DISEASES OF PULP AND PERIAPICAL TISSUES

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INTRODUCTION

- Dental pulp is **delicate connective tissue** consisting of
  - Tiny blood vessels
  - Lymphatics
  - Myelinated and unmyelinated nerves
  - Undifferentiated connective tissue cells

- Like other connective tissues, pulp reacts to the bacterial infections or to other stimuli by an **inflammatory response known as pulpitis**
- Which causes odontalgia or tooth ache

Diseases of dental pulp

- **Etiology**

FACTORS		
PHYSICAL INJURY	**CHEMICAL INJURY**	**MICROBIAL FACTOR**
Acute Injury Injury on tooth Cavity preparation without water spray Vigorous polishing Root planning in PDL therapy Restoration – improper insulation **Chronic Injury** Attrition -abrasive food & bruxism Abrasion -abnormal tooth brushing	**Medicaments or materials applied to dentin diffuses through dentinal tubules.**	**Bacterial invasion by:** Dental caries Fractured tooth where exposed pulp Anachoretic infection due to presence of bacteria in circulating blood stream.

- **Anachoresis: is a phenomenon by which blood born bacteria, dye, pigments, metallic substances, foreign proteins, and other materials are attracted to the site of inflammation.**
- **Anachorretic pulpitis: bacteria circulating in the blood stream tend to settle at sites of pulpal inflammation, such as that which might follow some chemical or mechanical injury to the pulp**
- **This phenomenon is due to increased capillary permeability in the particular area.**

Pulpitis

- **Definition: inflammation of the dental pulp, which can be acute or chronic**

Types of pulpitis

-Acute

Reversible pulpitis
Irreversible pulipitis

- chronic

Opened
Closed (hyperplastic)

Acute reversible pulpitis

– **Etiology**

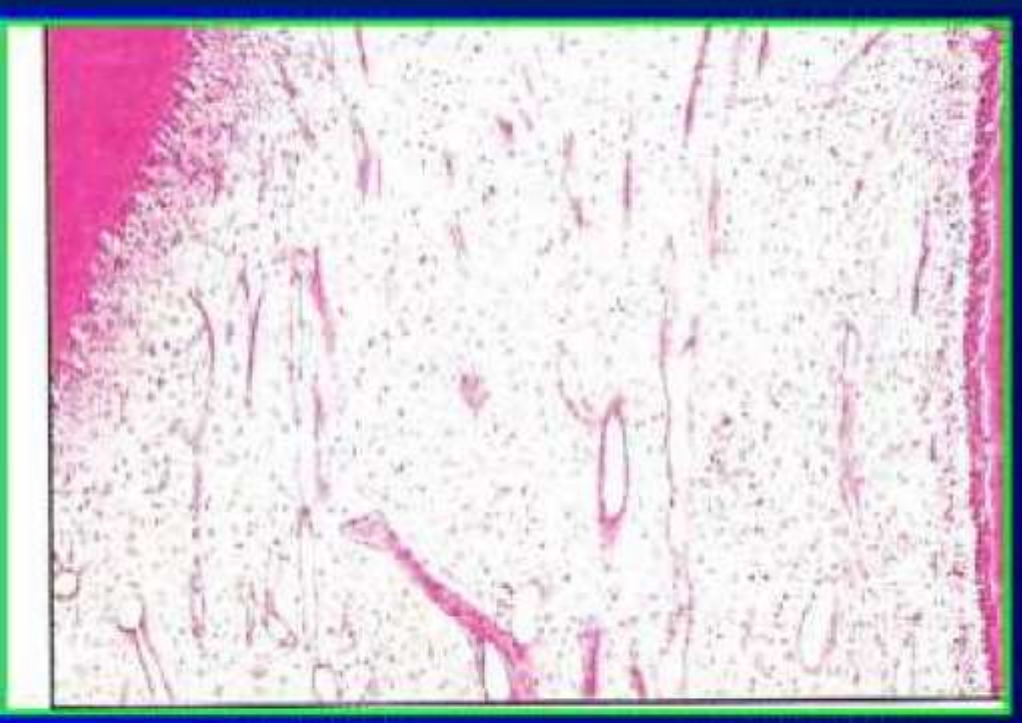
- **Dental caries**
- **Cavity preparation**
- **Thermal changes in large metallic fillings**

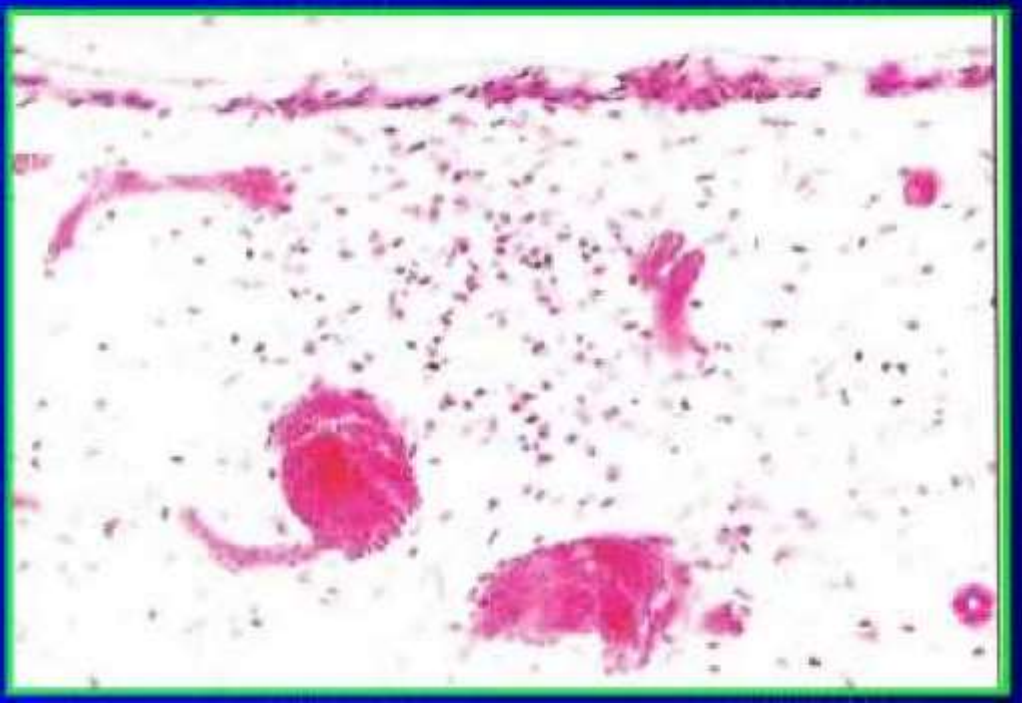
- **Clinical features**
- **Pain: mild to moderate**
- **The etiological factor is obvious**

- **Histopathological features**

  - **Pulp hyperemia (dilation of blood vessels)**
  - **Exudation**
  - **Inflammatory cell infiltration (neutrophils)**
  - **Reactions usually remain localized adjacent to the cause**

