotics with low toxicity
- mechanism of action : disruption of cell wall synthesis and consequent lysis of cell .



CEPHALOSPORINS

First generation- More active	*Second generation-*	*Third generation*	*Forth generation*
More active against gram positive organism	***more selective against gram positive and gram negative organisms***	***Highly active against gram negative organisms***	***similar antibacterial activity as that Of third generation but highly resistant to beta lactamases***
Parenteral- *Cephalothin* *Cefazolin* *Cephaloridine* ***Oral-*** *Cephalexin* *Cephadine* *Cefadroxil*	***Parenteral*** *Cefuroxime* *Cefoxitin* ***Oral*** *Cefaclor* *Cefuroxime acetyl*	***Parenteral-*** *Cefotaxim* *Ceftizoxime* *Ceftriaxone* *Cefoperazone* ***Oral*** *cefexim*	***Parenteral-*** *Cefepime* *Cefiperome*

Adverse effects

- **Allergic reactions** : rash that develops after days of treatment
  severe immediate reactions are rare.
- **Bleeding** : five cephalosporins cause bleeding tendencies
  (cefamandole , cefmentazole, cefoperazone , cefotetan and moxalactam)
  2 mechanism involved :
  -reduction in prothrombin levels and
  - impairment of platelet aggregation .
  (only with moxalactam)
- **Thrombophlebitis** : it may develop during IV infusion (>change in infusion site)
- **Pain at site of IV infusion**

IMIPENEM

- Relatively new beta-lactam antibiotic with very broad spectrum.
- Antimicrobial spectrum : highly active against gram +ve and gram-ve cocci .
- It is also the most effective beta-lactam antibiotic against anaerobic bacteria.

Pharmacokinetics

it is not absorbed from the GI tract .
IV or IM administration .

Adverse effects

(generally well tolerated)

- GI effects (nausea, vomiting , diarrhoea)
- Hypersensitivity reactions (rashes ,pruritus)
- Superinfections with bacteria or fungi develop in about 4%of patients .
- Rarely seizures have occurred

Bacteriostatic Inhibitors Of Protein Synthesis

- ***Aminoglycosides***
- ***MLSK*** *(Macrolides, Lincosamides, Streptogramins, Ketolides)*
- ***Tetracyclines***
- ***Glycylcyclines***
- ***Phenicols***
- ***Ansamycins***

INSTRUMENTS USED IN ORAL & MAXILLOFACIAL SURGERY

Dr. Vaishali Jamdade
Senior Lecturer
Department of Oral & MaxilloFacial Surgery
MGDCH

Aseptic technique

- it is necessary to sterilize and keep sterile all instruments,

material supplies that come in contact with the surgical site.

- Every item handled by the surgeon and the surgeon's assistants must be sterile

- The patient's skin and the hands of the members of the surgical team must be thoroughly scrubbed, prepared, and kept as aseptic as possible.

Donning of glove

Instruments used in Maxillofacial Surgery

- Instruments for wash down (Disinfection)
- Instruments for surgical draping (isolation of surgical field)
- Instruments for cutting
- Instruments for retraction
- Instruments for hemostasis
- Instruments for tissue holding
- Instruments for scraping (curettage)
- Instruments for bone surgery
- Instruments for suturing
- Instruments for dressing
- Instruments for cleft surgery
- Instruments for exodontia
- Instruments for anesthesia

Instruments for wash down (Disinfection)

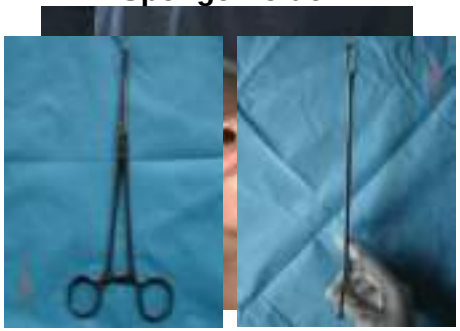
- Sponge forcep or holder
- Gallipot *a small glazed pot used by apothecaries for medicines*,
- Kidney tray

- After the patient is anesthetized and positioned on the operating room table, the preoperative skin prep is done by the surgeon, assistant surgeon, or circulator.
- This means the skin of the operative site and an extensive area round the site is mechanically cleansed again with an antiseptic solution prior to draping.
- A sterile skin prep tray is opened on the prep table.
- Usually, the prep tray is disposable, but the prep tray always contains two or more towels, small basin for solutions, sponges (these sponges must not be confused with the counted sponges on the instrument tray), and applicators.

Sponge Holder

Scrubs with a circular, ever-widening motion

Sponge Holder



Instruments for surgical draping

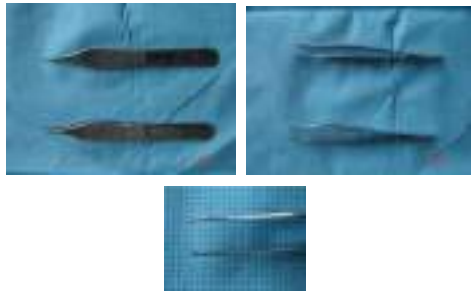
- Towel clips
  - Spring type
  - Lock type
  - Surgical Towels
  - square towel
  - split towel
  - draw sheets

Towel Clips

Spring Type Lock Type

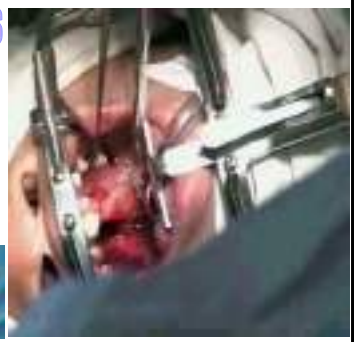
Suction Tip

Sterile Draping secured with tower clips



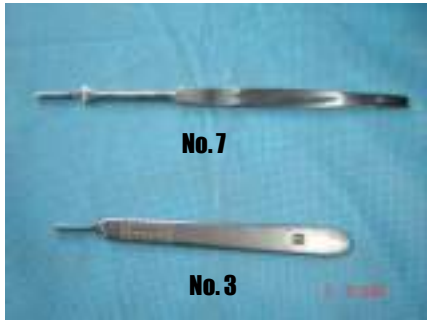
Adson's Tissue Forceps (Tooth & Non-tooth)

Tissue forceps

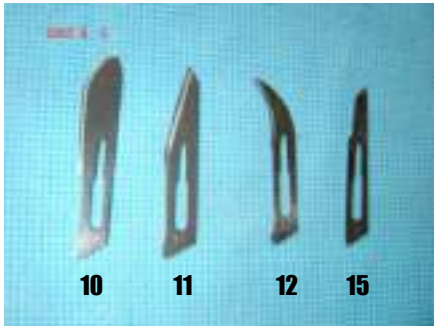


Instruments for cutting

- Scapel *A knife used in surgical dissection.*
- Blade holder *(Bard Parker Handle)*
- Detachable surgical blade
- Disposable or Single Use Scapel
- Lancet *A surgical knife with a short, wide, sharp-pointed, two-edged blade*.

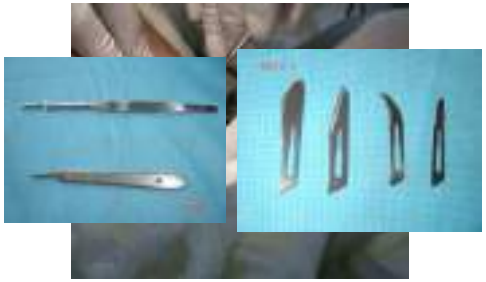


Bard-Parker Blade Holder



Surgical Blades

Blade Holder and Scapels



Instruments for cutting

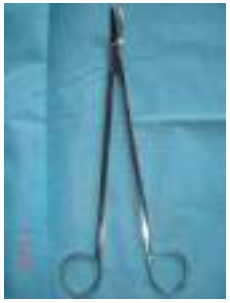
- Scissors
  - Tissue scissors
  - Suture scissors
  - Dressing scissors
  - Serrated scissors
  - Heavy scissors
  - Pointed
  - Round
  - Curved
  - straight

Mc Indoe's Tissue Scissors

Mc Indoe's Tissue Scissors

Dressing Scissors

Suture Scissors



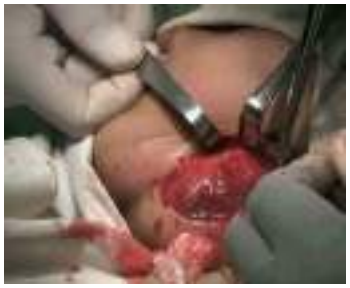
Flat on End Serrated Gum Scissors

Instruments for retraction

- Retractors
  - *An instrument for drawing aside the edges of a wound or for holding back structures adjacent to the operative field.*

Skin Hook

Retractors



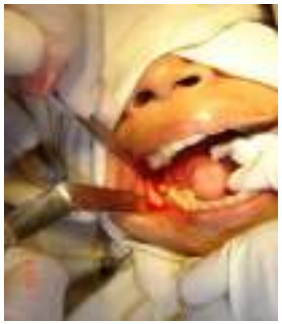
Scissors

Hernia Retractor

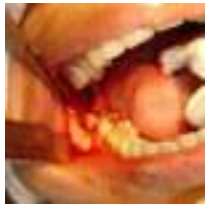
Prong Retractor

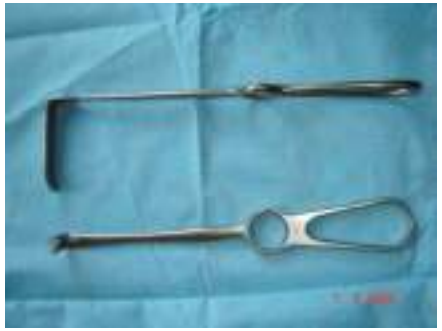
Austin's Retractor

Tongue Depressor



Austin's Retractor
Periosteal Elevator





Langenbeck's Retractors

Skin Hook

Nasal Hook

Tissue Holding Instruments

- Forceps *An instrument for seizing a structure, and making compression or traction. Cf. clamp.*
- Tissue Forceps
- Dissecting Forceps
- Tweezers
- *An instrument with pincers that are squeezed together to grasp or extract fine structures.*

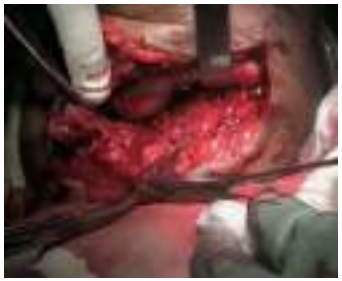
Gillie's Dissecting Forceps (Tooth & Non-tooth)

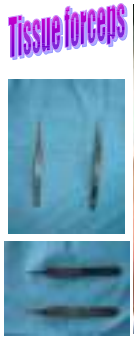
Allis's Tissue Forcep

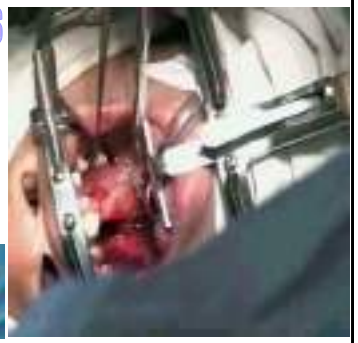
Instruments for hemostasis

- Artery forceps
  - straight
  - curved
  - Mosquito
- *a small hemostat, straight or curved, with or without teeth; used to hold delicate tissue or for hemostasis. mosquito forceps. Also known as mosquito clamp*

Artery Forcep







- Serration = artery forcep
- Rasp like surface
- Groove

- Needle holder

Bone Instruments

- Periosteal Elevator & Raspatory
- Bone Cutter
- Bone Holder
- Bone Curette
- Bone File
- Bone Chisel
- Osteotome
- Bone saw

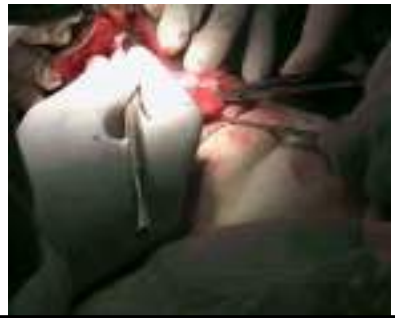
Periosteal Elevator

Howarth Periosteal Elevator

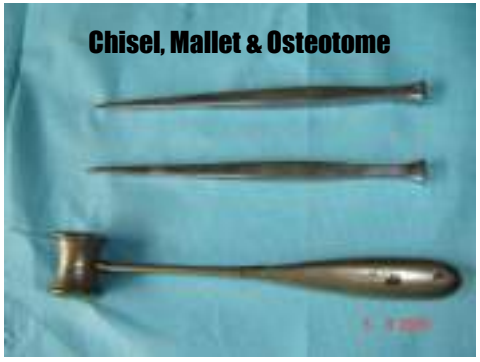
Raspatory

Plastic Instrument

Periosteal elevator



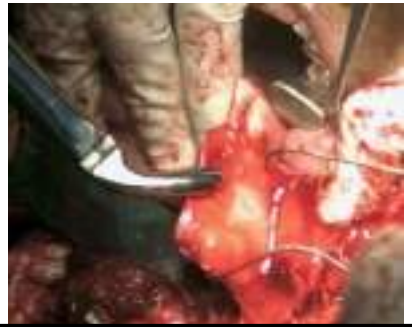
Chisel, Mallet & Osteotome



Chisel

Osteotome

Bone Holding

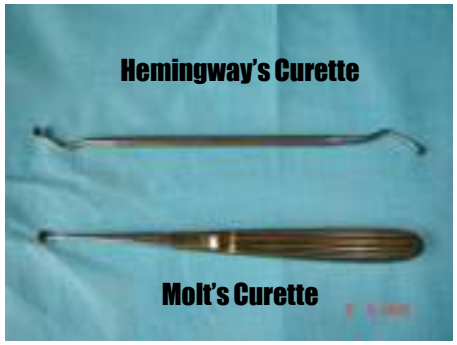


Gigli's Saw

Bone File

Alveolectomy File

Williger's Curette



INSTRUMENTS USED IN ORAL & MAXILLOFACIAL SURGERY

Dr. Vaishali Jamdade
Senior Lecturer
Department of Oral & MaxilloFacial Surgery
MGDCH

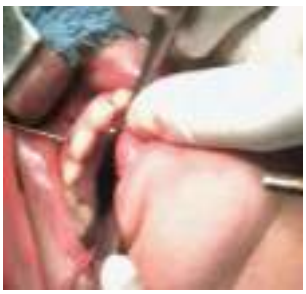
Special Instruments

- Instruments for circumferential wiring
- Instruments for nasal bone fracture
- Instruments for Malar complex fracture

Wire Cutter

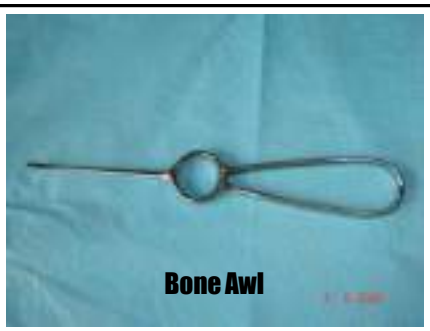
Wire Twister (Spancer Well Artery Forcep)

Wire Twister



Wire Cutter

Tongue Depressor



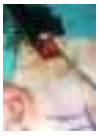
Bone Awl

Ash Forcep

Walsham Forcep

- Rowe's elevator
- Howarth's raspatory
- Artery forcep
- 15 blade and handle

Gillies Temporal Approach

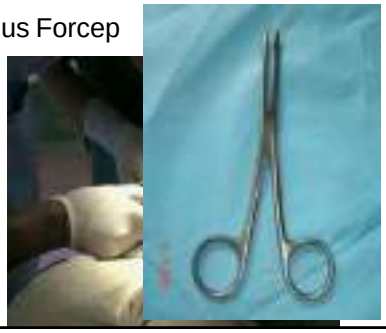


Instruments for I&D

- Sinus forcep
- Blade (# 11 - # 12)and Blade holder
- Curette
- Drainage tubes
- Kidney tray

