# Physical and chemical Injuries of the Oral Cavity

Shafer's 6th ed.
Pg 517

Physical → Iatrogenic
→ Self inflicted
→ traumatic
→ occupational.

Chemical ← Environmental – toxic chemical in water air
← consumables
← Restorative materials – Dental Practice

## (1) ASSOCIATED WITH TOOTH PREPARATION

✓ Tooth Preparation itself → Heat generated by friction
→ Cutting of odontoblastic process
→ Drying of dentin
→ Vibration
→ Removal of minerals
→ Exposure of organic matrix.

✓ Effect of Rotary instruments

Reaction of Pulp to injury : (A) Mild reaction – odontoblast distorted
– ↓ in number.
– Small vacuoles develop
– Clymph exudate
– Capillaries prominent (damaged)

(B) Severe injury
– disorganization of odontoblastic layer
– Hemorrhage in odontoblastic layer.

(C) More serious injury
PMNL infiltrate → later replaced by Lymphocytes

Temperatures over 700°F have been recorded on cutting surfaces of stones and burs under abrasive conditions

→ Best technique 300,000 rpm + air water spray No. 35 Carbide bur also caused ↑↑ reparative dentin formation.

EFFECT of LASERS

→ $CO_2$ laser and Neodymium : Yttrium – aluminium garnet (Nd:YAG) lasers are most commonly used.

. enamel : Glass like fusion (sometime chalky spots, holes or craters)
Dentin : Charred Crater
Pulp :- Hemorrhagic necrosis with acute and chronic inflammatory cell infiltration

EFFECT OF HEAT ✓ – odontoblastic layer – Coagulation necrosis.

SMEAR LAYER is an Amorphous micro layer deposited on prepared tooth surfaces and consists of inorganic enamel and dentin debries, organic pulp materials, dentinal fluid, bacteria and saliva
Thickness 1 µm to 5 µm.

- If the remaining thickness of Primary dentin is less than 2.0mm it is necessary that a cement base of one type or another may be utilized.

## EFFECT OF RESTORATIVE MATERIAL

Zn oxide Eugenol : least injurious of all filling material to the dental pulp. Eugenol :
- ⊣ Fixes cell
- ⊣ ↓ cell respiration
- ⊣ ↓ neural transmission
- ⊣ ↓ synthesis of prostaglandins and Cellulation

Self Polymerizing acrylic resin
- ⊣ mild reaction to pulp
- ⊣ shrink considerably so cause bacteria and saliva ingress in interface.
- ⊣ some contain Methacrylic acid resulting in formation of EDEMA BLISTERS of Pulp.

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- If a reparative dentin is not formed within first 50 days following a restorative procedure, then there will be none
- 20 post operative days are required for new odontoblasts to differentiate and produce dentin
- 100 productive days of matrix formation are required to produce a reparative dentin barrier of 0.15 mm

## PHYSICAL INJURIES OF THE TEETH

→ Bruxism (Night grinding) habitual grinding or clenching of teeth either during sleep or as an unconscious habit Incidence (5-20%)

Etiology mild occlusal disturbances, GI disturb., Nutritional deficiency, allergies, PSYCHOLOGIC Factors (Most common cause) ↑ anxiety stress tension

Occupation (voluntary bruxism)

(C/F) occlusal, interproximal wear → sensitivity, wear facets bilaterally TMJ disturbances, HYPERTROPHY OF MASSETER MUSCLE

(Rx) Botulinum toxin, Night guards/splints

## TOOTH FRACTURES

Children > adults 75-90% in maxillary teeth.
Boys > Girls

Root # are uncommon in young child
↳ more common 10-20 years of age involve MIDDLE 3rd of root and horizontal in nature

Histologically repair is being done by connective tissue cells of both PULP and PDL.

### ELLIS CLASSIFICATION

1. → Simple Crown fracture little or no dentin involved
2. → Extensive fracture Dentin ⊕ Pulp ⊖
3. → " " Dentin ⊕ Pulp ⊕
4. → Non vital tooth with or without loss of structure
5. → Teeth lost due to trauma
6. → Root fracture ~~⊕~~ loss of Crown structure ⊕/⊖
7. → Displacement of a tooth without # of Crown or root
8. → # of Crown en masse and its replacement
9. → Traumatic injuries to DECIDUOUS TEETH (2)

# INJURIES TO SUPPORTING STRUCTURE OF TOOTH

① **CONCUSSION**: No visible damage to tooth, No displacement, No altered mobility
Crown normal, no occlusal disturbance, Pulp vital.
Characteristic finding: ↑ Sensitivity to percussion
℞ selective grinding to eliminate occlusal forces.