  - **Treatment: remove the cause**





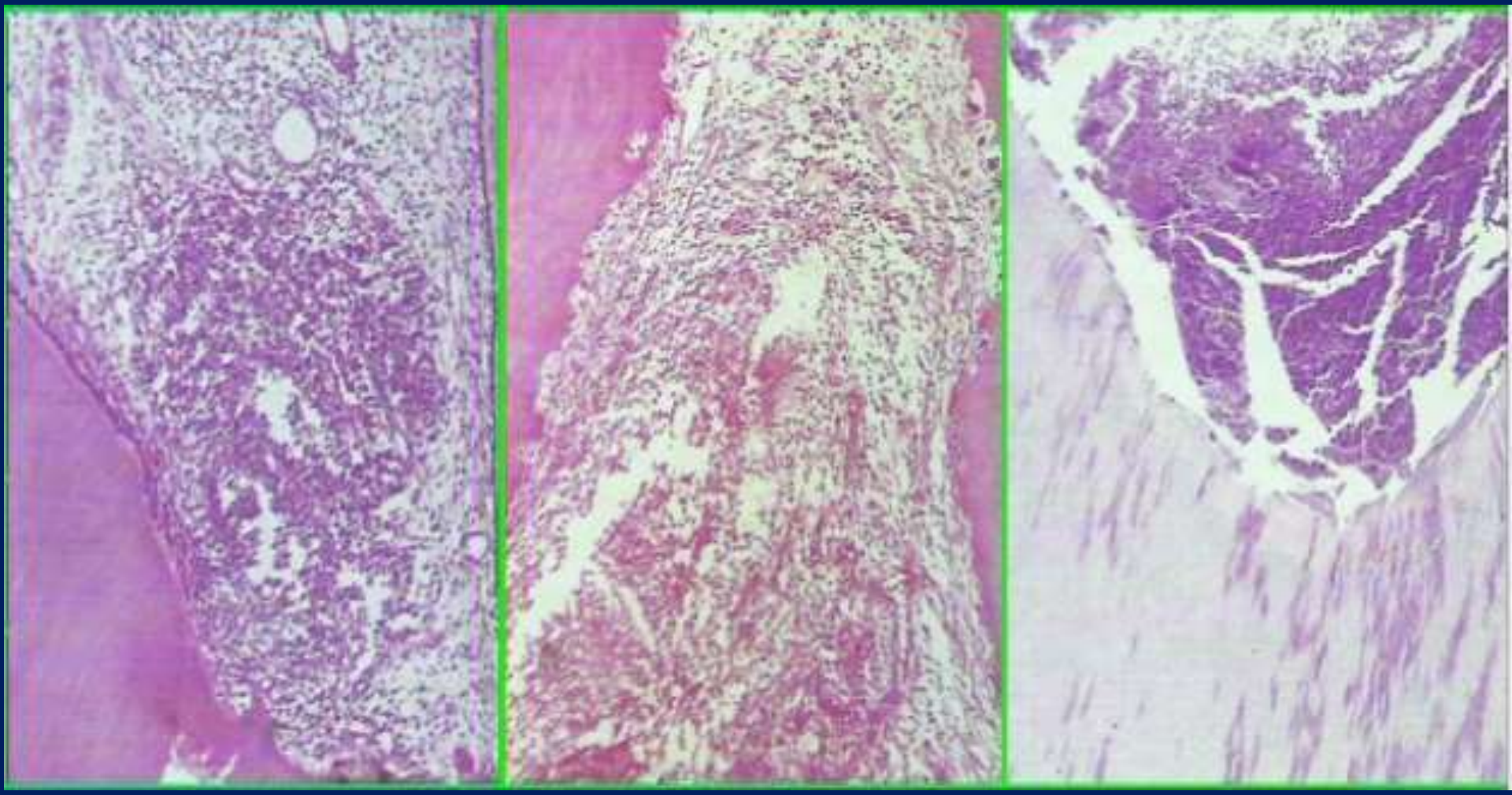
Acute irreversible pulpitis

- **Etiology**
- **Acute dental caries**
- **Pulp exposure**
- **Severe irritation**

- **Clinical features**
- **Pain: severe, spontaneous and continuous**
- **Little response to simple analgesics**
- **Pain increases when patient lies down**

- **Histopathological features**
- **Inflammation involves the whole dental pulp**
- **Vascular dilatation and edema**
- **Inflammatory (granular cells) infiltration**
- **Odontoblasts near to the cause are destroyed**
- **Formation of a minute pulp abscess**
- **In a few days pulp undergoes liquefaction and necrosis**

- **Treatment: RCT**



REVERSIBLE PULPITIS

- Mild – moderate inflammatory condition.
- Nature of pain is mild & diffuse.
- Brief duration & can be produce cold stimuli that elicits the pain mostly, although hot, sweet or sour food may also initiate the pain.
- Once stimulus is removed, pain is usually subsides.
- Tooth responds to electric pulp tester at lower currents.
- Reversible pulpitis if allowed to progress can led to irreversible pulpitis.

IRREVERSIBLE PULPITIS

- Sharp, severe, radiating pain of long duration & varying intensity.
- Pain continues even after the stimulus is removed.
- Pain may exacerbate with bending over or lying down.
- It may progress to more severe pain that is gnawing or throbbing.
- Increased by stimulus, like heat & at times relieved by cold although the cold may intensify the pain.
- When infection extends into PDL - apical periodontitis.