Sinus Forcep

Sinus Forcep



Instruments for suturing

- Needle holders
- Dissecting forcep
- Suture scissors

Mayo Halsted's Needle Holder

Gillie's Needle Holder

Gillie's Dissecting Forceps (Tooth & Non-tooth)

Root elevators

- Straight
- Curved
- Apex elevator
- Root tip pick

Coupland's Elevator Bein's Elevator

Winter's Exolever

Warwick Jame's Elevator

Irrigation Syringe

Instruments for cleft surgery

- Calibrator
- Marking ink and pencil
- Dingmann mouth gag
- Fine skin hook

Calibrator

Dingman's Mouth Gag

Dingmann's Mouth Gag

Instruments for anesthesia

- Anesthetic face masks
- Laryngoscope
- Laryngeal forcep
- Endotracheal tubes
- Guedel airways
- Nasopharyngeal airways
- Throat packs
- Mouth gags and props

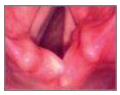
Face Mask

Laryngoscope

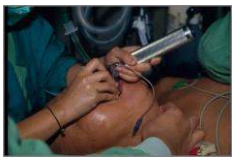
Orotracheal
Tube
RAE tube

Nasotracheal Tube

Endotracheal tube intubation:



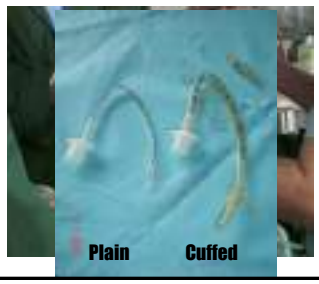
Vocal cord



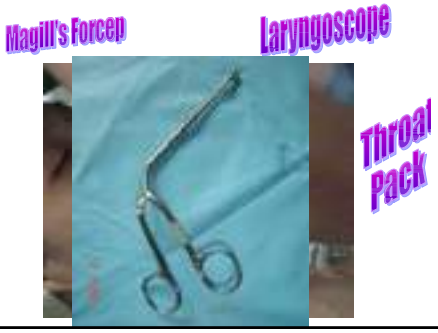
Lift forward & upward
Sellick maneuver
Length: 19~23cm
Cuff
Check position: stethoscope, CXR

Laryngoscope and Orotracheal tube

Orotracheal Intubation



Magill's
Forcep

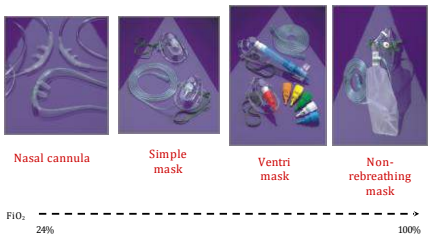


Fergusson's Mouth Gag

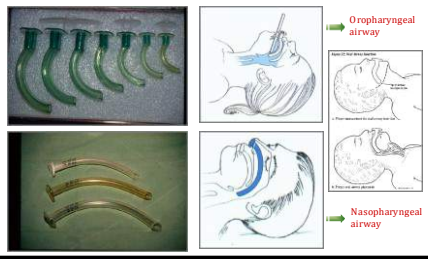
Mouth Gag

Mushin's Mouth Prop

Oxygen therapy:



Airways:



"BONE INJURY AND REPAIR"

Dr. Vaishali
Senior Lecturer
Department of Oral & MaxilloFacial Surgery
MGDCH

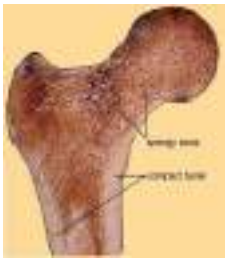
"Contents"

"BONE"

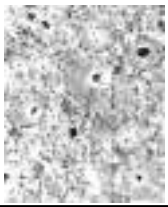
- Bone is unique structure
- It's the major reservoir of calcium and support the human frame.
- Despite of its strength its very light – only one tenth of the total body weight.
- Although it can resist axial stresses it is limited in its ability to resist rotational forces.
- BONE : FLAT
  : TUBULAR
- Bone and the liver are the only organs capable of undergoing spontaneous regeneration , with restoration of lost structure.

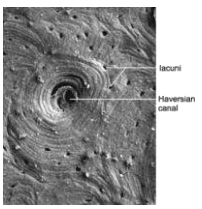
"Bone structure"

- Fibrous sheet periosteum covers the bone.
  Periosteum- outer fibrous layer
  -inner cambium layer .
  Endosteum– inner portion of the cortical bone
- **Compact bone** forms the outer shell of all bone .
- **Spongy bone** fills bones.



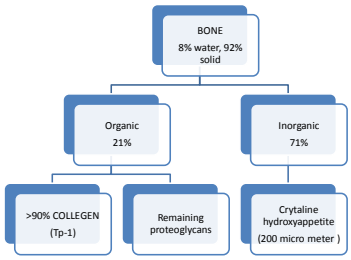
- **Compact or cortical bone**, is made up of many rod-like units called Osteons or Haversian systems which run longitudinally within the bone.
- Haversian systems
  central Haversian canal
  carries blood and thus nutrition
- The surronding lamellae has lacunae - each containing osteocyte.





- **Spongy or cancellous bone** consists of a lattice of thin threads of bone called trabeculae and is less dense than compact bone.
- The orientation of the trabeculae is affected by the mechanical stress to which the bone is exposed .

"Bone composition"



Organic matrix

- Osteoid is the unmineralized organic matrix secreted by osteoblasts.
- 90% type I collagen
  - two alpha 1 chain and one alpha 3 chain
- 10% ground substance, which consists of noncollagenous proteins, glycoproteins, proteoglycans, peptides, carbohydrates, and lipids.
- In *secondary bone healing - type 2 collagen* is predominantly seen which suggests endochondral bone formation(callus formation).
- Whereas in *primary bone healing (rigid fixation) - type 1 collagen* is seen which suggest healing without callus formation

Inorganic matrix

- Consists primarily of calcium phosphate and calcium carbonate, with small quantities of magnesium, fluoride, and sodium.
- The mineral crystals form hydroxyapatite, which precipitates in an orderly arrangement around the collagen fibers of the osteoid.
- Size- 25 to 75 nm in dia and 200 nm in length. This accounts for very large surface to volume ratio.
- The initial calcification of osteoid typically occurs within a few days of secretion but is completed over the course of several months.

There are four types of bone cell:

- **Osteoprogenitor cells**
- **Osteoblasts**
- **Osteocytes**
- **Osteoclasts**

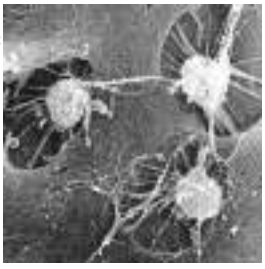
Bone tissue is formed by osteo**blasts**, maintained by osteo**cytes** and broken down by osteo**clasts**.

Osteoprogenitor cells

- Osteoprogenitor cells are the precursors of osteoblasts and osteocytes.
- They are unspecialised cells derived from mesenchyme, they can divide mitotically.
- They are found on all bone surfaces.

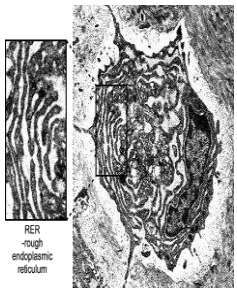
Osteocytes

- Osteocytes are found within the bone matrix and they function to maintain the surrounding bone tissue, dealing with the metabolic requirements, waste products, mineral homeostasis etc.
- They are mature, quiescent (resting) bone cells trapped within the bone matrix.
- They are in a compartment called a 'lacuna' and communicate with neighboring osteocytes through fine processes (links) which run through tubes known as 'cannaliculi'.



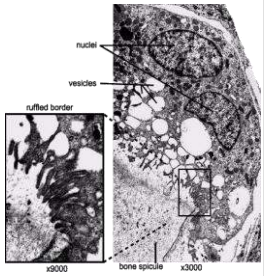
Osteoblasts

- Osteoblasts are bone forming cells, they secrete the organic component of the bone matrix. They are found on all bone surfaces and are enlarged and active at all sites of bone growth and repair.
- The osteoblast/early osteocyte pictured right is surrounded by uncalcified bone matrix (osteoid), the cell is in transition from an osteoblast into an osteocyte.



Osteoclasts

- Osteoclasts are derived from a type of bone marrow cell. They are multi nucleate cells which vary greatly in size. They are involved in the mobilisation of calcium and the destruction of the bone matrix.
- Osteoclasts are found on bone surfaces and are important in the normal growth, maintenance and repair of bone.
- Howship lacunae , ruffled border.



"Biophysical properties"

- Cortical bone is stiffer than cancellous bone:
  bone can bear stress>strain
- The contraction of muscles attached to the loaded bone alters distribution of stress placed on the bone by producing counter compressive forces .
- Fractures occurs on the surface that is under the most tension.
- Energy storage capacity of the bone
  - high speed of loading- bone fracture+ soft tissue damage.
  - low speed of loading- single fracture line
- At a high loading speed , energy doesn't dissipate rapidly through single break thus comminuted fracture with extensive soft tissue damage occurs.

The force required to fracture various facial bones maybe classified

- High impact
  - Supraorbital rim: 400 Kg
  - Symphysis mandible: 250 Kg
  - Frontal-glabellar: 300 Kg
  - Angle of mandible: 200 Kg
- Low impact
  - Zygoma: 130 Kg
  - Nasal bone: 80 Kg

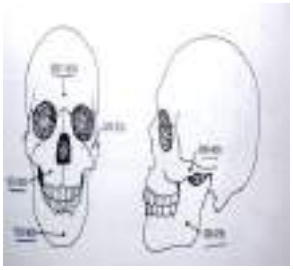


Fig: Force required (in pounds) for various facial bones fractures.

"Fracture healing"

- Force of trauma > strength of bone= fracture.
- Unlike other tissues bone heals by regeneration.
- The physical structure of bone allows it to regain its preinjury strength and function.
- As in soft tissue bone can heal by primary as well as secondary intention .

✓ SECONDARY – spontaneous healing without surgical intervention

✓ PRIMARY – excellent anatomic reduction, minimal or no mobility and good vascular supply.

Secondary healing in soft tissue versus bone :

In soft tissue -results in scar(less functional)

In bone - through adaptation and remodelling : form and function similar to preinjury bone.

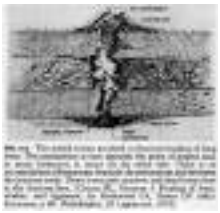
"Secondary bone repair"

- Spontaneous healing without surgical intervention.
- An intermediate fibrous tissue is formed.

There are four stages:

- Initial stage
- Cartilaginous callus
- Bony callus
- Remodeling .

Initial stage



Hypoxia & cellular death

↓

Aseptic Necrosis of # bone ends

↓

Inflammation & edema

↓

Release of vasoactive angiogenic pyrogens

↓

Vasodilatation------ hematoma

↓

Clot is invaded by variety of blood borne elements which contribute to healing

Initiation of Cellular proliferation from periosteum – osteoblasts & fibroblasts & cells with osteogenic potential Within 8-12hrs

↓

Capillary ingrowth begins andFibroblasts lay down collagen.

↓

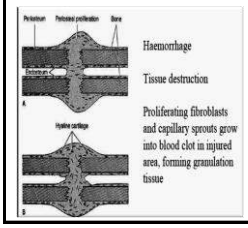
Combination of collagen & capillary network --- "granulation tissue"

↓

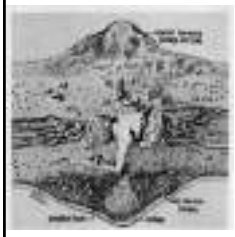
Low pH & low O2 tension & mobility

↓

HYALINE CARTILAGE



Cartilaginous callus formation



Both externally & internally

Externally

↓

Nodules of cartilage are separated by fibrous septa

↓

As Blood vessels increases through septa , hypoxemia is reversed

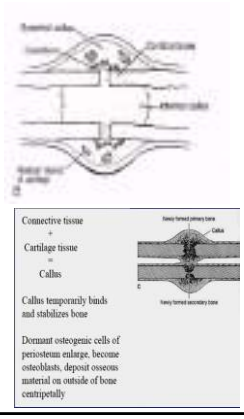
↓

Two changes occur:

↓

✓ Calcification of cartilage- trapping chondroblasts & converting to chondrocytes

✓ osteoblasts increases in no. & osteoclasts appears



Internal callus

↓

B/w the bone ends: good blood supply so less necrosis.

↓

No intermediate fibrocartilage.

↓

Directly Internal bony callus

↓

A cuff around # site

↓

Callus increase in size

↓

Increase in stability & stiffness

Hard callus formation

Increase O2 & nutrients

↓

Formation of osteoblasts

↓

Deposit osteiod on spicules of calcified cartilage

↓

Woven bone(randomly arranged)

↓

Lamellar bone

Remodeling

- Slow process
- Wolff's law: change in functional state of bone causes structural or architectural changes in the tissue through bioelectric field production.
- Osteoclasts - remodeling – resorption of bone
- Various factors are released: bone morphogenic protein & collagenase-resistant glycoprotein.
- BMP induces differentiation of mesenchymal cells towards bone formation
- Woven bone is converted to lamellar bone

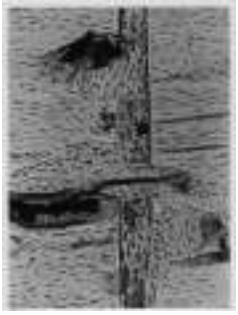
"Primary bone repair"

- Occurs when enough rigidity & anatomic reduction exist as in rigid fixation
- Schenk and Willenegger(1979)* : first to observe the histologic features of primary bone healing.
- Primary bone healing occurs in 2 ways:

1) Gap healing
2) Contact healing

Gap healing

- Even with rigid fixation some gap exists b/w fractured segments under the deforming forces produced by muscle pull and function.
- Blood vessels from periosteum, endosteum or haversian canals invade gaps, bringing mesenchymal osteoblastic precursors.
- Bone is deposited directly without intermediate cartilage formation.

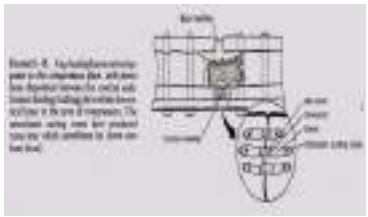


- If gap
  - < 0.3mm : lamellar bone forms directly.
  - 0.3mm – 0.5mm to 1mm : woven bone , lamellar bone is formed subsequently in appx 6 weeks.
- Bundles of lamellar bone are oriented at right angle to long axis of bone
- Over months remodeling leads to change in direction of bundles to reorient them along long axis of repaired bone.

Contact healing

- Inter fragmentary gap in zero
- Occurs through formation of a bone metabolizing unit (BMU) or BRU
- Histologically BMU : group of osteoclasts followed by vessels & cells which differentiate into osteoblasts, form new bone.
- Osteoclasts – cut away cores on either side of fracture @50-80-microm/day (cutting cones)
- Core of 200 microm dia – pathway for vessels ingrowth & osteoblastic proliferation.
- Osteon forms at rate of 1-2microm/d

- This lag produces porosity in compact bone visible radio graphically till 3months.
- Complete reconstruction of cortical bone takes 6month thus device must maintain stability for time



"Complication"

Non union

- Failure of hematoma to transform into osteogenic matrix– converted into non osteogenic fibrous tissue.
- Identified by mobility in all planes after an interval of 10 weeks.