② **SUBLUXATION**: - Abnormal loosening of teeth due to Trauma
- mobile on palpation, bleeding at gingival margin crevice ↓ due to rupture of PDL
- In time become non-vital

③ **AVULSION**: Dislocation of teeth from its socket due to traumatic injury
- Ⓐ Partial: includes intrusion, extrusion, facial lingual etc displacement
- Ⓑ Total: Complete avulsion

℞ Partial :→ repositioning and splinting
Total → Reimplantation

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## ANKYLOSIS

- Less common in deciduous, rare in permanent
- dull muffled sound rather than normal sharp sound on percussion
- loss of PDL space.

# PHYSICAL INJURIES OF THE BONE

## FRACTURES OF JAWS (Classification)

- Simple → Bone broken completely, structures overlying not intact and not exposed
- Greenstick → CHILDREN Break of bone on one side and bend on other side
- compound → EXTERNAL WOUND is associated with ## (RTA common)
- comminuted → Bone Crushed or splintered → may or may not be exposed

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## FRACTURES OF MAXILLA (more serious than mandible)

**Le Fort I** → Horizontal fracture, floating fracture.
Separation of body of maxilla from skull base BELOW THE LEVEL OF ZYGOMATIC PROCESS

**LE FORT II** → Vertical fractures, Pyramidal fracture
Through the FACIAL ASPECT OF MAXILLA and extend upward to the nasal ethmoid and ~~as~~ bones and usually extends through the maxillary sinus.

**LE Fort III** → Transverse Fracture, high level fracture
extends across the orbits, through the base of the nose and ethmoid region to the zygomatic arch. Bony orbit is fractured and lateral rim separated at zygomaticofrontal suture. Zygomatic arch fractured

**Skull involvement shows**: unconsciousness, CSF Rhinorrhea, Cranial nerve involvement

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## FRACTURES OF MANDIBLE

Cause common: RTA, Physical violence
Most Commonly involve ANGLE OF MANDIBLE → Condyle → molar region → Mental region → Symphysis.

## TRAUMATIC CYST

(Idiopathic bone cavity) (Solitary bone cyst, hemorrhagic cyst, unicameral bone cyst, simple bone cyst)

- Pseudocyst. Pathogenesis: Trauma → Hemarrhage (intramedullary) → Clot → Clot breaks down → leaving empty cavity → Steady expansion occurs secondary to altered or obstructed lymphatic or venous drainage

→ Expansion stops when cyst like lesion reaches the cortical layer of bone

average age: Young adult 18 years (Pulp vital in most of the teeth in involved area)
site: Post portion of mandible

Cavity contents: may contain: → Sero sanguinous fluid
→ Shreds of necrotic blood.
→ Fragments of fibrous C.T or nothing

R/F Smoothly outlined area with sclerotic borders when involve root of the teeth then SCALLOPED or lobulated

Traumatic cyst usually lies above the mandibular canal while stafne cyst is usually located below to it.

(H/F) Thin connective tissue membrane or no membrane
- Extensive osteophytic reaction at entire outer surface of cortical plate
- RBCs, Giant cells and blood pigments adhering to bone surface

(Rx) Induce fresh bleeding → filling of spaces followed by healing in 6–12 months

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## (RADIOLUCENT) FOCAL OSTEOPOROTIC BONE MARROW DEFECT

- Hyperplastic bone marrow other than normal sites of L/g mandible or maxillary tuberosity
- Two theories: 1) Hyperplastic marrow 2) abnormal healing after extraction.
- women, mandible more common, (H/F long thin trabeculae)

NO OSTEOSCLEROTIC BORDERS, Poorly defined periphery.

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## SURGICAL CILIATED CYST OF MAXILLA

- Implantation type of cyst formed by entrapment of maxillary sinus epithelium during surgery.
- Also called SINUS MUCOCELE, when infected called mucopyocele

# PHYSICAL INJURIES OF SOFT TISSUES

## LINEA ALBA

- white, from commissures posteriorly at the level of occlusal plane. usually Bilateral.
- Histologically Hyperkeratosis with intracellular edema of epithelium is seen.