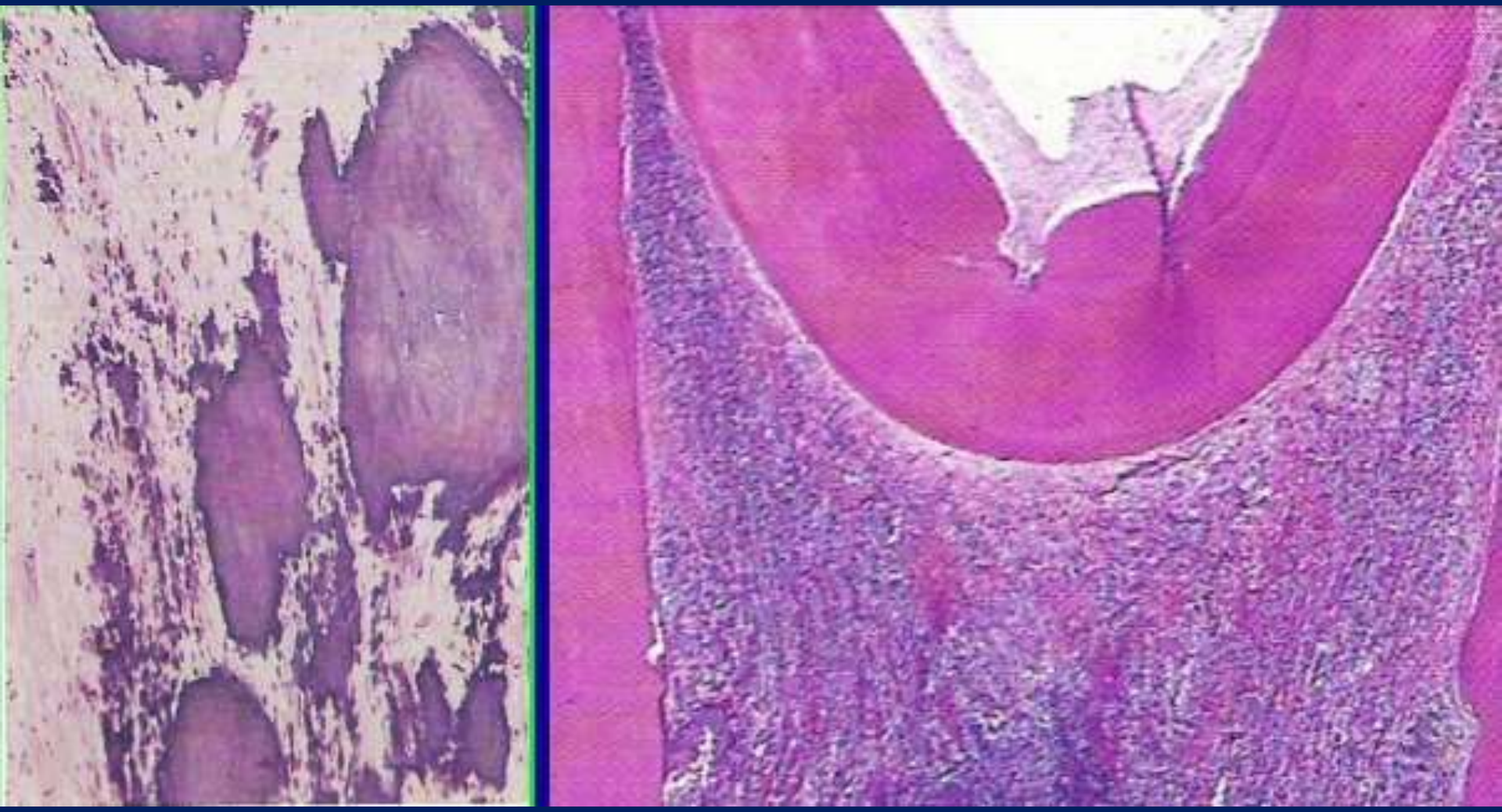
Chronic pulpitis

- **Etiology**
- **previous acute pulpitis**
- **Chronic dental caries**

- **Clinical features**
- **Pain: absent or mild to moderate, dull ache and intermittent**
- **Reaction to thermal changes is reduced in comparision to acute pulpitis**

- **Histopathological features:**
- **Mononuclear cell inflammatory infiltration**
- **Evidence of fibroblastic activity**
- **Minute abscess if exist it is localized by granulation tissue**

- **Treatment: RCT**



Chronic hyperplastic pulpitis
pulp polyp

- **Etiolog:**
- **Opened cavity**
- **Starts as chronic or acute**
- **Wide apical foramen (children)**

- **Clinical features:**
- **Red pinkish soft nodule protruding into the cavity**
- **Almost in children and young adults**
- **Relatively insensitive to manipulation**
- **Most common in deciduous molars**
- **Must be different from gingival polyp**

- **Histopathological features:**
- **The polyp surface is covered with stratified squamous epithelium.**
- **Epithelium may be derieved from gingiva or from freshly desqumated epithelial cell of mucosa or tongue.**
- **The polyp consists of granulation tissues**
- **It contains delicate connective tissue, fibers and blood vessels**
- **Mononuclear inflammatory cell infiltration**

- **Treatment:**
- **Rct or extraction of the teeth**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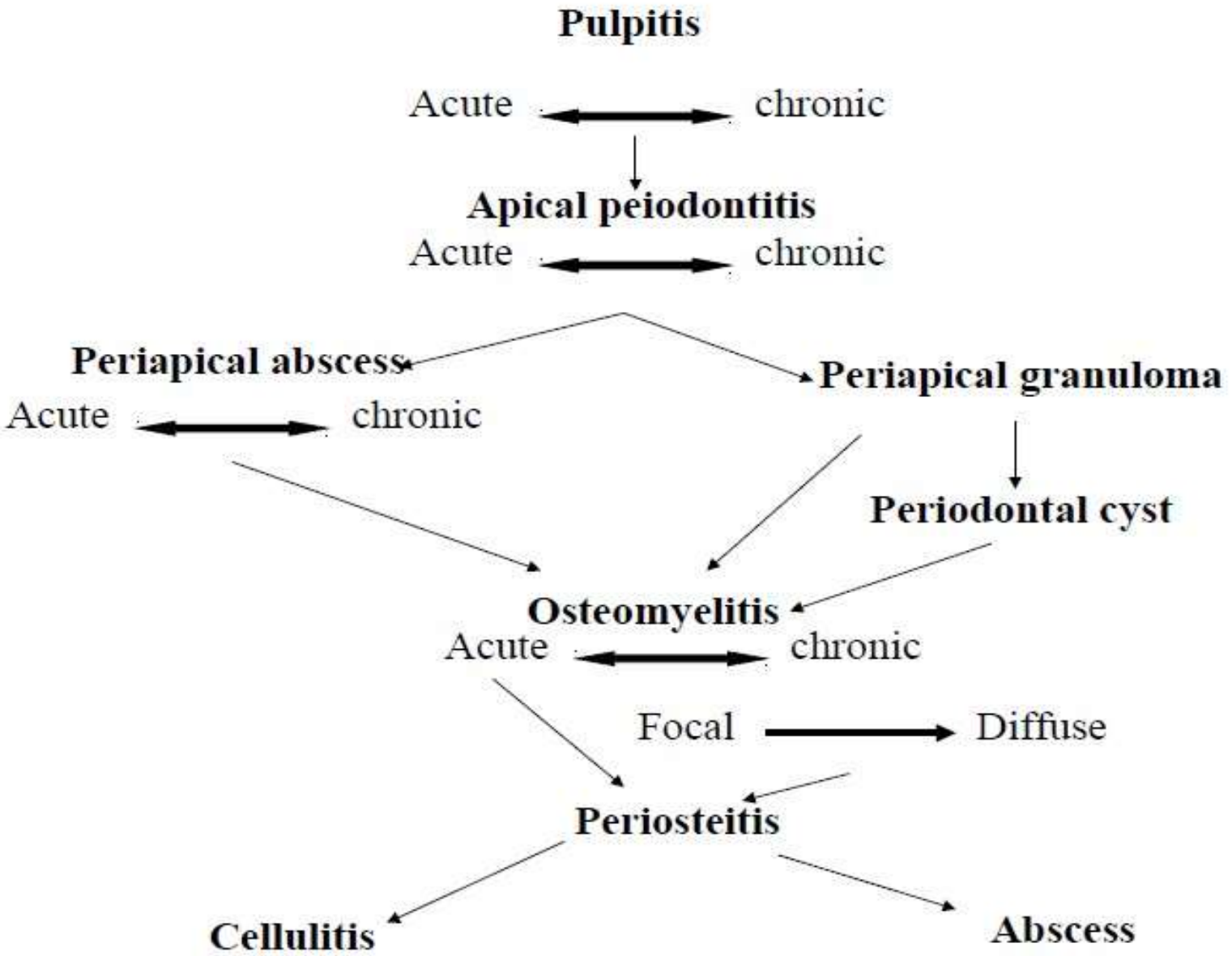
Sequelae of pulpitis