Etiology:

- Inadequate reduction: muscle pull
  : soft tissue entrapment
- Inadequate fixation: lead to excessive motion/mobility

- Vascularity
- Systemic factors:
  - ✓ Deficiency in vit C & D
  - ✓ Anemia
  - ✓ Aging
  - ✓ Diabetes
  - ✓ Corticosteroids

Goodship and Kenwright (1985)observed stimulation of osteogeneosis in intact bones exposed to intermittent deforming forces.The callus tissue is thought to be a function of bioelectric potential that are generated with in the bone and stimulate osteoblastic production and activity.

– micromovements accelerates bone healing.

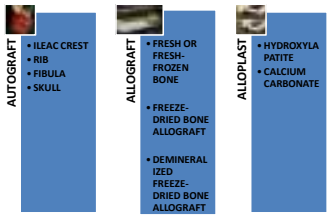
Infection	Diabetes	Corticosteroids
Osteomylitis	Increased healing time (2-3 times the normal rate) thus increased complications (delayed union, non-union, etc)	Antagonize action of vit D on the gut & reduce absorption of calcium
Change in pH	Delay in the expression of growth factors with a histologic delay in the progression of chondrogenesis.	In large doses— prolonged period – interfere with development of cartilage
Entering bacteria, lysosomal enzymes from polymorphonuclear cells		Continuous resorption -- osteoporosis

"Healing of bone graft"

- Graft healing and subsequent bone formation occurs in either of 3 ways:
- Osteogenesis – graft itself supplies viable osteo blasts to form new bone – eg :Auto graft
- Osteoinduction – graft stimulates surrounding tissue osteoblasts to form new bone. It is the process of differentiation of stem cells in osteo progenitor cells – e.g.: Autograft.
- Osteoconduction – undifferentiated mesenchymal cells invade the graft followed by formation of cartilage and subsequent ossification.- e.g.: Allografs

Properties of various types of bone graft sources

	Osteoconductive	Osteoinductive	Osteogenic
Alloplast	+	-	-
Xenograft	+	-	-
Allograft	+	+/-	-
Autograft	+	+	+



"Healing in distraction osteogenesis"

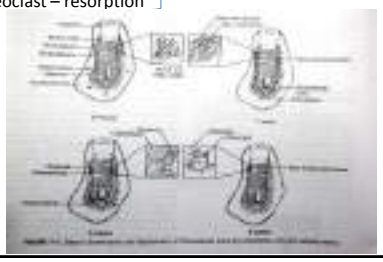
- Osteogenesis associated with distraction occurs primarily by recruitment and differentiation of primitive mesenchymal cells.
- Vascular response- mesenchymal cells- Type 1 collagen.
- Fibro vascular bridge is formed- collagen fibrils increase in density-orient along the axis or vector of distraction.
- Mineralization appears at days 10 -14 at the edges, central zone- fibrous.
- Bony spicules eventually replace collagen bundles

- Latency phase: 5- 7 days
- Activation phase: @ 1 mm per day
- Consolidation phase: app. 8 weeks.

"Osseointegration of an implant"

- At the implant bone interface , the microthrombi – granulation tissue – invaded by osteogenic cells.
- Osteoblast- formation
- Osteoclast – resorption

Osseointegration of Implant



"Healing of extraction socket"

Socket heals by secondary intention.

Events in 1st week

- When a tooth is removed ,socket fills with blood which coagulates to seal it from oral environment- clot formation.
- Inflammation & clearance of debris such as bone fragments.
- Fibroplasia also begins during first week.
- Epithelium migrates until it meets epithelium from other side or it finds a bed of granulation tissue.
- Osteoclasts accumulate along the crestal bone

2nd week

- Osteoid deposition along alveolar bone lining
- Epithelium may be fully intact

3rd & 4th week

- Epithelisation of most socket being complete .
- Resorption of cortical bone from crest and wall of socket.

4-6 months,

- Complete resorption of cortical bone lining.
- Epithelium moves toward the crest as bone fills socket. eventually becoming level with adjacent crestal gingiva.
- Radiographically loss of distinct lamina dura .

"Newer methods"

- Electrical stimulation of # healing
  - Electropositive at tension side & electronegative at compressed side
  - Bone formed at compressed side
  - Successful in non healing cases.
- Nature Healing Matrix
- Healing with PEMF treatment
- Ultrasound

"Natures healing matrix"*

- Collagen and fibrin to stimulate tissue growth in bone injuries
- Synthetic materials provide enough strength to remain in the injury site but are limited in their ability to promote healing. Biological materials are too weak to stay for the duration of the healing process.
- **Gelrin** –a combination of natural and synthetic molecules.
  used a protein called **fibrinogen**, the protein in blood plasma responsible for clotting , attached a synthetic material called **polyethylene glycol**, a plastic used in contact lenses and other biomedical applications.
- Gelrin can be adjusted to different strengths and degradation rates according to its intended application

*From Dr. Dror Seliktar, Senior lecture in the Biomedical engineering, received award for excellence in 2005. (Technion focus 2006)

"Healing with PEMF treatment"

- PEMF (pulsed electro-magnetic field) bone growth stimulation is a safe
- Results supports the use of PEMF to improve tissue response to implanted biomaterials (under study)

Journal of biomedical materials research part a , Vol 64 A ,Issue 1 , Pages 182-188

"Ultrasound"

In the past decades, low-intensity ultrasound treatment has been shown to reduce the healing time of fresh fractures of the extremities and to heal delayed and non-unions

Based on the assumption the potential of ultrasound to stimulate maxillofacial bone healing was investigated.

Although limited evidence* is available to support the susceptibility of maxillofacial bone to the ultrasound signal, ultrasound may be of value in the treatment of

- ✓ delayed unions,
- ✓ in callus maturation after distraction
- ✓ in the treatment of osteoradionecrosis.

CROBM (Critical Review In Oral Biology And Medicine)January 2003 Vol. 14 no. 1 63-74

"BMP binding peptide"

- Recombinant human BMP (rh BMP) helps in healing of bone through various modulators .
- It helps in :
  - ➢ Healing of the fractured site
  - ➢ in compromised surgical reconstructions#
- Through its effect on other bone inducing substances*

*Journal of Orthopaedic Research Vol 23 Issue 1 Jan 2005 Pages 175 -180
Journal of Cranio-maxillofacial Sx, Vol 22 Issue 1, February 1994, Pages 2-11

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DEPARTMENT OF ORAL & MAXILLOFACIAL SURGERY

DRY SOCKET

Dr. Vaishali
Senior Lecturer
Department of Oral & MaxilloFacial Surgery
MGDCH

Inclusions -

- Abstract
- Introduction
- Definition
- Signs & symptoms
- Incidence
- Onset and durarion
- Etiology
- Pathogenesis
- Prophylactic management
- Symptomatic management
- Discussion

Abstract -

"DRY SOCKET" is one of the most common complication that occurs after extraction of tooth. The main objective of this paper is to -

- *Harmonize descriptive definitions.*
- *Discuss the etiology and pathogenesis of dry socket.*
- *The need for identification and elimination of risk factors.*
- *The preventive and symptomatic management of the condition.*

Synonyms -

1. *Alveolar ostitis(AO)*
2. *Localized osteitis*
3. *Postoperative alveolitis*
4. *Alveolalgia*
5. *Alveolitis sicca dolorosa*
6. *Septic socket*
7. *Necrotic socket*
8. *Localized osteomyelitis*
9. *Fibrinolytic alveolitis*

Introduction -

- *One of the most common post operative complications following the extraction of permanent teeth is a condition known as "DRY SOCKET".*
- *This term has been used in the literature since 1896, when it was first described by "CRAWFORD".*
- *"FIBRINOLYTIC ALVEOLITIS" is the most accurate of all the terms of dry socket, but is also the least used in the literature.*
- *In most cases, the more generic lay term "dry socket" tends to be used.*

Definition -

A descriptive definition that could be used universally as a standardized definition for dry socket :

- *post operative pain in and around the extraction site , which increases in*
- *Severity at any time between 1 and 3 days after the extraction*
- *Accompanied by a partially or totally disintegrated blood clot within*
- *the alveolar socket with or without halitosis.*

Signs & Symptoms -

1. The denuded alveolar bare bone may be painful and tender.
2. Some patients may also complain of 'intense continuous pain' irradiating to the ipsilateral ear ,temporal region or the eye.
3. Regional lymphadenopathy (occasionally)
4. Unpleasant taste (occasionally)
5. Trismus is a rare occurrence in mandibular third molar extractions
   probably due to lengthy and traumatic surgery.

Incidence -

- 3-4% following routine dental extractions
- 1% to 45% after the removal of mandibular third molars.
- 25-30% after the removal of impacted mandibular third molars.
- Occurs 10 times more frequently following the removal of 3rd molars than from all other locations.

Onset & duration -

Mostly 1-3 days after tooth extraction.

Within a week in 95 %and 100% of all cases of dry socket.

The duration of dry socket varies to some degree, depending on the severity of the disease, but it usually ranges from 5-1o days.

Etiology -

Multifactorial origin

1. Oral micro-organisms
2. Difficulty & trauma during surgery
3. Roots or bone fragments remaining in the wound
4. Excessive irrigation or curettage of the alveolus after extraction.
5. Physical dislodgement of the clot
6. Local blood perfusion & anesthesia
7. Oral contraceptives
8. Smoking

Oral micro-organisms -

Increased frequency of dry socket in patients with
1, Poor oral hygiene
2, Pre-existing local infection such as pericoronitis and advanced periodontal disease

Reduced incidence of dry socket in conjunction with anti bacterial measures.

Presence of large number of bacilli & Vincent's spirochete was introduced by SCHROFF & BARTEL in 1929.

Difficulty & trauma during surgery -

Surgical extraction that involve the reflection of a flap and sectioning of the tooth with some degree of bone removal
Less experienced surgeons
Excessive trauma results in delayed wound healing-
1, Compression of bone lining the socket
2, Thrombosis of the underlying vessels
3, Trauma with a reduction in tissue resistance and consequent wound.

Roots & bone fragments remaining in the wound -

Logical that fragments and debris remnants could lead to disturbed wound healing.

Excessive irrigation & curettage -

Energetic repeated irrigation of the alveolus might interfere with clot formation and give rise to infection.

Violent curettage might injure the alveolar bone

Local blood perfusion & anesthesia -

The vasoconstrictors in local anesthetic solutions have been suggested as alternative factors in the pathogenesis of dry socket.

Patients who requires repeated injections of local anesthetic solutions may have a reduced pain threshold, which may account for complaints of pain originating from the extraction socket.

Increase in incidence of dry socket when periodontal intraligamental injections were used rather than block or infiltration injections.

Oral contraceptives -

It has been proposed that "estrogen" like pyrogens present in the contraceptive pills will ACTIVATE THE FIBRINOLYTIC SYSTEM INDIRECTLY.

CATERANI et all : the propability of dry socket increases with increased estrogen dose in the oral contraceptives and that fibrinolytic activity appears to be lowest on days 23 through 28 of the menstrual cycle.

Smoking -

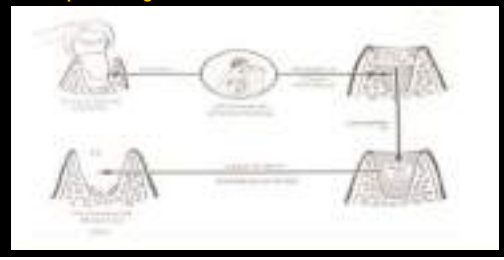
Total of 400 surgically removed mandibular 3rd molars, those who smoked a half pack of cigarettes per day

A four- to five – fold increase in dry socket (12 vs 2.6 %) compared to non – smoking patients

Incidence of dry socket is > 40 % among patients who smoked on the day of surgery or on the first post operative day.

Pathogenesis -

Partial or complete lysis and destruction of the blood clot was caused by tissue kinases liberated during inflammation by a direct or indirect activation of plasminogen in the blood.



Causes of pain -

Presence and formation of 'kinin' locally in the socket .

Kinins activates the primary afferent nerves, which may have already been presensitized by other inflammatory mediators and algogenic substances (even in concentrations as low as 1 ng/ml)

Factors influencing the healing

1. Infection
2. Size of wound
3. Blood supply
4. Resting of part
5. Foreign bodies
6. General condition of the patient

Prophylactic management -

With references in the literature correlating to the prevention of dry socket can be divided into

1. Non- pharmacological and
2. Pharmacological preventive measures.

Non- pharmacological measures -

1. Use of good quality current preoperative radiographs.
2. Careful planning of surgery.
3. Use of good surgical principles.
4. Extractions should be performed with minimum amount of trauma and maximum amount of care.
5. Confirm presence of blood clot subsequent to extraction.

6. Preoperative oral hygiene measures.

7. Encourage the patient to stop/limit smoking in immediate postoperative period.

8.Avoid vigorous mouth rinsing for the first 24 hours of post extraction

9.For patients taking oral contraceptives extractions should ideally be performed during days 23 through 28 of menstrual cycle.

10.Comprehensive pre and post operative verbal instructions should be given.

Pharmacological measures -

1. Anti- bacterial agents
2. Anti- septic agents and lavages
3. Anti- fibrinolytic agents
4. Steroidal anti- inflammatory agents
5. Obtundent dressings
6. Clot supporting agents

Anti-bacterial agents -

Prophylactic antibacterials, either given systemically or used locally.
Systemic anti bacterials – penicillin
clindamycin
erythromycin
metronidazole

Preoperative administration of antibacterial agents is more effective.

A significantly reduced incidence of dry socket following light socket irrigation with Betadine & topical application of Clindamycin in Gelfoam.

Anti septic & lavage -

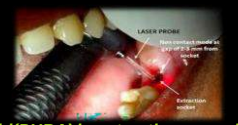
Chlorhaxidine (CHX) is a bisdiguanide antiseptic with anti microbial properties.

USE OF WHITEHEAD'S VARNISH:
Whitehead's varnish is a combination of 'iodoform, balsam tolutan, styrax liquid I a base liquid.

RESULT: Significant decrease in incidence of postoperative pain. Haemorrhage and swelling.

Alvogyl

Has been widely used in the management of dry socket and is frequently mentioned in the literature.



It contains: butamben(anesthetic)
eugenol(analgesic)
iodophorm(antimicrobial)

Topical use of 'para-hydroxybenzoic acid(PHBA) in extraction wounds as Anti-fibrinolytic agents.

Apernyl- an alveolar cone with formulation of
32 mg acetylsalicylic acid
3mg propyl ester of PHBA
20 mg unknown tablet mass

Steroid anti-inflammatory agents -

Topical use of corticosteroids in the prevention of dry socket –
decreases immediate post – operative complications
failed to reduce the occurrence of dry socket

Obtundent dressings -

Immediate placement of eugenol containing dressing into the extraction socket is beneficial in the prevention of post extraction complication.

Use of clot supporting agents such as 'polylactic acid(PLA)' was widely promoted as ultimate solution for preventing dry socket.

Non-dressing management

1. Remove any suture to allow adequate exposure of extraction site.
2. Irrigate the socket with isotonic saline gently,careful suctioning of all excess irrigation.
3. Do not attempt to curette the socket.
4. Prescription of potent oral analgesics.
5. Patient is given with a 'plastic syringe with curved tip for home irrigation' with chlorhexidine solution.