## TRAUMATIC ULCER (Decubitus Ulcer).

- lateral border of tongue (due to own ~~bite~~ bite) most common site
- Buccal mucosa also common

## Traumatic Ulcerative Granuloma with stromal eosinophilia (TUGSE)

Pathogen: T cell mediated. Rigfede disease is also supposed to be its variant

## MORSICATIO LABIORUM: (Factitial Lip biting)
## MORSICATIOE BUCCARUM (Factitial Cheek biting)

] Seen in Pt. with Psychogenic stress

## SORE-SPOT → Traumatic ulcer caused by denture irritation

## EPULIS FISSURATUM: Irritational hyperplasia ~~due to~~ along the denture borders (flange area) due to ill fitting dentures

(H&E) Fibrous hyperplasia, "Plasma pooling" or "Mucopolysaccharide keratin dystrophy"
↓
homogeneous eosinophilic pools of material in superficial spinous layer of epithelium where it appears to have replaced individual cell.

## INFLAMMATORY PAPILLARY HYPERPLASIA (Palatal Papillomatosis)

Frictional irritation due to ill fitting dentures

## Mucous retention phenomena — lower lip

## Ranula → Floor of the mouth sublingual or submaxillary gland (Submandibular)

Plunging or cervical ranula

## SIALOLITHIASIS

| | |
|---|---|
| Submandibular gland / duct | 64%. |
| Parotid gland / duct | 20%. |
| Sublingual " / duct | 16%. |

If it involves minor salivary gland, most common is Upper lip

### Major component

Calcium phosphate

Submandibular gland stones are larger than parotid and other

# RADIATION INJURIES

Radiation < Electromagnetic radiation (infrared, visible, UV, x rays, radiowaves)
Particulate radiation (released from natural / artificial radioactive material, also generated by accelerating electrons, deutrons etc)

Radioactive elements of Radium, Uranium < α β → major component
γ → minor component.

- α Particles → Helium nuclei in rapid motion
  Have little ability to penetrate tissue, so give up energy at short distance.
- β Particles → negatively charged electron
  ↑ Penetrating Power

## General effect of Radiation on tissues

- Caused by ionization in living tissue / cells.
- Embryonic / immature / Poorly differentiated cells are more easily injured than mature or differentiated

| Radiosensitive (2500 R or less kills or seriously injures many cells) | Radioresponsive (2500 - 5000 R kills or seriously injures many cells) | Radioresistant (over 5000 R necessary to kill or seriously injure) |
|---|---|---|
| Eg Lymphocytes, Lymphoblasts | Skin epithelium, appendages | Kidney liver thyroid |
| Bone marrow (myeloid / erythroid) | Endothelium of Blood vessels | Pancreas Pituitary |
| Intestinal or gastric epithelia | Salivary glands | Adrenal, Parathyroid. |
| Germ cells (testis ovary) | Bone and cartilage (growing) | Mature bone and mature cartilage |
| | Conjunctiva, Cornea, lens of eye | muscle, brain, nervous tissue |
| | Collagen and elastic tissue. | |

## EFFECT ON ORAL and PARAORAL TISSUES

Following 350-450 rads of total body radiation following effect were noted.
- acute parotitis + partial xerostomia + oral mucositis which spontaneously resolved in first 24-48 hours

During 1 week → Saliva ↓, thicker, more mucoid
- ~~Mucositis lasted for 2-3 weeks (swelling → edema and whitening of mucosa)~~

within 48-72 hours entire oral cavity show reddening + Mucositis
↓
lasts for 2-3 weeks

## Effect of Radiation on skin

→ Earliest visible reaction is Erythema (within few days)
↓ fades away
Reappear within 3-4 weeks
↓
Fades slowly and leave a light tan → hyperpigmentation

Reepithelization occurs in 10-14 days
↑
Followed by denudation ← Fades slowly and leave a light tan → hyperpigmentation

→ ↓ in sebaceous gland secretion, dryness of skin (evident within a week)
→ Superficial blood vessels become telangiectic or occluded.
↓
Persist for month to years.
→ Thickening of intima

## Effect on oral mucosa

Same as skin but lower doses also cause.
- damage to taste buds → ie to microvilli and outer surface of taste cells
- taste sensation restored within 10-120 days

## Effect on Salivary gland

- Earliest manifestation Xerostomia. damage to acinar cells. almost no damage to ducts. ↓ in secretory granules
- Serous glands are more radiosensitive as compared to mucous
- ↑ in serum and urinary amylase levels