Diseases of periapical tissues

- Apical periodontitis
  - Acute
  - Chronic (periapical granuloma)
- Periapical abscess
- Residual cyst
- Osteomyelitus

Apical periodontitis

- **Inflammation of PDL around apical portion of root.**
- **Cause: spread of infection following pulp necrosis, occlusal trauma, inadvertent endodontic procedures etc.**
- **Types:**
  - **1.Acute Apical Periodontitis**
  - **2.Chronic Apical Periodontitis**

Acute apical periodontitis

- **CLINICAL FEATURES:**
- **Thermal changes does not induce pain.**
- **Slight extrusion of tooth from socket.**
- **Cause tenderness on mastication due to inflammatory edema collected in PDL.**
- **Due to external pressure, forcing of edema fluid against already sensitized nerve endings results in severe pain.**

- **RADIOGRAPHIC FEATURES:**
- **Appear normal except for widening of PDL space.**

- **HISTOLOGIC FEATURES:**
- **PDL shows signs of inflammation -vascular dilation infiltration of PMNs**
- **Inflammation is transient, if caused by acute trauma.**
- **If irritant not removed, progress into surrounding bone resorption.**
- **Abscess formation may occur if it is associated with bacterial infection Acute periapical abscess /Alveolar abscess.**

- **TREATMENT & PROGNOSIS:**
- **Selective grinding if inflammation due to occlusal trauma**
- **RCT**

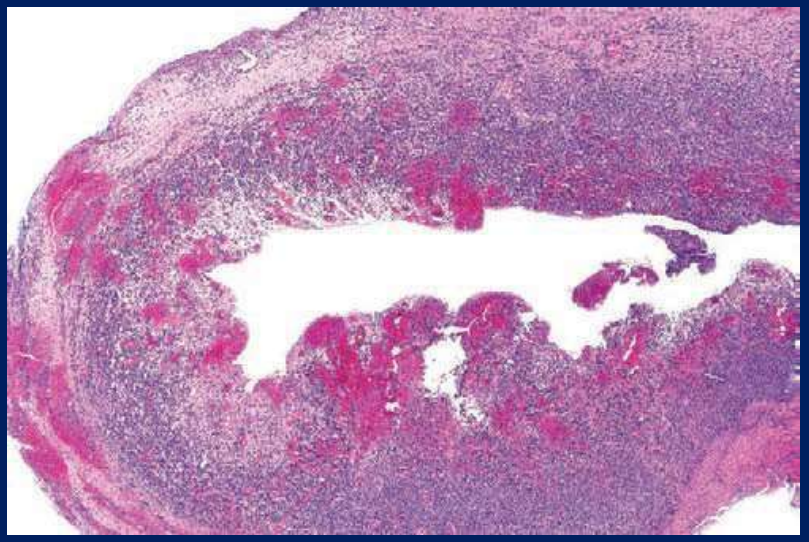
Chronic Apical Periodontitis (Periapical Granuloma)

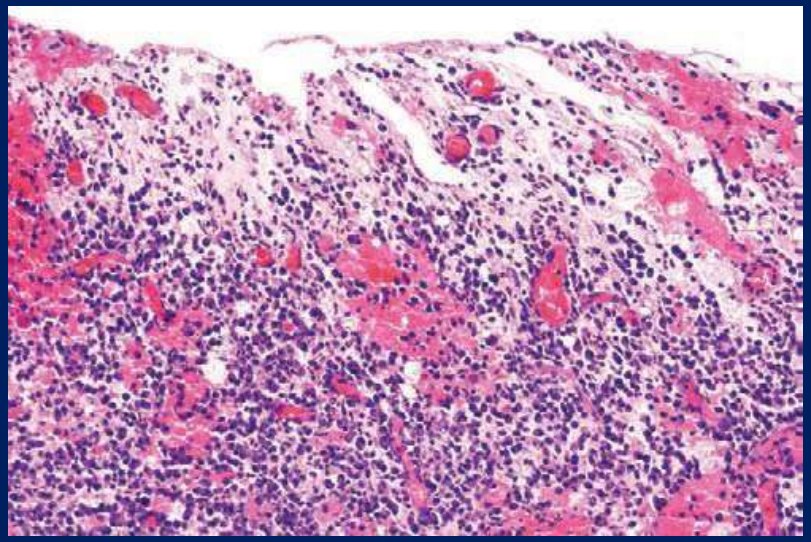
- Most common sequelae of pulpitis or apical periodontitis.
- If acute (exudative) left untreated turns to chronic (proliferative).
- Periapical granuloma is localized mass of chronic granulation tissue formed in response to infection.
- But term is not accurate since it doesn't shows true granulomatous inflammation microscopically.

- **CLINICAL FEATURES:**
- **Tooth involved is non vital / slightly tender on percussion.**
- **Percussion may produce dull sound instead metallic due to granulation tissue at apex.**
- **Mild pain on chewing on solid food.**
- **Tooth may be slightly elongated in socket.**
- **Sensitivity is due to hyperemia, edema & inflammation of PDL.**
- **In many cases, asymptomatic.**
- **No perforation of bone & oral mucosa forming fistulous tract unless undergoes acute exacerbation.**

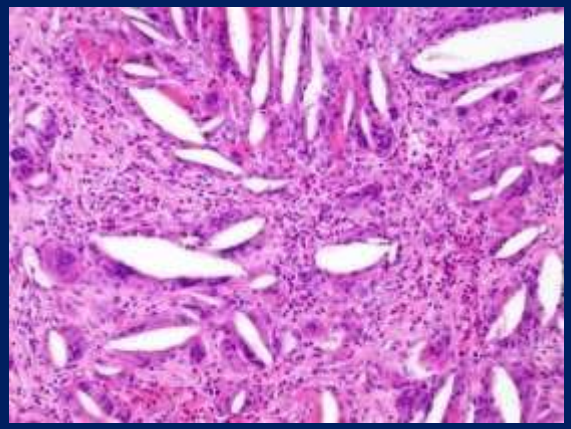
- **RADIOGRAPHIC FEATURES:**
- **Thickening of PDL at root apex.**
- **As concomoitent bone resorption & proliferation of granulation tissue appears to be radiolucent area.**
- **Thin radiopaque line or zone of sclerotic bone sometimes seen outlining lesion.**
- **Long standing lesion may show varying degrees of root resorption.**

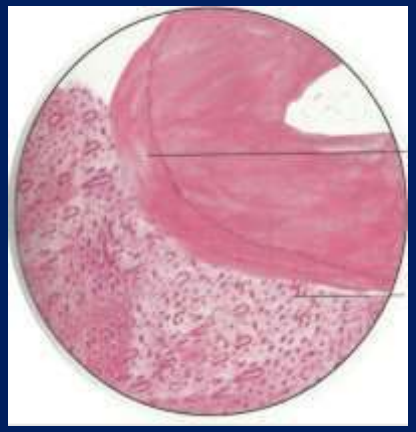
- **HISTOLOGIC FEATURES:**
- **Granulation tissue mass consists proliferating fibroblasts, endothelial cells & numerous immature blood capillaries with bone resorption.**
- **Capillaries lined with swollen endothelial cells.**
- **Its is relatively homogenous lesion composed of macrophages, lymphocytes & plasma cells.**
- **Lymphocytes produces IgG, IgA, IgM & IgE modulators of disease activity.**
- **Plasma cells containing Russels body are found extracellularly.**





- T lymphocytes produce cytotoxic lymphokines, collagenase & other enzymes & destructive lymphokines.
- Collection of cholesterol clefts, with multinuclear gaint cells.
- Epithelial rests of Malassez may proliferate in response to chronic inflammation & may undergo cystification.