Surgical management

- Under block anesthesia
- Sharp margins were trimmed, rounded
- Any foreign bodies present were thoroughly removed
- Detached gingival margins are also scraped.
- Desired medications as well as precautions
- Patients was not only without pain but was also comfortable both physically as well as psychologically from the very next day.

Conclusion

Evidence suggests that it is most particularly related to a complex interaction between excessive localized trauma , bacterial invasion and their association to plasmin and subsequently , the fibrinolytic system.

AT FIRST DO NO HARM

- Hippocrates

Prevention of dry socket entails reducing the number of possible risk factors, meticulous attention to procedural details and surgical skills.

HAEMORRHAGE AND ITS MANAGEMENT IN ORAL AND MAXILLOFACIAL SURGERY

Dr. Vaishali
Senior Lecturer
Department of Oral & MAxilloFacial Surgery
MGDCH

- Hemorrhage (Hemo + rrhage) denotes the escape of blood from a blood vessel.
- The word hemorrhage is synonymous with bleeding.
- Any damage to the vasculature leads to outflow of blood.
- Blood carries oxygen and nutrients to the tissues and is vital for body functions. Loss of blood due to any reason beyond a certain point is potentially life threatening and may lead to exsanguination.

- **Types of Hemorrhage**
- *Depending on the Type of Blood Vessel Involved*
- Depending on the type of blood vessel involved, hemorrhage can be arterial, venous or capillary.
- 1. *In arterial hemorrhage there is bleeding from a ruptured* artery. Arterial bleeding is pulsatile, brisk and bright red in color.
- 2. Loss of blood from a vein is known as *venous hemorrhage. Bleeding from veins is dark in color and blood flows in an even stream.*

- Oozing from the capillaries is known as *capillary hemorrhage.*
- *In capillary hemorrhage, blood oozes* from the area and no bleeding point can be made out.
- The blood is bluish bright red in color as compared to arterial and venous blood.
- Bleeding is not severe and is easily controlled by simple pressure with gauze pads.
- In coagulation disorders, there can be extensive blood loss from capillaries.

- *Primary, Reactionary, Intermediate Bleeding and Secondary Bleeding*
- 1. *Primary bleeding occurs at the time of injury.*
- Hemostatic mechanisms in the body attempt to stop the bleeding by formation of a clot.
- 2. If the primary bleeding has stopped once, and wound starts to bleed again after 24 hours to several days, it is known as *secondary bleeding. It may be* due to: (a) dislodgement of clot or (b) secondary trauma to the wound, (c) infection is also the mostcommon reason for secondary bleeding.
- Infection causes softening of the blood clot or even erosion of the vessel wall.

- Bleeding occurring within eight hours after stoppage of primary bleeding is labeled as *intermediate bleeding.*
- *Loose* foreign body in the wound like calculus, broken bone piece, and preexisting extensive granulation tissues in the extraction socket are the most common causes for the inter mediate bleeding.

- *Internal & External Bleeding*
- Bleeding that is confined within the body cavity and is not apparent on the surface is known as (i) *internal or concealed bleeding.*
- *Whereas, blood escaping through a* wound in the skin is known as (ii) *external bleeding.*
- *Spontaneous Bleeding*
- Sometimes bleeding can occur without any provocation,
- e.g. in acquired (patients on oral hypoglycemic agents—decreased platelets count) and hereditary coagulopathies, such type of bleeding is labeled as *spontaneous bleeding.*

- **Hemostasis**
- It is important to understand the mechanism of stoppage of bleeding. There are four important steps in hemostasis:
- 1. First of all, the injured blood vessel, in an attempt to reduce blood flow undergoes constriction due to spasm in the vessel wall.
- 2. In the second step, there is activation of platelets and formation of platelet plug. This leads to primary hemostasis.

- 3. In the third step, there is activation of clotting mechanism and formation of clot leading to completion of secondary hemostasis.
- 4. In the final step, there is fibrous organization of the clot or retraction of clot.

- *Primary Hemostasis*
- Primary hemostasis is the process of platelet plug formation at the site of injury. It occurs within seconds of injury and is important in stoppage of blood from small arterioles, venules and capillaries. There is platelet adhesion , aggregation and formation of fibrin clot.

- *Secondary Hemostasis*
- Secondary hemostasis is the activation of clotting process in plasma, that ultimately results in the formation of fibrin, which strengthens the primary hemostatic plug.
- It is completed in several minutes and is important in bleeding from larger vessels.

Hemostasis - Normal Mechanism

1. VASCULAR PHASE
2. PLATELET PHASE
3. COAGULATION PHASE

VASCULAR PHASE

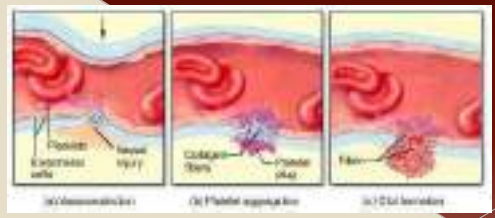
When a blood vessel is damaged, vasoconstriction results.

PLATELET PHASE

Platelets adhere to the damaged surface and form a temporary plug.

COAGULATION PHASE

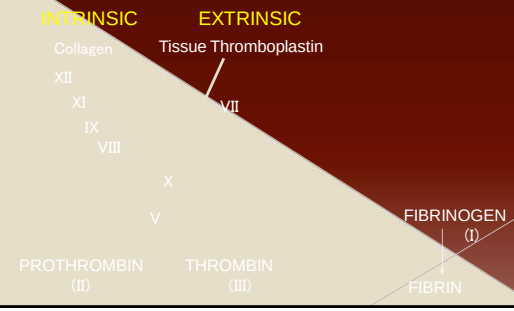
Through two separate pathways, the Intrinsic and Extrinsic, the conversion of fibrinogen to fibrin is complete. Fibrin tightly binds the platelets to form a clot



CLOTTING FACTORS:

Factor	Name	Pathway
I	Fibrinogen	Both
II	Prothrombin	Both
III	Tissue Factor	Extrinsic
IV	Calcium	Both
V	Proaccelerin	Both
VI	Accelerin	Both
VII	Proconvertin	Extrinsic
VIII	Antihemophiliac	Intrinsic
IX	Christmas Factor	Intrinsic
X	Stuart-Prower Factor	Both
XI	Plasmathromboplastin antecedent (PTA)	Intrinsic
XII	Hageman Factor	Intrinsic
XIII	Protransglutaminase	Both

THE CLOTTING MECHANISM



HEMOSTASIS

DEPENDENT UPON:

- Vessel Wall Integrity
- Platelets
- Proper Functioning Platelets
- Adequate Levels of Clotting Factors
- Proper Function of Fibrinolytic Pathway

- **Clinical evaluation of the Bleeding Patient**
- Careful evaluation of the patient with coordinated history and physical examination provides valuable clues as to whether the bleeding abnormality resides in:
- (a) the vessels walls, (b) platelets or (c) in the process of coagu lation.
- Laboratory tests should supplement and not super sede a careful review of history and physical exami nation.

- **Laboratory Tests for Screening**
- Majority of defects of hemostasis can be screened by four basic tests.
- *Bleeding Time: 3 to 10 min*
- Bleeding time (BT) is a sensitive measure of platelet function. Usually there is a linear relationship between platelet count and bleeding time.
- Patients with bleeding time more than 10 minutes have increased risk of bleeding.
- There are various methods of measuring bleeding time, e.g. Ivy, Duke and template.
- BT is prolonged in thrombocytopenia, VonWillebrand's disease and platelet dysfunction.

- *Platelet Count*
- Normal platelet count is 1,50,000 to 4,50,000 per cumm of the blood. When count becomes 50,000 to 1,00,000 per cumm, there is mild prolongation of bleeding time, so that bleeding occurs after severe trauma, or surgery.
- Patients with count less than 50,000 per cumm have easy bruising manifested as petechia and ecchymoses during trauma or surgery.
- Patients with platelet count below 20,000 per cumm have an appreciable incidence of spontaneous bleeding,which may be intracranial or any other internal bleeding.
- Minor oral surgical procedure can be safely done, if platelet count is above 80,000 to 1,00,000 per cumm,otherwise patient needs transfusion of platelet rich plasma.

- *Prothrombin Time:*
- Prothrombin time (PT) screens the extrinsic limb of coagu lation pathway (Factors V, VII and X) and factors I, II and V of the common pathway.
- It is prolonged in patients, who are on warfarin anticoagulant therapy, vitamin K deficiency or deficiency of factor V, VII, X, prothrombin or fibrinogen.
- Normal PT is usually 12 to 14 seconds.
- As a general guideline for dental procedures, the PT should be less than 1½ of the control value.

- *Partial Thromboplastin Time*
- Partial thromboplastin time (PTT) screens the intrinsic limb of coagulation pathway and tests for the adequacy of factors VIII, IX, X, XI, XII of intrinsic system and factors I, II, V of the common pathway.
- It is prolonged in hemophiliacs.
- Both the tests PT and PTT together also screen the common coagulation pathway involving all the reactions, that occur after activation of factor X.
- If both the tests are prolonged, then factor II, V, X or vitamin K deficiency and liver disease are suspected.
- Normal PTT is less than 45 seconds.

- **Local Hemostatic measures**
- During any surgical procedure, complete hemostasis must be achieved before closure of the wound.
- Direct control of bleeding at the site of injury is the best method to achieve hemostasis.
- Surgical bleeding most of the times is caused by ineffec tive local hemostasis.
- The techniques for local hemostasis may be classified as (i) mechanical,
- (ii) thermal or (iii) chemical.

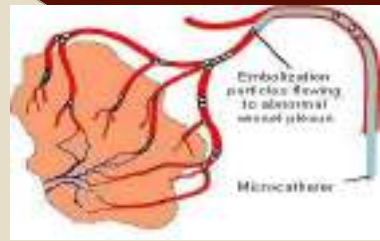
- *Mechanical Methods*
- ***Pressure:*** ***Application of pressure basically counteracts*** the hydrostatic pressure within the bleeding vessel until such time, that a clot can form and occlude the bleeding orifice.
- Pressure should be applied directly over the bleeding site firmly over a gauze pack .
- Posttraumatic nasopharyngeal bleeding or pharyngeal bleeding due to maxillofacial trauma can be controlled by nasal packing. Sometimes posterior nasopharyngeal pack is required.
- Along with this, anterior nasal packing can be done, if bleeding point is located anterior to the pressure area.
- In fractures of mandible, bleeding from inferior dental artery usually stops spontaneously or with the help of pressure packs.

- ***Use of hemostats: Hemostat (Mosquito, artery) forceps*** are specially designed to catch bleeding points in the surgical area.
- These can be straight or curved.
- Curved hemostats are used more frequently, because of their versatility and ease in tying the ligature around the tip of forceps.
- Usually electrosurgical thermocoagulation is done after catching the bleeding point with artery forceps.

- ***Sutures and ligation*: *Transected blood vessel may*** need to be tied with the help of ligature.
- When large pulsatile artery needs to be tied, nonabsorbable material like 3-0 black silk is preferred.
- Smaller vessels can be ligated with 3-0 catgut, or polygalactin.
- The presence of nonabsorbable material in an infected wound can lead to extrusion or sinus tract formation.
- Large arteries with pulsation, such as external carotid artery, should have double transfixion suture passed through the wall of vessel to prevent chances of slipping of ligature.

- ***Embolization of the vessels: With the help of*** angiography, the exact bleeding point can be localized.
- Agents which can be used for embolization include steel coils, polyvinyl alcohol foam, gel foam, silicon spheres and methyl metha crylate.
- These particles are placed via a catheter super selectively into the bleeding vessel usually via femoral artery. The femoral artery is percutaneously punctured. A guidewire is then inserted into the vessel followed by a 100 cm long catheter.

Embolization of blood vessels:



- This catheter can be maneuvered into various branches of the external carotid artery under constant fluoroscopic control.
- Vessels that are usually investigated and catheterized for treatment of oral and perioral lesions include the facial, lingual, transverse facial and internal maxillary arteries.

- *Thermal Agents*
- ***Cautery: Heat achieves hemostasis by denaturation of*** proteins which results in coagulation of large areas of tissue.
- In cauterization, heat is transmitted from the instrument by conduction directly to the tissues. Electrocautery has replaced direct heat application.
- When an electrosurgery unit is not available, dental burnisher can be directly heated over a flame and applied directly to the bleeding point in oral cavity.

- ***Electrosurgery: In electrocautery, heating occurs by*** induction from an alternating current source.
- It is an effective and convenient way of controlling hemorrhage.
- Electrocautery can be applied directly to bleeding point or after catching the bleeding point with hemostat.
- Then cautery point is touched to the hemostat, causing sealing of the vessel through the action of heat.
- It causes tissue destruction producing a burning smell and smoke during application. This cannot control hemorrhage from large vessels, which need to be ligated.

- ***Argon-beam coagulator: It represents a new form of*** electrocautery, shown to be more effective than standard electrocautery.
- In this, coagulator, monopolar current is transmitted to tissues through the flow of argon gas.
- This allows bleeding from vessels that are smaller than 3 mm in diameter to be controlled without the use of hemostats or ligatures. The tip of the coagulator is held approximately 1 cm from the tissue

Argon beam coagulator

- A flow of argon gas clears the surgical site of fluids to allow current to be focused directly on tissue, with reduced carbonization.
- There is formation of 1 to 2 mm of Escher, that covers the bleeding surface and remains attached to the tissues with less tendency to rebleed.
- There is possibility of gas embolism, as there is stream of gas in direct contact with tissues. This risk can be eliminated by not placing handpiece tip in direct contact with tissues.

- ***Lasers: Lasers usually result in bloodless surgery, as*** these effectively coagulate the small blood vessels during cutting of tissues.

- *Chemical Methods*
- ***Local agents***
- a. *Astringent agents and styptics: Chemical agents vary* in their hemostatic action.
- Monsel's solution contains ferric subsulfate and it acts by precipitating proteins.
- It is quite effective in arresting the capillary bleeding and post extraction bleeding in medullary bone.

- Tannic acid also helps in precipitating proteins and causes clot formation.
- This is more helpful as a home remedy or prescription over phone until patient reaches the clinician.
- Patient can be asked to bite over a folded tea bag in case of post extraction bleeding.
- Mann hemostatic is a mixture of tannicacid, alum and chlorobutamol.
- Silver nitrate and ferric chloride are other agents, which can be used in case of minimal bleeding.

- *Bone wax: When bleeding is occurring from a bony* canal, it can be troublesome, because of inability to occlude the vessel that is confined within bony canal
- In such a case, small quantity of bone wax can be app lied to the bleeding bone.

It acts by mechanical occlusion of the bony canal. Large quantity of bone wax can lead to foreign body granuloma and infection.


- *Thrombin: Topical use of thrombin acts by converting* fibrinogen into fibrin clot. It is very kind to tissues and quite effective.
- It is applied to the bleeding surface via a pack, gelatin sponge or surgicel.

- *Gelfoam: It is made from gelatin and is sponge like.*
- Gelfoam has no intrinsic hemostatic action. Its main hemostatic activity is related to large surface area, which comes in contact with blood and further swells on absorbing blood.
- It exerts pressure along with acting as scaffold for fibrin network.
- It is absorbed by phagocytosis.
- Gelfoam should be moistened in saline or thrombin solution prior to application and all the air should be removed from interstices.


- *Oxycel: It is oxidized cellulose and on application* releases cellulosic acid, which has marked affinity for hemoglobin, leading to formation of artificial clot.
- It should be applied dry, because acid formed during wetting process inactivates the thrombin or other hemostatic agent.
- Acid produced also inhibit epithelialization, therefore, it is not recommended for use over epithelial surfaces.