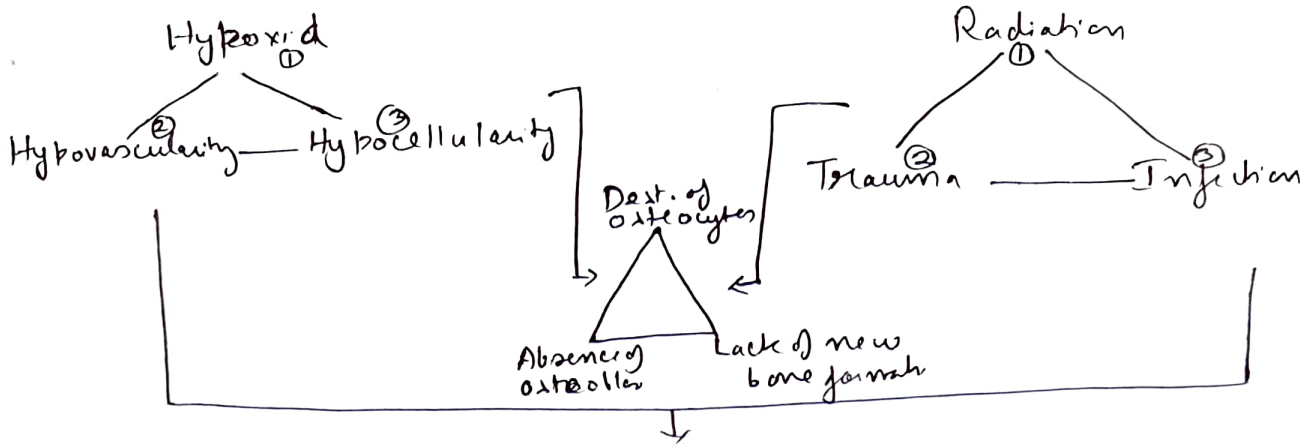
## Effect on teeth

- Radiation caries → cervical area (Amputation caries)
- Brittle tooth.
- disorganisation of odontoblast and formation of atypical dentin as compared to odontoblast
- ameloblasts are more resistant, but ↑↑ doses, they undergo metaplasia to less differentiated
→ Cause anodontia if radiation is given at an early stage

## Effect on bone

- relatively resistant.
if ↑ doses given general bone vitality decreased
- osteoblasts are sensitive
- damage to vascular bed
- Poor bone healing

Causes thickening of intima of blood vessels
↓
endarteritis obliterans and periarteritis
← Osteoradionecrosis
Radiation (> 7500 rads)
↓
Devitalised bone
↓
Sequestration (There is no CLEAR CUT line between vital and non-vital bone




Non healing dead bone
↓ followed by
Delayed sequestration (Intense pain)

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Stomatitis medicamentosa → drug allergy
~~Contact~~ Stomatitis venenata → Contact stomatitis

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Bismuth Pigmentation :- Gingiva and buccal mucosa
- Bismuth line : Blue black, marginal gingiva (gingival papilla) due to formation of Bismuth sulphide

Product of bacterial degradation of food debries. ← $H_2S$ + Bismuth (In oral tissues) → Bismuth sulfide (H/F remain as black granule Perivascular in location

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Dilantin induced gingival enlargement

→ develop within two weeks to 2-3 months
→ initially painless enlargement of one-two papilla.
↑ stippling, cauliflower, warty or pebbly surface
Little tendency to bleed (H/F) TEST TUBE RETEPEGS

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Nifedipine induced enlargement begins after 1-3 months of taking these drugs

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PLUMBISM (Lead poisoning)

- In adults chief mean of poisoning is through inhalation of lead vapours & dust
- occupational hazard. -
- characterized by - Gastro intestinal disturbances
  - Peripheral neuritis causing "Wrist drop" and "foot drop"
  - hypochromic anemia, basophilic stippling of RBCs.

Oral manifestation : - Bluish black line of lead sulphide pigmentation on gingiva
- metallic taste

## Mercury Poisoning < acute (mare serious) / chronic

- Gastrointestinal problems, fine tremors of fingers, tongue Lips
  Nephritis in acute mercurial poisoning
- ulceration on gingiva palate and tongue.
- Pigmentation of gingiva.

**Acrodynia**: mercury toxicity reaction (acute mercury Poisoning or idiosyncrasy)

Young infaints (< 2 years)

Pink disease

- hands, feet, nose ear - Pink colour
  cold clammy feeling
- Pruritic maculo-papular rash.
- Severe sweating

Oral manifestation
Profuse salivation, (drooling)
(Dribbling)
Bruxism

℞ administration of immediate chelation agent therapy

dimercaprol, D-Penicillamine, 2-3 dimercapto-1-Propanesulfonic acid

## Silver Poisoning (Argyria, argyrosis)

- Permanent pigmentation of skin
- appearence of Slate-blue silver line ~~on~~ along gingival margins.
- Pigmented sclera and nails

Amalgam tatoo: macules or slightly raised black, blue, grey lesion gingiva, buccal mucosa or alveolar mucosa