- Bacteriologic Features:
- Strep. viridans, strep. Hemolyticus, non hemolytic strep, staph. aureus, staph. Albus, E coli & pnemococci are isolated from lesion.

- TREATMENT & PROGNOSIS:
- Extraction or RCT with / without apicoetomy.

- **Residual Cyst**
- **Type of inflammatory odontogenic cyst in edentulous alveolar ridge.**
- **Occur due to extraction of tooth, leaving periapical pathology untreated or incomplete removal of periapical granuloma /cyst.**

- **RADIOGRAPHIC FEATURES:**
- **Round /ovoid radiolucency in alveolar ridge.**
- **Lumen may show radiopacity - dystrophic calcification**

- **TREATMENT & PROGNOSIS:**
- **Cyst should curetted & lining should be subjected to histopathological examination.**

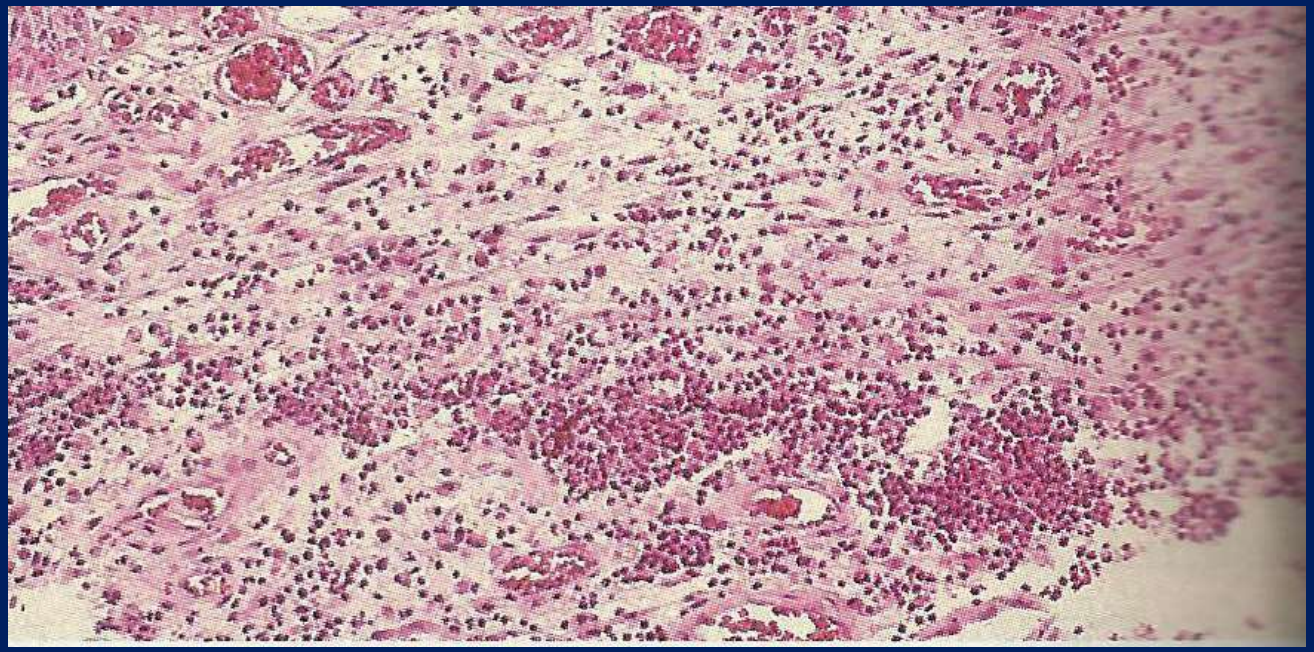
Periapical Abscess
(Dento-Alveolar abscess, Alveolar Abscess)

- Developed from acute periodontitis / periapical granuloma.
- Acute exacerbation of chronic lesion **Phoenix Abscess**
- Cause due to – pulp infection, traumatic injury pulp necrosis, irritation of periapical tissues (endo procedures).

- **CLINICAL FEATURES:**
- **Features of acute inflammation.**
- **Tenderness of tooth, which relives after pressure application.**
- **Extreme painful tooth extrude from socket.**
- **Extension to bone marrow spaces produce osteomyelitis, but clinically considered as Dento-Alveolar abscess – swelling of tissues.**
- **Chronic abscess generally presents no features, since it is mild, well circumscribed area of suppuration which spread from local area.**

- **RADIOGRAPHIC FEATURES:**
- **Slight thickening of PDL space.**
- **Radiolucent area at apex of root.**

- **HISTOLOGIC FEATURES:**
- **Area of suppuration composed of PMN leukocytes, lymphocytes, cellular debris, necrotic materials & bacterial colonies.**
- **Dilation of blood vessels in PDL & bone marrow space.**
- **Marrow space show inflammatory infiltrates.**
- **Tissue around area show suppuration containing serous exudate.**



- **TREATMENT & PROGNOSIS:**
- **Drainage of abscess by opening pulp chamber or extraction.**
- **RCT.**
- **If untreated, causes osteomyelitis, cellulites & bacteremia & formation of fistulous tract opening to oral mucosa.**
- **Cavernous sinus thrombosis has been reported**

Osteomyelitis

- **The word "osteomyelitis" originates from the ancient Greek words osteon (bone) and muelinos (marrow) and literally means infection of medullary portion of the bone.**
- **Inflammation process of the entire bone including the cortex and the periosteum.**

- Predisposing factors
- Local factors (decreased vascularity/ vitality of bone)
  - Trauma
  - Radiotherapy
  - Pagets disease
  - Osteoporosis
  - Major vessel disease

- Systemic factors (impaired host defence)
  - Immune deficiency
  - Immunosupression
  - Diabetes mellitus
  - Malnutrition
  - Extremes of age

Classification Of Osteomyelitis

- Based on the duration
- 2 major groups
  - Acute
  - Chronic
- Suppurative osteomyelitis
  - Acute suppurative osteomyelitis
  - Chronic suppurative osteomyelitis
- Non suppurative osteomyelitis
  - Chronic focal sclerosing osteomyelitis
  - Chronic diffuse sclerosing osteomyelitis
  - Garres chronic scelrosing osteomyelitis (proliferative periostitis)