- *Surgicel: It is glucose polymer based sterile knitted* fabric prepared by the controlled oxidation of regenerated cellulose.
- Its local hemostatic mechanism depends on binding of hemoglobin to oxycellulose, allowing the dressing to expand into a gelatinous mass, which in turn acts as scaffold for clot formation and clot stabilization.
- Surgicel can be applied dry or it can be soaked in thrombin solution.

- *Fibrin glue: It is a biological adhesive containing* throm bin, fibrinogen, factor XIII and aprotinin.
- Thrombin converts fibrinogen to unstable fibrin clot, factor XIII stabilizes the clot and aprotinin prevents its degra dation.
- During wound healing, fibroblasts move through the fibrin meshwork forming more permanent framework composed of collagen fibers.
- The product poses virtually no risk of transmission of viral infections because of pasteurization of the plasma components and has little or no antigenic potential.

- *Adrenaline: Adrenaline or epinephrine, applied* topically induces vasoconstriction and thus helps in achieving hemostasis.
- The drug is applied with the help of gauze pack in a concen tration 1:1000 over oozing sites.
- It can also be injected along with local anesthetic in concentration of 1:80,000 to 1:2,00,000.
- This drug should not be used in patients who have hypertension or previously existing cardiac disease.
- The vasoconstrictor effect is reversible and one should be careful to watch for recur rence of bleeding when its effect wears off.

- ***Systemic agents***
- a. *Whole blood: When there is excessive blood loss due* to hemorrhage, and there are symptoms of hypovolemic shock, whole blood transfusion may be indicated.
- Fresh whole blood contains all the factors for coagulation. When specific blood components are not available to treat the patient's hemostatic defect, whole blood may be used. It is necessary to type and crossmatch the blood before transfusion.
- Blood must be checked for hepatitis B, C and HIV viruses before transfusion.

- Banked blood is a poor source of platelets.
- Factors II, VII, IX and XI are stable in banked blood.
- Fresh whole blood refers to blood that is administered within 24 hours of its donation.
- Fresh whole blood is rarely indicated because of specific component therapy available these days.

- *Platelet rich plasma: It is advisable to elevate the* platelet levels to the range of 50,000 to 1,00,000 cells per cu mm to provide continued protection.
- Platelets can be collected from donated whole blood or directly from the patient via plasmapheresis.
- Platelet concentrates are viable for three days when stored at room temperature. If they are refrigerated viability decreases. They must be infused quickly via a short IV transfusion set with no filter.
- One unit of platelet rich plasma raises the platelet count approximately by 7,000 to 10,000 cells per cu mm.

- *Fresh frozen plasma: A unit (150 ml) of fresh frozen* plasma is usually collected from one donor and contains all coagulation factors including 200 u factorVIII, 200 u factor IX and 400 mg fibrinogen.
- Fresh frozen plasma is stored at –30oC and should be infused within two hours once defrosted.

- *Cryoprecipitate: A 15 ml vial of cryoprecipitate* contains approximately 100 u factor VIII, 250 mg fibrinogen, factor XIII and von Willebrand factor and is stored at –30oC.
- Each bag of cryoprecipitate is derived from a single donor and is not treated to inactivate viruses. Therefore, the use of cryoprecipitate is associated with a substantial risk of viral transmission.

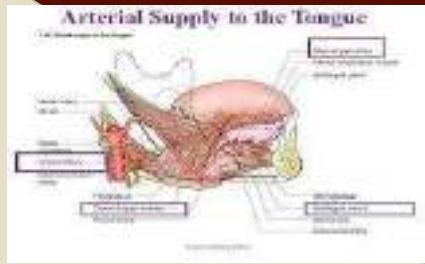
- *Adrenochrome monosemicarbazon and ethamsylate:*
- These systemic chemical agents are of doubtful efficacy.
- Adrenochrome monosemicarbazon (1 mg/ml injec tion) is given 2 ml/6 hourly before the surgical procedure.
- Ethamsylate reduces capillary bleeding in the presence of normal number of platelets.
- It acts by correcting abnormal platelet adhesion.

Ligation of arteries:

- *Greater Palatine Artery*
- Greater palatine artery runs anteriorly from the greater palatine foramen in the submucosa of the hard palate in a groove between the horizontal palatine process of the maxilla and the inner plate of the alveolar process.
- The incisions over the palate should be made parallel, rather than perpendicular to this vessel.

- Most of the times, the hemorrhage can be controlled by a pressure pack.
- A round bolus of gauze is made of adequate size, so that it does not cause gagging.
- It is kept in place by tie over sutures for 24 to 48 hours.

- *Sublingual Artery*
- Injury to sublingual artery can occur accidentally by rotating disks or slipping of sharp instrument, while working on mandibular teeth.
- Injury to this artery may lead to large sublingual hematoma which, if not controlled, can compromise airway and may be lifethreatening.
- It is a small artery and local clamping of the artery and application of electrocautery usually controls the bleeding.

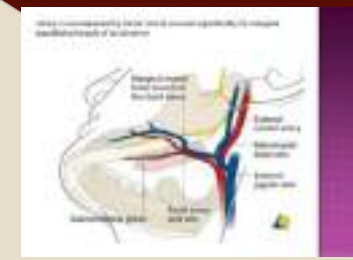


Lingual artery ligation:

- Submandibular curvilinear incision is taken from the gonial angle to mental region, extending inferolaterally overlying hyoid bone.
- The skin, platysma and deep fascia are incised and lower pole of the submandibular gland is exposed.
- The gland is lifted upwards and tendon of digastric muscle is exposed. Mylo hyoid and hyoglossus muscles are identified forming floor of digastric triangle.

- Hypoglossal nerve is identified at the posterior border of mylohyoid muscle.
- Lingual triangle or Lesser's triangle is formed by digastric tendon, posterior mylohyoid border and the hypoglossal nerve.
- Within the triangle, vertical fibers of hyoglossus muscle are separated bluntly and in the gap between these fibers, lingual artery is identified and ligated.

- *Ligation of Facial Artery*
- Facial artery is third anterior branch of external carotid artery.
- It can be easily ligated at the point where it crosses lower border of mandible just anterior to masseter muscle.
- Marginal mandibular branch of facial nerve crosses superficially over facial artery and vein.

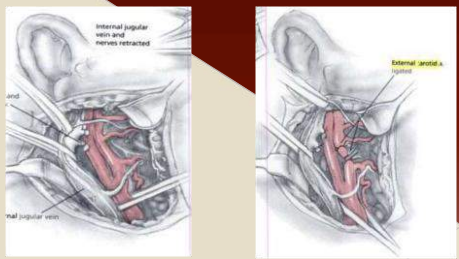


- To prevent damage to this nerve submandibular incision is given two cm below the lower border of mandible.
- The skin, subcutaneous tissue, platysma and deep fascia are cut. These tissues are retracted upwards and here artery lies just anterior to masseter muscle. It is isolated, tied and cut.

- *Ligation of Maxillary Artery*
- The maxillary artery is terminal branch of external carotid artery.
- It is situated deep and direct ligation is difficult. Transantral approach for ligation of maxillary artery has been described. This artery is at risk during surgery condylar neck.
- Ligation is difficult due to limited access.
- Direct pressure with packing can control the bleeding in majority of cases.
- If direct packing cannot achieve hemorrhage control, the ligation of external carotid artery becomes necessary.

- *Superficial Temporal Artery*
- It is also one of the terminal branches of the external carotid artery.
- Bleeding from temporal region (scalp) can be best managed by direct identification of the bleeding point and electrocoagulation.
- The pulsations of superficial temporal artery can be felt just anterior to preauricular region. This artery is usually encountered during surgery of the temporomandibular joint through the preauricular incision.
- The artery can beexposed through same incision as used for exposure of temporomandibular joint.

- *Ligation of External Carotid Artery in Carotid Triangle*
- The patient is placed supine and neck is extended and rotated towards contralateral side by placing a pillow below the shoulders.
- An incision is placed through skin and superficial fascia at the level of the hyoid bone.
- Next the platysma muscle and superficial layer of deep investing fascia is cut gaining an entry into the carotid triangle.
- Sternocleidomastoid muscle is retracted back and blunt dissection is done to expose the contents of carotid sheath.



- Pulsations of carotid artery can be felt and help in direction of dissection.
- Blue internal jugular vein covers the common carotid artery superficially.
- Lying between the two vessels and deep to them, there is yellow vagus nerve. External carotid artery is identified by its branching.
- Umbilical tape is passed and fixed superior to superior thyroid artery and its effect seen by occluding the artery. If need be, ligatures and transfixion sutures are passed.

- *Ligation of External Carotid Artery in Retromandibular Fossa*
- Retromandibular incision is planned. Skin is incised behind the ramus and angle of mandible starting at tip of mastoid process continued till just below the mandibular angle.
- Skin and platysma muscle are incised.
- Retromandibular vein, external jugular vein and branches of great auricular nerve are encountered and these are sectioned.

- Parotid gland is separated from anterior border of sternocleidomastoid muscle by sharp dissection and retracted.
- Posterior belly of digastric and above it stylohyoid muscle becomes visible.
- The mandible is pulled forward to widen the retromandibular fossa. Here pulsations of external carotid artery can be felt.
- Blunt dissection is done to expose the external carotid artery. Here it can be ligated

- **Hereditary Coagulopathies**
- Ninety percent of inherited hemostatic disorders consist of hemophilia A, B and von Willebrand's disease.
- Hemophilias are inherited disorders caused by a decreased activity or absence of coagulation factor VIII or IX.

- *Hemophilia A*
- The severity of the disease is dependent on the amount of factor present in the blood stream.
- Normal plasma contains 1.0 unit of a factor per milliliter or level that is defined as 100 percent.
- Deficiency of a factor is expressed as percentage (0.25 unit/ml = 25%).
- Patients with less than 1 percent factor VIII activity have severe disease.
- They bleed frequently into soft tissues, without discernible trauma.

- Patients with levels between 1 and 5 percent have moderate disease with less severe bleeding episodes.
- Those with levels above 5 percent have mild disease with infrequent bleeding usually secondary to trauma or surgery.
- Majority of patients of hemophilia A have levels of factor VIII below 5 percent.

- The recommended level of replacement therapy of factor VIII varies from 30 to 75 percent.
- For extensive surgical procedure, the levels of factor should be raised to 50 to 75 percent.
- Factor VIII has halflife of 8 to 12 hours, uncomplicated procedure may not require further replacement therapy. Each unit of factor VIII transfused is estimated to raise factor VIII levels 2 percent per kilogram of body weight.
- Dose of factor VIII in units =
- (desired % activity – initial % activity) x _weight _in_ kg_2

- The more extensive procedures like surgical extraction or major oral surgery may require further infusion at 12 to 24 hours intervals and adequate levels of factor VIII may have to be maintained until healing is complete.
- Local hemostatic measures such as application of topical thrombin, surgicel or gelfoam is indicated.
- Stabilization of clot with antifibrinolytic drugs such as epsilonaminocaproic acid (EACA) and tranexamic acid
- (5%) mouthwash 4 to 6 times daily is indicated. Analgesics such as aspirin and NSAIDs are contraindicated as they alter platelet function.

- Inferior alveolar nerve block and posterior superior alveolar nerve block injections should be administered only after replacement therapy of factor VIII, because of possibility of a dissecting hematoma.
- EACA is a potent antifibrinolytic agent that inhibits plasminogen activators present in oral secretions and stabilizes clot formation in the oral tissues.

- Tranexamic acid is a more potent and longer acting anti fibrinolytic drug. It is available as both oral and parenteral forms. Intravenous dose is 10 mg/kg body weight, the dose being repeated 4 to 6 hourly.
- It can be used as 5 percent mouthwash (500 mg tablet dissolved in 10 ml of water) and this solution can be swallowed.

- *Hemophilia B*
- Factor IX deficiency is clinically indistinguishable from factor VIII deficiency, therefore, accurate laboratory diagnosis is critical. It requires therapy with fresh frozen plasma or factor IX concentrates.
- there is more biologic halflife(32hours) as compared to factor VIII.

- Replacement therapy consists of raising the plasma level factor IX to 30 to 50 percent of normal by using fresh frozen plasma (FFP) or prothrombin complex concentrates.
- Plasma infusion can begin 24 to 36 hours before the scheduled procedure due to long halflife of factor IX.
- This allows multiple units of plasma transfusion to be given without overloading

- *Management of Patients with Von Willebrand's Disease*
- Von Willebrand's disease (VWD) is an autosomal dominant inherited disorder of coagulation, that results from a quantitative or qualitative abnormality of the plasma protein, i.e. Von Willebrand's factor (VWF).
- It is a glycosylated protein which is synthesized in endothelial cells of blood vessel and megakaryocytes.

- *Three Main Roles of VWF in Hemostasis*
- 1. It enables the binding of platelets to the subendothelial collagen matrix at the sites of vascular injury.
- 2. It mediates subsequent platelet aggregation allowing the formation of platelet plug.
- 3. It acts as carrier protein for factor VIII protecting it from proteolytic degradation.

- Patients undergoing minor surgery and dental extraction should be adequately covered with single infusion of desmopres sin.
- To cover major soft tissue and hard tissue surgery, VWF and factor VIII concen tration should be checked after infusion of desmo pressin prior to surgery to ensure adequate response.
- It should be given postope ra tively daily for atleast 5 days and VWF activity and F VIII concentrations monitored daily after surgical procedure.

- *Vitamin K Deficiency*
- Vitamin K is a necessary cofactor for carboxylation of factors II, VII, IX, X.
- Vitamin K deficiency results in abnormal blood coagulation and bleeding. Vitamin Kdeficiency can occur in biliary obstruction, malabsorption syndrome, prolonged antibiotic therapy, nutritional deficiency and warfarin ingestion.
- Hospitalized patients who are unable to eat and are receiving antibiotics that suppress intestinal flora may become vitamin K deficient in 1 to 2 weeks.
- Prothrombin time (PT) is usually prolonged.

- Deficiency can be usually corrected by administration of vitamin K injection 10 mg for 1 to 3 days.
- Intravenous administration of vitamin K has been associated with anaphylaxis in rare patients; therefore, it should be given in a closely monitored setting.
- Patients with severe hemorrhage due to vitamin K deficiency can be managed by transfusing fresh frozen plasma.

- MANAGEMENT OF A PATIENT ON ORAL ANTICOAGULANTS
- Many patients seeking dental treatment are on oral anticoagulant therapy.
- Most common indications for anticoagulant therapy are prevention of thromboembolism from prosthetic heart valves and arrhythmias, prevention of stroke, and prevention of deep venous thrombosis.

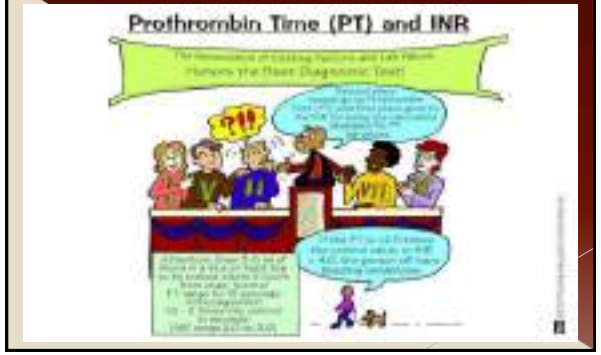
- PT been the conventional means used to monitor the degree of anticoagulation.
- Prothrombin ratio (PTR) is the ratio of patient's PT divided by control PT from the laboratory.
- A PTR of 2 to 2.5 is considered to be the therapeutic range. World Health Organization (WHO) has recently recommended monitoring of these patients with international nor malized ratio (INR), because PT has been shown to be imprecise and variable.