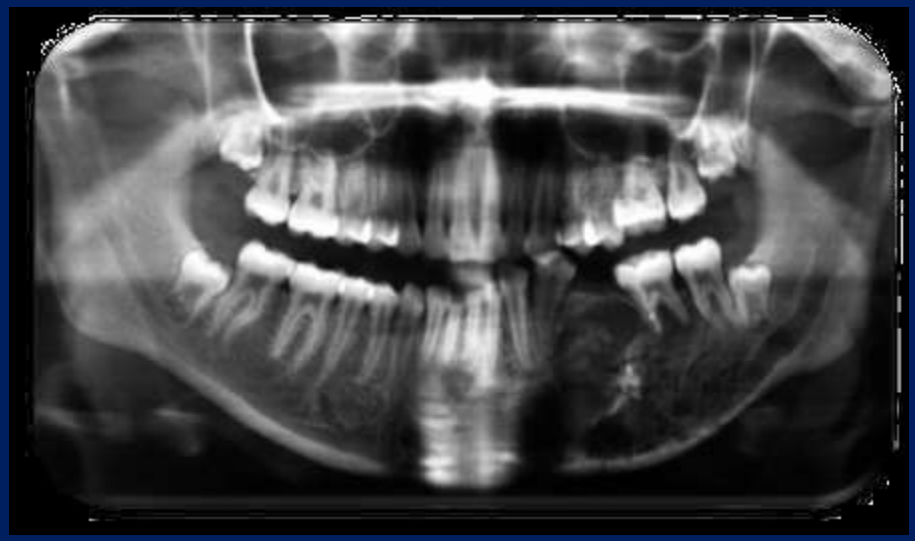
Acute suppurative osteomyelitis

- Serious sequela of periapical infection that often results in diffuse spread of infection throughout the medullary spaces, with subsequent necrosis of variable amount of bone.
- Poly microbial
- Most common cause : Dental infection
- Other causes : Infection due to fracture of jaw, gun shot, or hematogenous spread

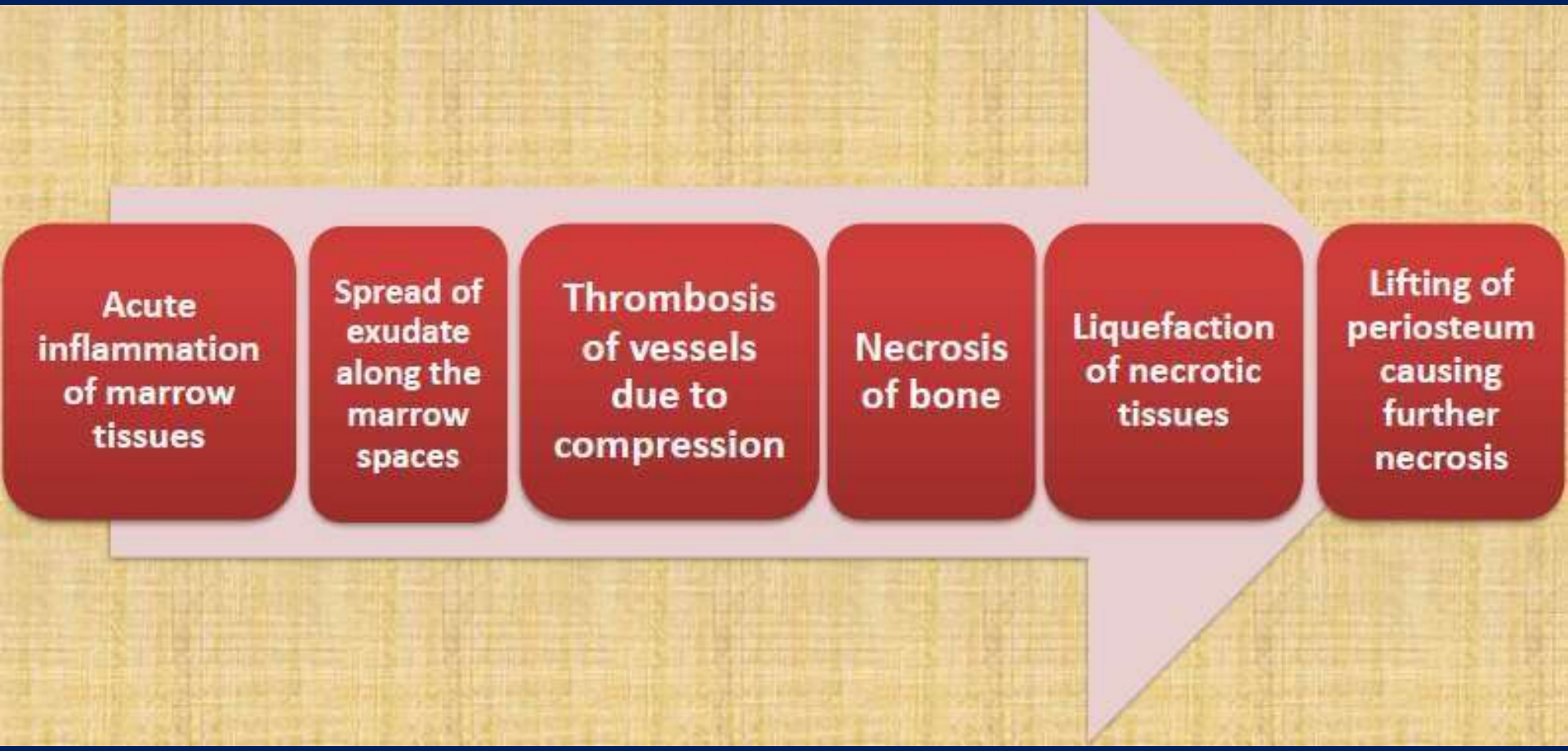
- **Clinical features**
- **Maxilla : localized ; Mandible : Diffuse and widespread**
- **Sever pain**
- **Trismus**
- **Parasthesia of lips in case of mandibular involvement**
- **Elevation of temperature**
- **Regional lymphadenopathy**
- **Loosening of teeth and exudation of pus from gingiva**
- **No swelling and redness till periostitis develops**

- **Radiographic features**
- **No Radiographic evidence of its presence until the disease has developed for atleast one to two weeks**
- **Trabeculae becomes fuzzy and indistinct**

Ill defined margins



Moth Eaten Appearance


Acute inflammation of marrow tissues
Spread of exudate along the marrow spaces
Thrombosis of vessels due to compression
Necrosis of bone
Liquefaction of necrotic tissues
Lifting of periosteum causing further necrosis

- **Histological features**
- **The inflammatory cells are chiefly neutrophilic polymorphonuclear leukocytes but may show occasional lymphocytes and plasma cells**
- **Osteoblasts bordering the bony trabeculae are destroyed**
- **Trabeculae may lose their viability and begin to undergo slow resorption**

- **Treatment and prognosis (Essential measures)**
- **Bacterial sampling and culture**
- **Emperical antibiotic treatment**
- **Drinage**
- **Analgesics**
- **Specific antibiotic based on culture and sensitivity**
- **Debridement**
- **Remove source of infection, if possible**

- **Adjunctive treatment**
- **Sequestrum - If small, exfoliates through mucosa, If large, surgical removal – sequestrectomy, decortication**
- **Involucrum : When Sequestrum is surrounded by new living bone**
- **Hyperbaric oxygen**

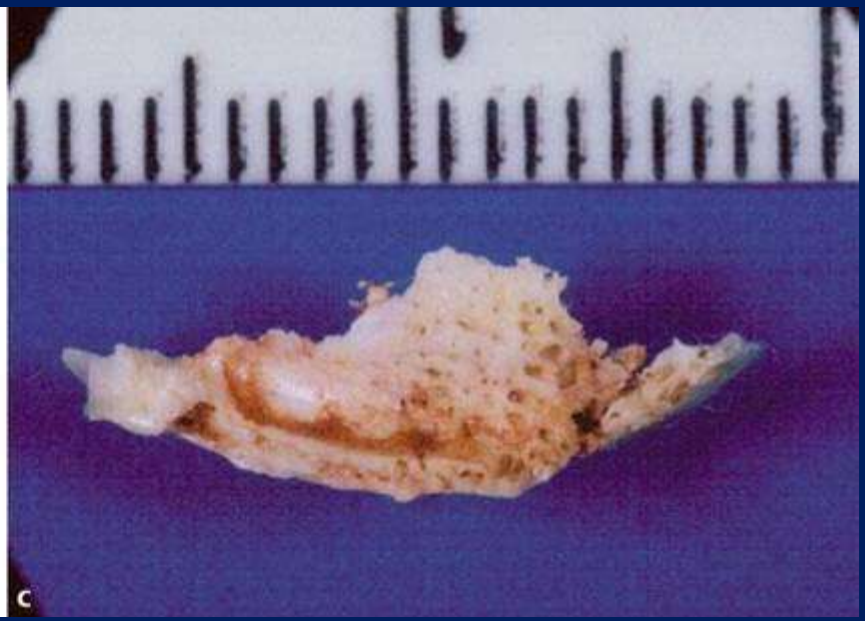
- **Complication**
- **Pathological facture – extensive bone destruction**
- **Chronic osteomyelitis – inadequate treatment**
- **Cellulitis – spread of virulent bacteria**
- **Septicemia – immuno-compromised patient**

Chronic osteomyelitis

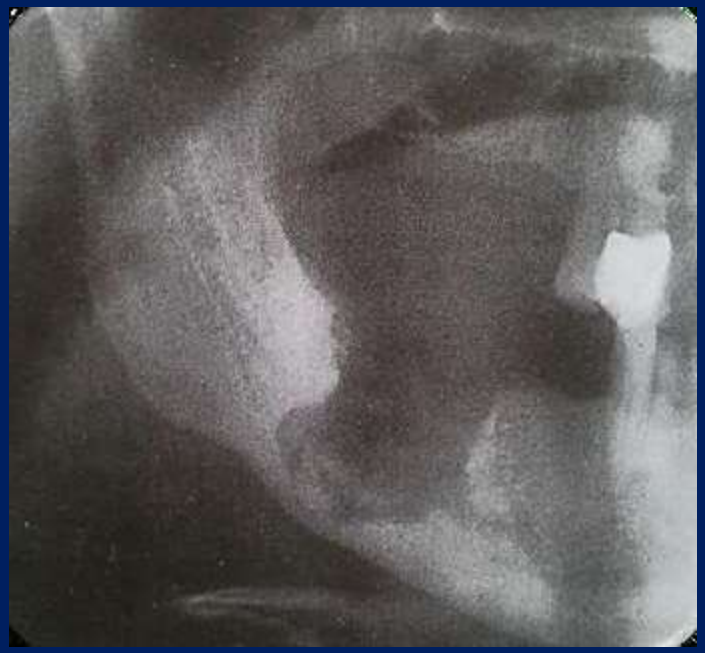
- Chronic suppurative
- Chronic diffuse sclerosing
- Chronic focal sclerosing

Chronic suppurative osteomyelitis

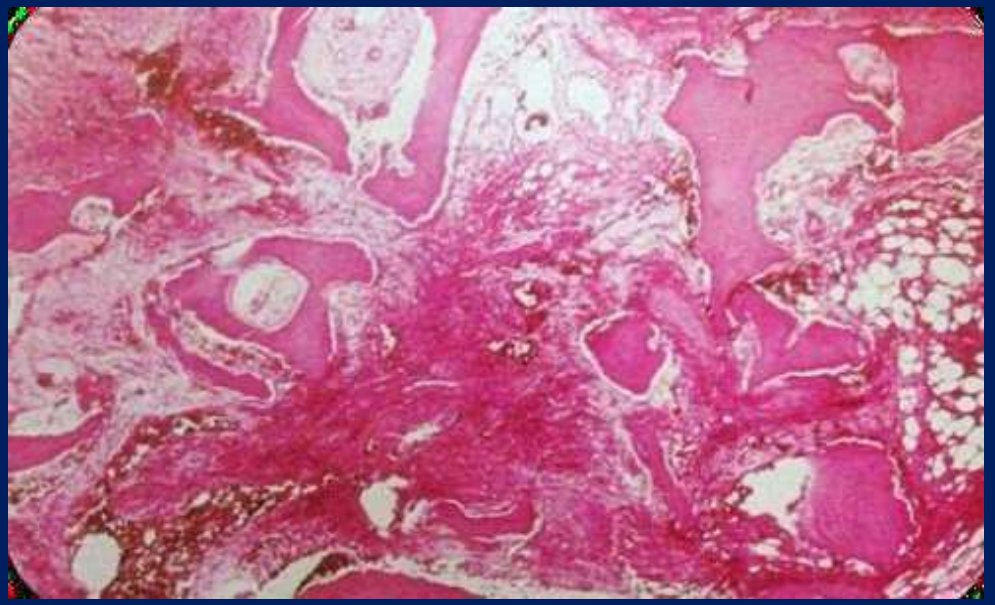
- Inadequately treated acute osteomyelitis
- Clinical features similar to acute forms but milder
- Acute exacerbations of chronic stage may occur
- Fistulous tract may form which open to surface



- **Radiological features**
- **Patchy, ragged and ill defined radiololucency**
- **Often contain radiopaque sequestrum**



- **Histologic features**
- **Inflammed connective tissue filling inter-trabacular areas of bone**
- **Scattered sequestra**
- **Pockets of abscess**



- **Treatment**
- **Difficulty to manage medically**
- **Surgical intervention is mandatory**
- **Antibiotics are same as in acute condition but are given through IV in high doses**

Chronic Focal Sclerosing Osteomyelitis (Condensing Osteitis)

- Unusual reaction of bone to infection
- Bony reaction to low grade peri-apical infection or unusually strong host defensive response
- High degree of tissue reaction and tissue reactivity

- **Clinical features**
- **Commonly affects young adults and children**
  - **Mandibular molar is affected commonly**
  - **Symptoms : mild pain due to infected pulp**
  - **Tissues reacts to the infection by proliferation rather than destruction , since the infection acts as a stimulus rather than a irritant**

- **Radiographic features**
- **Pathognomic , well circumscribed radiopaque mass of sclerotic bone surrounding and extending below the apex of one or both roots**
- **PDL space widening (distinguishes from cementoblastoma)**

- **Histologic features**
- **Dense bony trabeculae with little interstitial marrow tissue**
- **Many reversal and resting lines giving pagetoid appearance**
- **If interstitial soft tissue is present , it is generally fibrotic and infiltrated with small amount of lymphocytes**
- **Osteocystic lacunae appears empty**

- **Treatment**
- **Elimination of the source of inflammation by extraction or endodontic treatment.**
- **If lesion persists and periodontal membrane remains wide, reevaluation of endodontic therapy is considered.**
- **After resolution of lesion, inflammatory focus is termed as bone scar.**