- There is little comparability of PT values taken in different laboratories.
- These differen ces are primarily due to the thromboplastin used in performing the test as thromboplastin can be obtained from different sources and the type of instrumentation used in performing the test.

- In an effort to standardize the results of the PT, World Health Organization introduced the concept of INR.
- INR is the PTR that would have been obtained if a standard thromboplastins reagent had been used.
- The INR relates all thromboplastins to the standard of human brain thromboplastin with the use of internal sensitivity index (ISI).
- The ISI established the reference standard of 1.0 to human brain derived thromboplastin.
- INR = (patient's PT/control PT)ISI

- With the use of INR variations due to differences in nature of source and potency of thromboplastin has been standardized.
- INR for a normal healthy adult is 1.0.
- Recommended intensity of INR for patients on oral anticoagulants varies from 2.0 to 4.5 depending on indication for use.
- For example recommended INR for deep vein thrombosis, valvular heart disease, pulmonary embolism, myocardial infarction is 2.0 to 3.0 and in case of artificial mechanical heart value is 3.0 to 4.5

- In patients, where stoppage of anticoagulant therapy can lead to significant risk of thromboembo lism, they are shifted to heparin therapy after stoppage of the oral anticoagulant and then surgical procedures are carried out.
- Current literature suggests that, if international normalized ratio (INR) of prothrombin is below 3.5 then simple extractions can be done safely without altering the oral anticoagulant therapy.
- Hemostasis can be achieved with the use of local hemostatic measures and use of topical antifibrinolytic agent such as 5 percent tranexamic acid mouthwash.



- Haemorrage is one of the most commonest complications of maxillofacial surgery.
- Surgeon should have the ability to recognize it based on signs and symptoms and should have ability not only to recognize abnormal bleeding but also know how to control it successfully.

Thank you

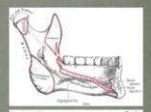
Surgical anatomy

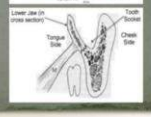
Dr. Vaishali Jamdade
Senior Lecturer
Department of Oral & Maxillofacial Srugery
MGDCH

MUSCLES

Muscles:

- Vestibule is formed by the attachment of buccinator buccally and mylohyoid lingually.
- Along the anterior border of the ramus - tendinous insertion of temporalis Excessive stripping of these muscle will cause hematoma, pain and trismus.
- Lingual pouch

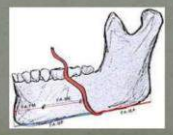




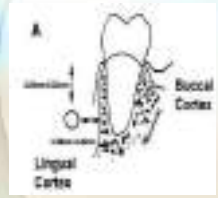
ARTERIES

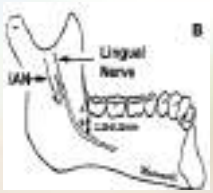
Arteries

- Facial artery & facial vein run in close approximation with lower 1st molar near the anterior border of masseter.
- Mandibular vessels in retro molar triangle which supply temporalis tendon.
- Hemorrhage can occur during surgical removal of impacted tooth if distal incision is not taken laterally towards cheek.



Lingual nerve



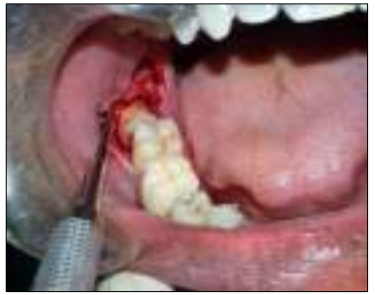


(Antony Pogrel ,J oral maxillofac Surg 1995:53:1178)

Surgical procedure

- John tomes-1848-extn of 2nd molar-Impaction
- Steele-1895- Grinding of distal surface of 2nd molar
- NOVITSKY-1890-1st to raise the flap and remove bone
- Edmund kells-1918-tooth sectioning.
- Winter-1926-chisel (ossisector)

Surgical removal of the third molar



STEPS TO BE FOLLOWED

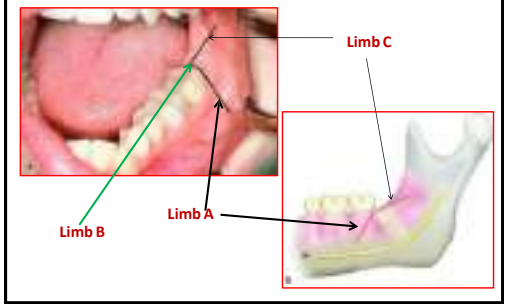
- Premedication
- Armamentarium and patient preparation
- Local anesthesia+ sedation/general anesthesia
- Incision
- Reflection of mucoperiosteal flap
- osteotomy
- odontectomy
- Elevation
- Extraction
- Debridement and smoothening of bone
- Control of bleeding
- Closure
- Medications
- Follow up

Incision and Mucoperiosteal Flap

Principles of flap

- Accessibility
- Vascularity
- Base wider than apex
- Rest on sound bone
- Full thickness flap
- Should not extend too far distally

PARTS OF INCISION



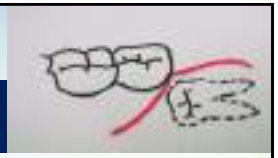
WARD'S INCISION 1956

Ward T.G(1955). The radiographic assessment of the impacted lower wisdom tooth. Dent dezin.6.3-7

Modified Ward's incision - 1968

indicated when lower third molar is completely unerupted and inadequate depth of buccal vestibule

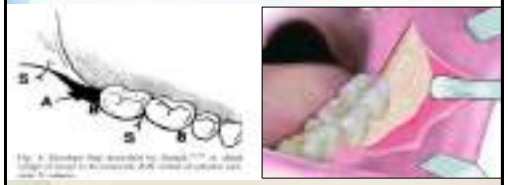
- Triangular incision:



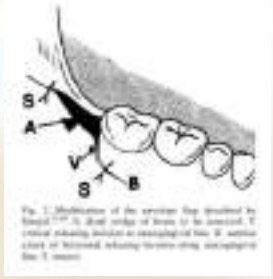
triangular incision for L shaped flap

- Crevicular with distal releasing incision:

ENVELOPE FLAP BY SZMYD (1971)



MODIFIED ENVELOPE FLAP BY SZMYD (1971)



BAYONET FLAPS

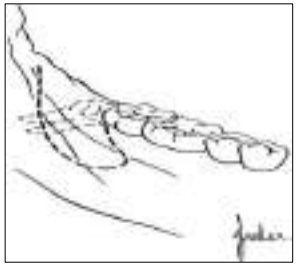
Bayonet shaped flap is reflected when Ward I and II incisions are given. This flap provides better blood supply to the flap by providing a broader base.

'L' SHAPED FLAP

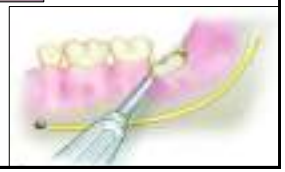
Advantage : Prevents pocket formation distal to second molar.

(Mac GregorAJ.the impacted lower wisdom tooth.oxford:oxford university press 1985)

VESTIBULAR TONGUE-SHAPED FLAP BY BERWICK (1966)



OSTEOTOMY (BONE REMOVAL)



CHISEL TECHNIQUE

•For bone removal – monobevel chisel
• For tooth sectioning- bibevel chisel

•To plane bone with a chisel, the bevel have to be turned towards the bone. To penetrate the bone, turn the bevel away from the bone.

•To restrict the bony cut to the desired extent a vertical limiting cut is made by placing a 3 mm or 5 mm chisel vertically at the distal aspect of the II molar with the bevel facing posteriorly.

LATERAL TREPHENATION TECHNIQUE

- Was first described by **Bowdler – henry**
- Modified s-shaped incision is made from retromolar fossa across the external oblique ridge to 1st molar
- Buccal cortical plate is trephined over the iii molar crypt. Bur is used to make vertical cuts anteriorly and posteriorly.

LATERAL TREPHENATION TECHNIQUE

- A chisel or an osteotome is applied in the vertical direction over the bur holes. Then the buccal plate is fractured out.
- **Advantages:**
  - Partially formed unerupted 3rd molar can be removed.
  - Post-op pain is minimal.
  - Bone healing is excellent and there is no loss of alveolar bone around the 2nd molar.

DIFFERENCES BETWEEN BUR & CHISEL TECHNIQUE

Sl.No	*Criteria*	*Chisel&Mallet*	*Bur*
1.	Technique	Difficult	Easy.
2.	Control over bone cutting	Uncontrolled & chances of fracture is more.	Controlled.
3.	Patient acceptance.	Not tolerated in L.A.	Well tolerated in L.A.
4.	Healing of bone.	Good	Delayed Healing
5.	Postoperative edema	Less	More.
6.	Dry socket.	Less.	More.
7.	Postoperative Infection.	Less.	More.

ODONTECTOMY

• **INDICATIONS :**

• Large bulbous crown.

•Deep horizontal or Mesioangular impactions.

•Disto angular impactions with plenty of bone cover.

• Unfavorable root form like divergent, locking or dilacerated roots.

• Hypercementosed roots.

SECTIONING OF TOOTH

Advantages of the tooth division technique (Pell and Gregory , 1942):

1.Bone removal is eliminated or considerably reduced, resulting in less post-operative pain and swelling.

2.There is less chance of damage to the adjacent tooth because no effort is made to force the impacted tooth past the convexity of the second molar, which would tend to elevate it out of the socket.

3.The risk of fracture of the jaw is reduced, since most fractures occur from forced elevation.

4. Danger of injury to the inferior alveolar nerve is reduced.

PATH OF WITHDRAWAL

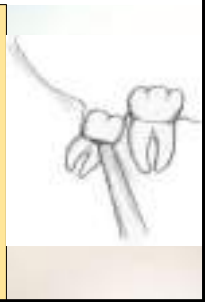
- The path of withdrawal defined by **Moore** is that, along which the tooth would move according to its position and the curvature of its roots , if it was able to erupt unimpeded into the mouth.

LINGUAL SPLIT TECHNIQUE

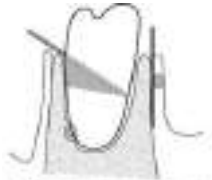
(WARD TG:THE SPLIT BONE TECHNIQUE FOR REMOVAL OF LOWER THIRD MOLAR.BR DENT J 101:297,1956)

LINGUAL SPLIT TECHNIQUE

- A 5-mm chisel and mallet used to place a horizontal cut parallel to the cervix of the tooth.
- This buccal osteotomy should extend the full mesiodistal width of the crown to allow placement of a Coupland elevator



CORONECTOMY

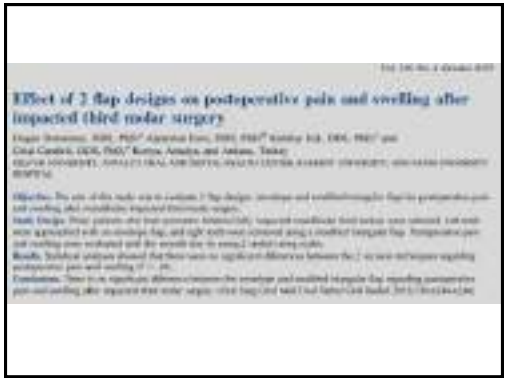


CLOSURE—SUTURING.

- Most important suture is the one placed immediately behind the second molar.
- It also prevents pocket formation distal to second molar.

Recent advances

Novel incision design and primary flap closure reduces the incidence of alveolar osseitis and infection in impacted mandibular third molar surgery



Effect of 2 flap designs on postoperative pain and swelling after impacted third molar surgery

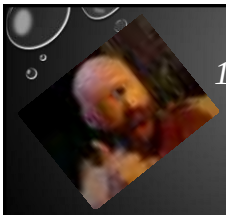
Cornectomy of Deeply Impacted Lower Third Molar: Incidence of Outcomes and Complications after One Year Follow-Up

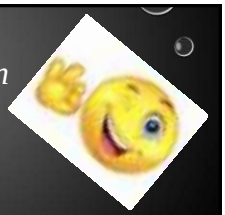
Local Complications Of Local Anaesthesia

Presented By:
Dr. Vaishali Jamdade
Department Of Oral & Maxillofacial Surgery
MGDCH

Contents

1. Definition

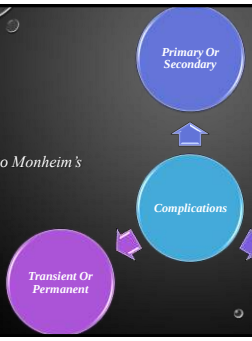




- **Complications :** *As any deviation from normally expected pattern during or after the securing of regional analgesia.*

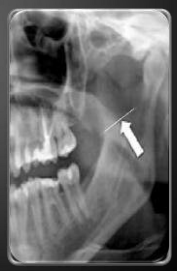
2. Classification

According to Monheim's



- **Primary :** *caused and manifested at the time of anaesthesia*
- **Secondary :** *manifested later, even though it may be caused at the time of insertion of needle and injection of solution*
- **Mild :** *exhibits slight change from normally expected pattern and reverses itself with any specific treatment*
- **Severe :** *manifests itself by pronounced deviation from normally expected pattern and requires A definite plan of treatment.*
- **Transient :** *severe at time of occurrence but leaves no residual effect*
- **Permanent :** *leave residual effect even though mild in nature.*

A. Needle breakage



- Most annoying and depressing comoplication
- But also easiest one to prevent
- Causes :
  - Sudden movement of patient during insertion
  - Thin gauge needle
  - Weakening of needle due to pre-bending
- Problems:
  - No problem if can be retrieved.
  - If not visible – immediate surgical intervention.

- Prevention:
  - Use Large Gauge Needle
  - Avoid Using Using Short Needle In Childrens
  - Avoid Bending Of Needle
  - Care While Inserting Needle In Phobic Patients
  - Avoid Needle Redirection After Insertion

- Management:
  - **DON'T PANIC**
  - Tell patient not to move his jaws and keep his/her mouth open
  - Best would be to place a BITE BLOCK.
  - OBTAIN A RADIOGRAPH (OPG)
  - If fragment of needle is visible use a haemostat to hold it and retrieve it.
  - If not visible DO NOT DO EXPERIMENTS and CALL AN ORAL SURGEON.

B. Pain on Injection

- Can be avoided, if proper knowledge is present.
- Causes:
  - Careless injection technique
  - Dull needle tip
  - Multiple injections
  - Rapid injection
  - Needles with barb- fishhook barb

- Prevention:
  - Proper injection technique
  - Use of sharp needles
  - Use topical anaesthetic prior to injection
  - Slow injection deposition
  - Optimal temperature of solution
- Treatment:
  - Follow above mentioned options

C. Burning Sensation On Injection

- Not uncommon
- Causes:
  - Ph of solution
  - Rapid L.A. Deposition
  - Contaminated solution
  - Temperature of solution
- Problems:
  - Transient in nature
  - Indication of tissue irritation
  - May develop edema, trismus, parasethesia

- *Prevention:*
  - *Speed of injection- slow injection- 1ml/min*
  - *Storing L.A. At room temperature*
  - *Solution without alcohol content*

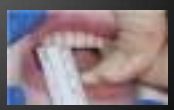
D. Prolonged anaesthesia

- *Rare but disturbing complication*
- *Causes:*
  - *Trauma to any nerve or nerve sheath → electrical shock & parasthesia*
  - *Injection of contaminated L.A cartilage by alcohol or sterilizing solutions near the nerve → irritation & edema → increase pressure on the region → paresthesia*
  - *Haemorrhage into or around the neural sheath → increase pressure on the nerve → paresthesia*
  - *L.A itself- 4% solutions eg- prilocaine, articaine*

- *Problems:*
  - *Self-inflicted injury*
  - *Loss of taste- more psychological distress*
  - *Hyperesthesia/dysesthesia- even more disturbing*
- *Prevention:*
  - *Proper injection technique*
  - *Proper handling of l.A.*
- *Management:*
  - *Re-assure patient*
  - *Usually resolves in 8 weeks*
  - *Examine degree of paresthesia and follow up*
  - *Can consult neurologist if needed.*

E. Trismus

- *Prolongeds tetanic spasm of jaw muscles by which normal jaw opening is restricted.*
- *Causes:*
  - *Trauma to muscles*
  - *Irritating solution*
  - *Haemorrhage*
  - *Low grade infection*
  - *Excessive volumes → distention of tissues → post – injection trismus*
  - *Multiple needle penerations*

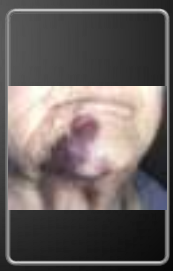


- *Problems:*
  - *Acute phase*
    - *Pain, spasm, limitation of movements*
  - *Chronic phase*
    - *Develops if treatment not begun*
  - *Fibrous and chronic hypomobility*
- *Prevention:*
  - *Sharp, sterile disposable needles*
  - *Proper handling of L.A.*
  - *Aspetic technique*
  - *Atraumatic injection technique*
  - *Avoid multiple injections*
  - *Use minimal effective volumes*

- *Management:*
  - *Depends on cause*
  - *Recall*
  - *Heat therapy: moist towel for 20 min*
  - *Analgesics & muscle relaxants*
  - *Physiotherapy: 5 min every 3-4 hours jaw movements, chewing gum*
  - *Antibiotics if required*
  - *Refer to oral surgeon if not resolves within 2-3 days without antibiotics or 5-7 days with antibiotics or severe limited mouth opening.*
  - *In severe case surgical intervention may be required.*

F. Haematoma

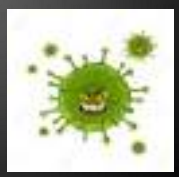
- *Effusion of blood into extravascular spaces caused by inadvertent nicking of blood vessel.*
- *Palatal haematoma is rare, following ianb is visible intra-orally and following psa-nb is visible extra-orally.*
- *Problem:*
  - *Aesthetically unacceptable*
  - *Possible complication include trismus & pain*
  - *Swelling & discoloration subsides within several days*
- *Prevention:*
  - *Knowledge abour normal anatomy*
  - *Aspiration*
  - *Modify injection technique*
  - *Minimize number of needle penetrations of tissues*
  - *Avoid using needle as probe in tissues*



- *Management:*
  - *Immediate- apply local pressure for atleast 2 min to stop bleeding*
    - *Ianb- medial ramus*
    - *Infraoribtal- diract pressure over infraorbital foramen*
  - *Posterior superior alveolar nerve block*
    - *Produces largest & aesthetically unappleaing*
    - *Not recognized till swelling appears on side of face*
    - *Difficluty in applying pressure*
    - *Located to posterior superior & medial to tuberosity*
    - *Stop when pressure exceeds normal blood pressure*
  - *Subsequent:*
    - *Avoid additional dental treatment*
    - *About possible sequale → trismus, discoloration → resorbed by 7-14 days, soreness → treat by analegesics*
    - *Ice application immediately*
    - *No heat application*
    - *Moist heat from next day by warm towel 20 min every hour*

G. Infection

- *Extremely rare since introduction sterilization technique*
- *Causes:*
  - *Contamination of needle prior to insertion*
  - *Improper handling and technique*
- *Problem:*
  - *Contaminated solution → infection → trismus*
- *Prevention:*
  - *Use disposable syringe*
  - *Proper care*
  - *Avoid multiple injections*
  - *Proper preparation of tissue prior to penetration*



- *Management:*
  - *Low grade infection*
    - *Rare, seldomly recognized immediately*
  - *Immediate treatment consists of symptomatic treatment and trismus management.*
  - *Trismus doe to factors other than infection will respond to treatment within 2-3 days*
  - *If does not responds than initiate antibiotic therapy*

H. OEDEMA

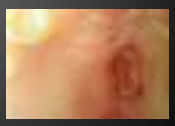
- NOT A CLINICAL SYNDROME BUT CLINICAL SIGN.
- CAUSES:
  - TRAUMA DURING INJECTION
  - INFECTION
  - ALLERGY
  - HAEMORRHAGE
  - INJECTION OF IRRITATING SOLUTION

- PROBLEMS:
  - AIRWAY OBSTRUCTION
  - PAIN & DYSFUNCTION OF THE REGION
  - AGIOOEDEMA →DUE TO ALLERGIC REACTION → COMPROMISED AIRWAY
  - OEDEMA OF TONGUE, PHARYNX, LARYNX → LIFE THREATENING SITUATION
- PREVENTION:
  - PROPER CARE AND HANDLING OF L.A.
  - USE OF ATRAUMATIC INJECTION TECHNIQUE
  - PROPER AND ADEQUATE MEDICAL EXAMINATION OF PATIENT PRIOR TO DRUG ADMINISTRATION.

- MANAGEMENT:
  - OEDEMA DUE TO TRAUMATIC TECHNIQUE OR IRRITATING SOLUTION → MINIMAL DEGREE OF OEDEMA AND RESOLVES WITHIN 1-3 DAYS
  - ANALGESICS FOR REDUCTION OF PAIN
  - FOLLOWED BY HAEMATOMA/ HAEMORRHAGE OEDEMA RESOLVES WITHIN 1-2 WEEKS
  - IF DUE TO INFECTION, WILL NOT RESOLVE SPONTANEOUSLY BUT WILL PROGRESSIVELY BECOME MORE IN INTENSITY. IF SIGNS OF OEDEMA DOES NOT RESOLVE WITHIN 3 DAYS → ANTIBIOTIC THERAPY
  - **BUT IF OEDEMA IS DUE TO ALLERGY THEN IT IS POTENTIALLY LIFE THREATENING**
  - IF SWELLING IS IN BUCCAL SOFT TISSUE THEN I.M OR ORAL ANTIHISTAMINICS TREATMENT IS PREFERRED.
  - IF BREATHING IS COMPROMISED → BLS, POSITION = SUPINE , ABC,
    - EPINEPHRINE 0.3MG I.V/I.M ; ANTIHISTAMINIC, CORITICOSTEROID, CRICOTHYROTOMY

I. SLOUGHING OF TISSUE

- PROLONGED ISCHEMIA AND IRRITATION → EPITHELIAL DESQUAMATION AND STERILE ABSCESS
- CAUSES:
  - EPITHELIAL DESQUAMAMTION
    - APPLICATION OF TOPICAL L.A. FOR LONG TIME
    - SENISITIVITY OF TISSUES TO CHEMICAL AGENTS
  - STERILE ABSCESS
    - SECONDARY TO PROLONGED ESCHEMIA DUE TO VASOCONSTRICTOR
    - OCCURS IN SOFT TISSUES OF HARD PALATE



- PROBLEM:
  - PAIN
  - POSSIBILITY OF DEVELOPING INFECTION
- PREVENTION:
  - USE TOPICAL L.A. FOR 1-2MIN
  - USE VASOCONSTRICTOR IN MINIMUM CONC.
  - EPINEPHRINE 1: 50,000 OR NOR-EPINEPHRINE 1: 30,000

- MANAGEMENT:
  - NO FORMAL MANAGEMENT REQUIRED
  - SYMPTOMATIC MANAGEMENT
  - ANALGESIC
  - EPITHELIAL DESQUAMATION WILL RESOLVE WITHIN FEW DAYS
  - STERILE ABSCESS WILL STAY FOR 7-10 DAYS

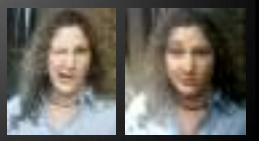
J. SOFT TISSUE INJURY

- INADVERTENT INJURY TO ANAESTHETISED TISSUES OF LIP & TONGUE
- COMMON IN CHILDREN & MEDICALLY COMPROMISED PATIENTS.
- CAUSES:
  - LONG ACTING L.A.
- PROBLEM:
  - SWELLING & PAIN

- PREVENTION:
  - SELECTION OF PROPER DURATION OF L.A
  - USE OF COTTON ROLLS BETWEEN TISSUE POST DISCHARGE
  - WARN PATIENT AND ATTENDERS AGAINST POSSIBLE OUTCOMES
  - USE OF TAGS OR STICKERS
- MANAGEMENT
  - SYMPTOMATIC
  - ANALGESIC FOR PAIN
  - ANTIBIOTICS
  - LUKE WARM SALINE RINSES
  - PETROLLEUM JELLY OR OINTMENTS TO COVER LESION

K. FACIAL NERVE PARALYSIS

- 7TH CRANIAL NERVE SUPPLYING MUSCLES OF FACIAL EXPRRESSIONS, SCALP, EXTERNAL EARS, OTHER STRUCTURES
- CAUSES:
  - DEPOSITION OF LA IN CAPSULE OF PAROTID GLAND PRESENT ALONG POSTERIOR BORDER OF RAMUS CLOTHED BY MEDIAL PTERYGOID AND MASSETER MUSCLES
  - IF NEEDLE PENETRATES IN PAROTID SUBSTANCE DUE TO INADVERTENT DEFLECTION → PARALYSIS OF NERVE



- PROBLEMS:
  - LOSS OF FACIAL EXRESSION FUNCTION WHICH DEPENDS UPON AMOUNT OF LA ADMINISTERED AND PROXIMITY TO NERVE
  - UNABLE TO CLOSE EYES, FROWNING, CORNEAL IRRITATION → TEARS, DROOPING OF ANGLE OF MOUTH, DROOLING OF SALIVA
- PREVENTION
  - PROPER INJECTION TECHNIQUE
  - CONTACT OF NEEDLE TIP TO MEIDAL ASPECT OF BONE THUS REDUCING DEPOSITION OF LA INTO OT NEAR PAROTID
  - IF NEEDLE GETS DEFLECTED THEN WITHDRAW ENTIRE NEEDLE AND RE-INSERT AND DIRECT ANTERIORLY

- MANAGMENT:
  - RE-ASSURE THE PATIENT
  - USE CORNEAL PATCH TO PREVENT AND REDUCE IRRITATION
  - EXPLAIN PATIENT TO PATIENT ABOUT TRANSIENT NATURE ABOUT THIS PROBLEM
  - REMOVE CONTACT LENS UNTIL MUSCULAR CONTROL RESTORES

L. POST ANAESTHETIC INTRA-ORAL LESION

- OCCURS 2 DAYS POST INJECTION
- CAUSES:
  - RECURRENT APHTHOUS STOMATITIS- MOST COMMONLY PRESENT OF MOVABLE MUCOSA
  - HERPES SIMPLEX- MOST COMMON EXTRA-ORALLY AND OCCURS ON ATTACHED MUCOSA
  - TRAUMA TO TISSUES BY NEEDLE, LA, COTTON SWABS OR ANY INSTRUMENTS

- PROBLEM:
  - ACUTE SENSITIVITY
  - DEVELOPING SECONDARY INFECTION RISK IS LOW
- PREVENTION:
  - NOT POSSIBLE
  - HERPES SIMPLEX CAN BE MANAGED IF PRODROMAL SYMPTOMS ARE RECOGNISED AND TREATED ADEQUATELY
- MANAGEMENT:
  - SYMPTOMATIC, RESOLVES WITH OR WITHOUT TREATMENT WITHIN 10 DAYS
  - COVERING ULCERATED REGION
  - TOPICAL LA
  - MIXTURE OF DIPHENHYDRAMINE & MILK OF MAGNESIA → RELIEF FORM PAIN OVER ULCER

References

- *Monheim's local anaesthesia and pain control in dental practice 7th edition*
- *Malamed handbook of local anaesthesia 6th edition*


THANK
YOU
FOR
LISTENING
ANY QUESTIONS?

THE TRIGEMINAL NERVE

Department of Oral & Maxillofacial Surgery

NARSINHBHAI PATEL DENTAL COLLEGE AND HOSPITAL VISNAGAR

Guided By :

Dr. Arvind Agarwal , HOD and Professor

Dr.Anil Mannagutti , Professor

Dr.Shreedevi Bhat

Presented by: Dr. Harsh Patel

1st year PG

Contents:

INTRODUCTION

- The **largest** cranial nerve
- It is **mixed nerve** (sensory and motor)
- Sensory to – Skin of face
  - -Mucosa of cranial viscera
  - -Except base of tongue and pharynx
- Motor to –Muscles of Mastication
  - -Tensor ville palatini,Tensor tympany
  - -Anterior belly of digastric
  - -Mylohyoid

NUCLEI

TRIGEMINAL NUCLEI

- A **cranial nerve nucleus** is a collection of neurons (gray matter) in the brain stem that is associated with one or more cranial nerves.
- Axons carrying information to and from the cranial nerves form a synapse first at these nuclei.
- Lesions occurring at these nuclei can lead to effects resembling those seen by the severing of nerve(s) they are associated with.

SENSORY NUCLEI :

1.Mesencephalic nucleus

- Cell body of *Pseudounipolar* neuron
- Relay ***proprioception*** from muscles of mastication, Extra ocular Muscles, Facial muscles.
- Situated in Midbrain just latetral to Aqueduct.

2.Principal sensory nucleus-

Lies in Pons lateral to Motor nucleus

Relays ***touch*** sensation

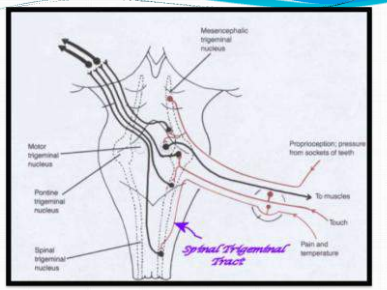
3.Spinal nucleus-

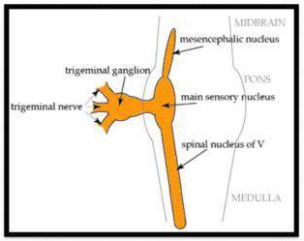
Extends from caudal end of principal sensory Nucles in pons to 2nd or 3rd spinal segment

It relys ***Pain*** and ***Temperature***

MOTOR NUCLEUS :

- Innervates **muscles of mastication** and **tensor tympani** **and** **tensor palatini**
- Derived from ***first branchial arch.***
- Located in pons medial to principle sensory nucleus.





FUNCTIONAL COMPONENTS

- ***Sensory Root***
- ***Motor Root***

SENSORY ROOT

GENERAL SOMATIC AFFERENTS- Face, Scalp, Teeth, Gingiva, Oral, Nasal, Cavities, Para nasal sinus, Conjunctiva and Cornea.

Pain, temp, light touch → Trigeminal gang.
touch, pressure → Trigeminal gang.
proprioception → Bypasses trigem gang.

Trigeminal gang. → sensory root.

sensory root. → Spinal nuc.
sensory root. → Principal sen nuc.
Bypasses trigem gang. → Mesencephalic

Spinal nuc. → CNS
Principal sen nuc. → CNS
Mesencephalic → CNS

MOTOR ROOT

CNS

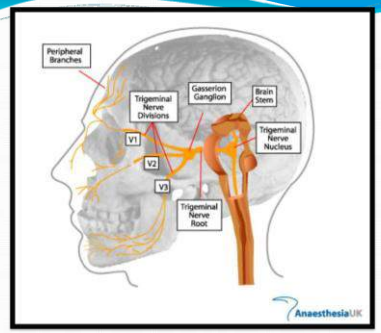
MOTOR NUCLEUS

MOTOR ROOT

MANDIBULAR NERVE

Muscles of mastication
- Masseter
- Lateral & Medial Pterygoids
- Temporalis

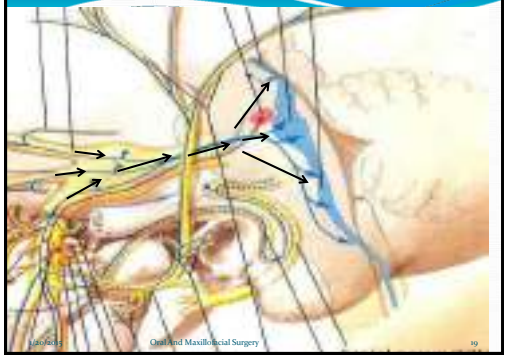
Tensor tympani
Tensor palatini

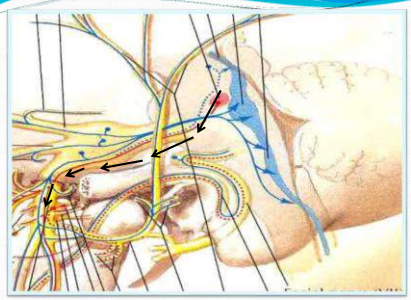


COURSE & DISTRIBUTION

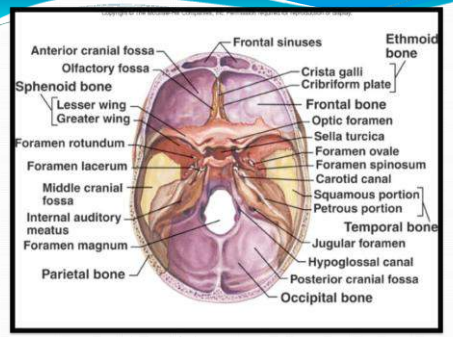
- Both motor and sensory root are attached ventrally to junction of pons and middle cerebellar peduncle with motor root lying ventromedially to the sensory root.
- Pass anteriorly in middle cranial fossa to lie below tentorium cerebelli in cavum trigeminale, here motor root lies inferior to sensory root.

- Sensory root connected to postromedial concave border of the trigeminal ganglion.
- Convex antrolatateral margin of the ganglion gives attachment to the 3 div. Of the trigeminal nerve.





- Motor root turns further inferior with sensory component of V3 to emerge out of foramen ***Ovale*** as Mandibular nerve.
- Ophthalmic and Maxillary division emerges through ***Superior orbital fissure*** and foramen ***Rotundum*** respectively.

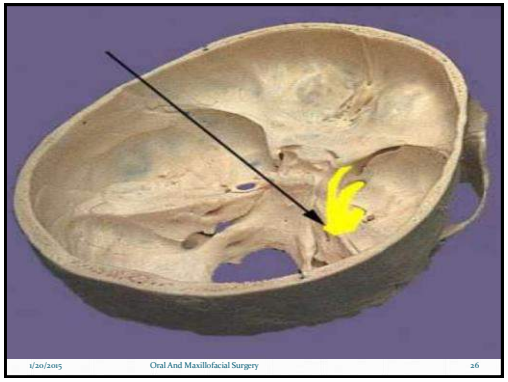


GANGLION

THE TRIGEMINAL GANGLION

- SEMILUNAR OR GASSERIAN GANGLION.
- Cresentric in shape with convexity anterolaterally.
- Contains cell bodies of pseudounipolar neurons.
- LOCATION: lies in a bony fossa at apex of the petrous temporal bone on floor of middle cranial fossa, just lateral to posterior part of lateral wall of the cavernous sinus.

- **COVERINGS**: covered by dural pouch = MECKLES CAVE or CAVUM TRIGEMINALE.
  cave lined by pia and arachnoid thus the ganglion is bathed in **CSF**.
- **ARTERIAL SUPPLY**: Ganglionic branches of Internal Carotid Artery, middle meningeal artery and accessory meningeal artery.



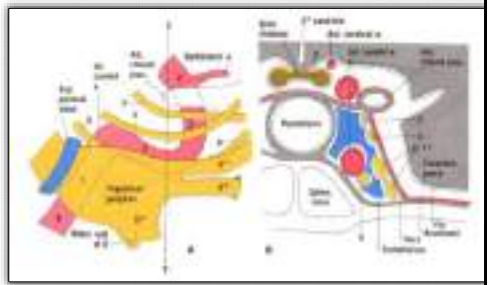
RELATIONS:

SUPERIORLY: *superior petrosal sinus
*free margin of tentorium cerebelli

INFERIORLY: *motor root
*greater petrosal nerve
*petrous apex
*foramen lacerum

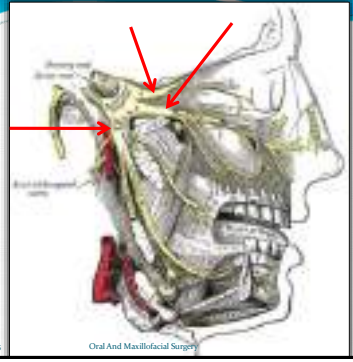
MEDIALLY: *posterior part of lateral wall of cavernous sinus
*Internal Carotid Artery with its sympathetic plexus

LATERALLY: *uncus of temporal lobe
*middle meningeal artery and vein
*nervous spinosum



DIVISIONS OF TRIGEMINAL NERVE

1. Ophthalmic nerve
2. Maxillary nerve
3. Mandibular nerve



OPTHALMIC NERRVE

OPHTHALMIC NERVE

- Smallest division.
- Sensory only
- Supplies : eyeballs, conjunctiva, lacrimal gland, mucosa of nose and paranasal sinus, skin of forehead eyelid and nose

- Course:

emerges from trigeminal ganglion

↓

lat wall cavernous sinus

↓

3 branches in ant part of cavernous sinus

↓

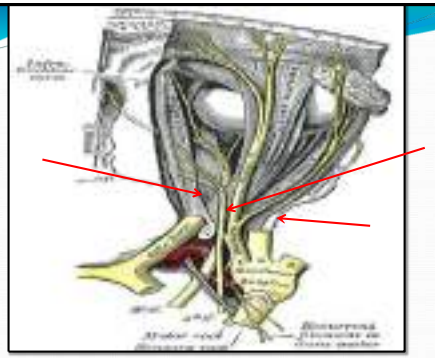
lacrimal, nasociliary, frontal

↓

superior orbital fissure

↓

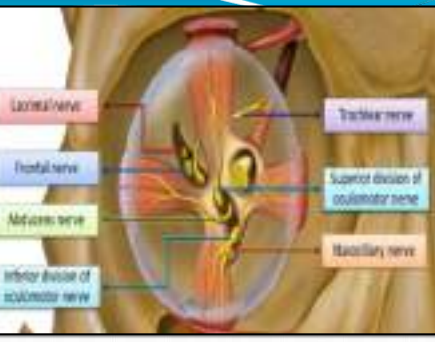
orbit



LACRIMAL NERVE

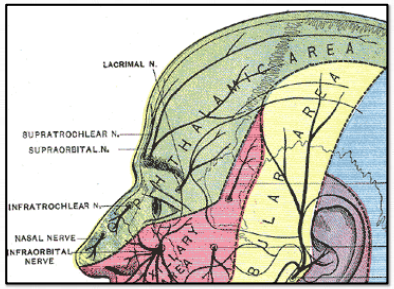
- Smallest
- Passes into orbit through lateral compartment of the Superior orbital fissure outside the tendinous ring.
- Receives communicating branch from Trochlear nerve branch of Opthalmic

- Receives branch from Zygomaticotemporal nerve branch of maxillary
- Sensory to lateral conjunctiva, Upper Lid, lacrimal gland
- Post synaptic parasympathetic fibers from pterigopalatine ganglion to lacrimal gland (parasym secretomotor).



FRONTAL NERVE

- Largest
- Enters orbit through lateral part of superior orbital fissure outside tendinous ring
- Passes forward between roof of orbit and Levator Palpebral Superioris
- Divides midway into :
  - **Supratrochlear Nerve**
  - **Supraorbital Nerve**

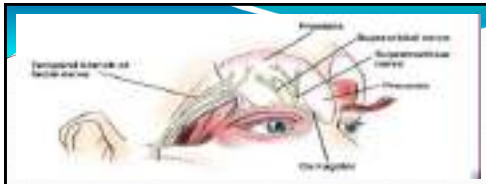


SUPRATROCHLEAR N

- Smaller nerve
- Medial branch
- Receives communication branches from infratrochlear nerve
- Curves around superomedial margin of orbit

SUPRAORBITAL N

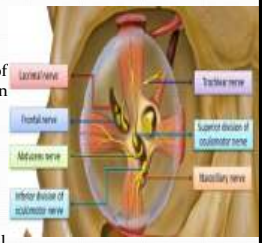
- Larger nerve
- lateral branch
- Passes through supraorbital notch
- Divides in medial and lateral branches.



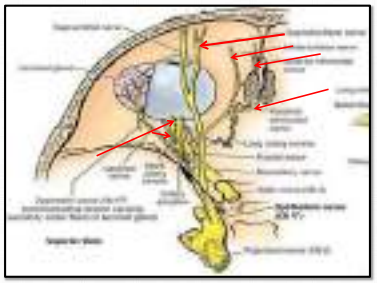
- supplies: median conjunctiva, Upper Lid and lower part of forehead
- Lies between frontalis and corrugator supercilliary muscles
- Lies beneath frontalis muscle
- Supplies: conjunctiva, scalp upto vertex , mucous membrane of frontal sinus

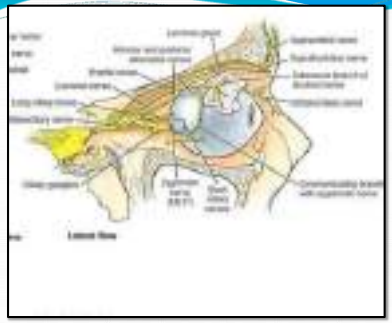
NASOCILLIARY NERVE

- Purely **Sensory**
- Passes through middle part of superior orbital fissure within the tendenious ring .
- Runs along medial wall of orbit between Superior Oblique and Medial Rectus
- Divides into Anterior Ethmoidal and External Nasal
- 5 branches in orbit.



1. **Short Cliiary Nerves**: Fibers reaches eyeball and also contains fibers from Cilliary Ganglion
2. **Long Cilliary Nerves** : 2 or 3in no. supply to Iris and Cornea.
3. **Post Ethmoidal Nerve**: passes through posterior ethmoidal foramen to supply the Ethmoid and Sphenoid PNS.
4. **Infratrochlear Nerve**: appears on face above med angle the eye. Supplies to skin of lacrimal sac and caruncle.





5. **Anterior Ethmoidal Nerve:**

larger terminal branch

Course: anterior ethmoidal foramen and canal

↓

into anterior cranial fossa on sup surf of cribriform plate

↓

Through slit lat to crista galli into nasal cavity

↓

Med internal nasal branch Supplies ant nasal septum

lat internal nasal branch supplies ant part lat nasal cavity emerges as external nasal nerve to skin of ala,vestibule,and tip of nose

Ganglia Associated With The Trigeminal Nerve

1. **Cilliary Ganglion**: connected with nasocilliary nerve by ganglionic branches in orbit,
   non synapsing
   sensory for orbit

2. **Pterygopalatine Ganglion**: connected to maxillary nerve in infratemporal fossa
   sensory to orbital septum, orbicularis and nasal cavity, max sinus, palate, nasopharynx.

3. **Otic Ganglion**: betwn trunk of mandibular n and tensor palatini, nerve to med pterygoid passes thru but does not synapse in the ganglion.

4. **Submandibular Ganglion**: related to lingual n, rests on hypoglossus
   supplies post gang. Parasym secretomotor fibres to submandibular and sublingual gland.

CUTANEOUS DISTRIBUTION OF TRIGEMINAL NERVE

Each half of face is supplied by 13 cut N

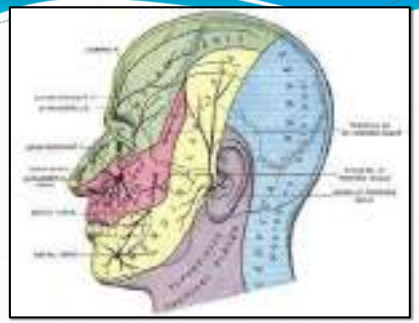
1motor and 12 sensory

Of 12 sensory : 11 are from trigeminal N

1 is c2 greater auricular N

Branches of trigeminal N

5 from ophthalmic: lacrimal
supraorbital
supratrocheal
infratrochlear
external nasal



3 from maxillary N: infra orbital N
zygomaticofacial N
zygomaticotemporal N
3 from mandibular N: buccal N
auriculotemporal N
mental N

DIVISIONAL SUPPLY:
From lat canthus to vertex- ophthalmic N
From angle of mouth to vertex- mandibular N
Between the two areas-maxillary N

Examination of trigeminal nerve

Examination of trigeminal nerve

1 Sensation Function
2 Motor Function
3Corneal reflex
4- Test jaw jerk

- **Sensation function**

use sterile sharp item on forehead, cheek, and jaw
If any abnormality present we test the thermal sensation and light touch

- **Corneal reflex**
- a clean piece of cotton wool and ask the patient to look away gently touch the cornea with the cotton wool and the patient will blink.

- **Test jaw jerk**
- Doctor finger on tip of jaw, grip patellar hammer halfway up shaft and tap finger lightly usually nothing happens, or just a slight closure.

APPLIED ANATOMY

1. **Trigeminal Neuralgia – Tic Douloureux**

- Sudden, usually unilateral severe, brief, stabbing lancinating, recurring pain in the distribution of one or more branches of the 5th Nerve

2. **TRIGEMINAL NEUROPATHY**

- sensory loss of face or weakness of the jaw muscles
- causes- sjogren syndrome
- herpes zoster, leprosy
- meningioma,schwanomma

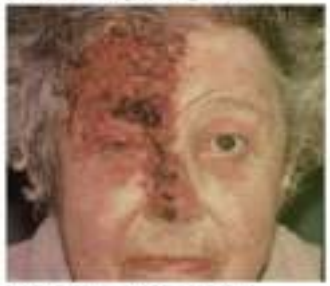
4. **HERPES ZOSTER OPHTHALMICUS:**

- Recurrent neurocutaneous inf. In opth. Div. of trigeminal dermatome, most freq. affecting nasociliary branch
- HHV3 / vericella zoster
- Gasserian ganglion

ophthalmic nerve

Supraorbital N.
Supratrochlear N.
Infratrochlear N.
Nasal N.

Infraorbital N.



5. Cavernous sinus syndrome

- Cavernous sinus syndrome
- Multiple cranial neuropathies
- Exophthalmos, ocular motor defects, sensory loss in V_1 and / or V_2.
- Pupils may be spared or involved.

causes: bacterial thrombophlebitis
actinomycosis
rhinocerebellar mucormycosis
aspergillosis
tolosa hunt syndrome
neoplasms
vascular lesions

6.Gradenigos syndrome

- Petrous bone osteitis due to otitis media
- Characterized by I/L trigeminal N palsy (Va, Vb)

  retro orbital pain

  I/L sixth N palsy.

Conclusion

- Since Trigeminal nerve is mixed nerve, suplies mainly head and neck region. Hence as a Oral and Maxillofacial surgeon one should know throughly about itracranial and extracranial course and distribution of Trigeminal nerve,to diagnose the pathologies associated with Trigeminal nerveand for appropriate treatment.

- Refrences:

Greys anatomy
Snells anatomy

Head and Neck Anatomy-BD Chourasia
Textbook of Local Anesthesia-Stenly F Malamed

THANK YOU