Chronic Diffuse Sclerosing Osteomyelitis

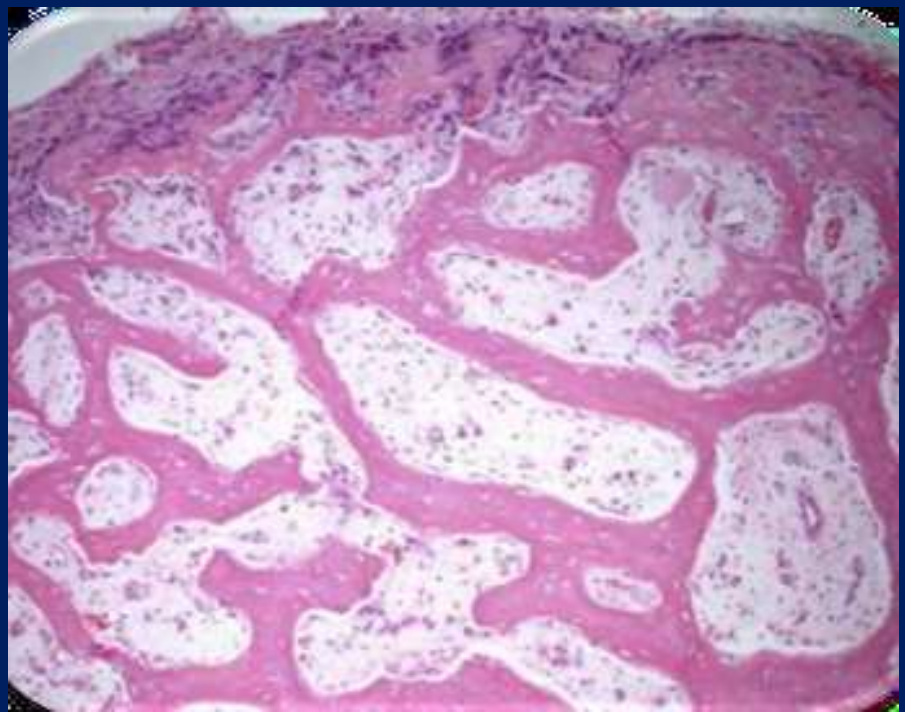
- In contrast to focal type , it may occur at any age group , no gender predominance
- Common in edentulous mandible
- Insidious in nature, no clinical indications of its presence
- Acute exacerbation can result in : vague pain , unpleasant taste , mild suppuration , many times drainage through fistulous tract

- **Radiographic features**
- **Cotton wool appearance**
- **Indistinct borders because of its diffuse nature**
- **Mimic Paget's disease or fibro osseous proliferation**

Histological features

Dense, irregular trabeculae of bone bordered by active layerof Osteoblasts; focal Osteoclastic area may be present

- **Mosaic pattern appearance**
- **Interstitial soft tissue is fibrotic**
- **Proliferating fibroblasts and occasional small capillaries as well as small focal collection of lymphocytes and plasma cells**



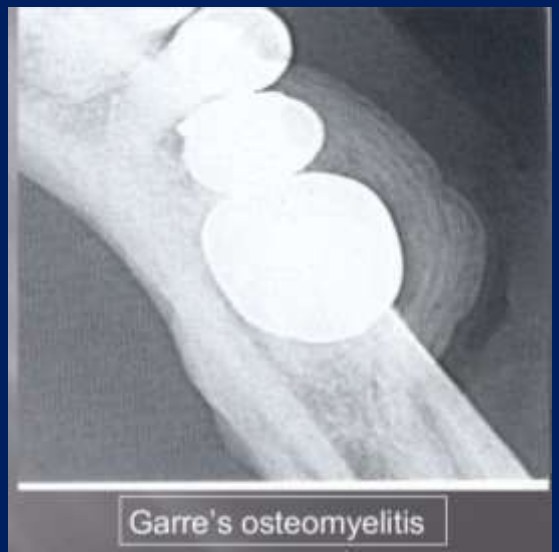
- **Treatment and prognosis**
- **Lesion is too extensive to be removed surgically**
- **Sclerotic bone is hypovascular and resistant to antibiotics**
- **Extraction of tooth as a last option utilizing a surgical approach with *removal of liberal amounts of bone to facilitate* extraction and *increase bleeding.***
- **Antibiotic administration during acute exacerbation may help**

Chronic osteomyelitis with proliferative periostitis (Garres osteomyelitis)

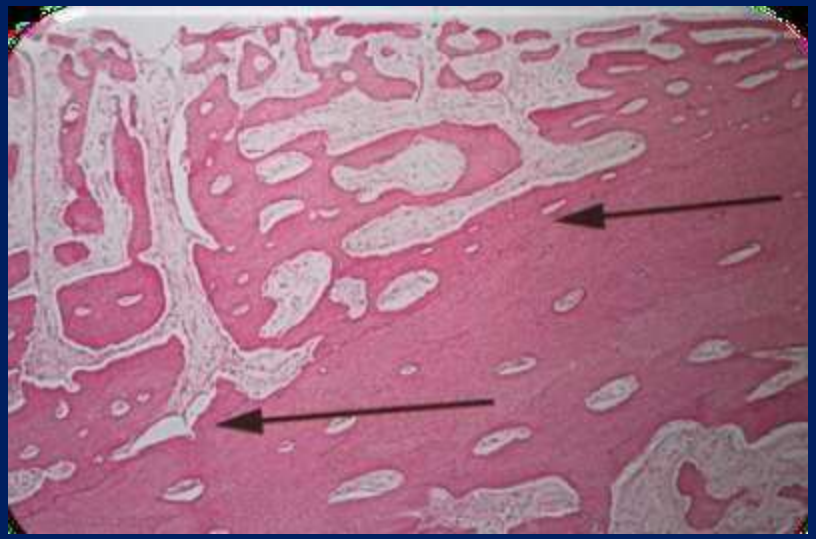
- **Distinctive type of chronic osteomyelitis in which there is focal gross thickening of the periosteum, with peripheral reactive bone formation resulting from mild reaction or infection**

- **Clinical features**
- **Common : Children and young adults; Mandible ; especially in bicuspids and molars**
- **Toothache or pain in the jaws**
- **Bony hard swelling on the outer surface of jaw , which may last for several weeks**
- **May develop only due to dental infection but also from soft tissue infection or cellulitis**

- **Radiographic features**
- **ONION PEEL APPEARANCE : Focal overgrowth of bone on the outer surface of cortex ,which may be described as duplication of the cortical layer of bone**
- **IOPA often reveals a carious tooth opposite to bony hard mass**
- **This mass of bone is smooth rather well calcified which itself shows a thin but definite cortical layer**



- **Histologic features**
- **Supracortical but subperiosteal mass is composed of much reactive new bone and osteoid tissue, with Osteoblasts bordering many of trabeculae**
- **Trabeculae is perpendicular to cortex and parallel to each other**
- **Connective tissue is fibrous and shows sprinkling of lymphocytes and plasma cells**



- **Treatment and prognosis**
- **Extraction or endodontic treatment of the teeth**
- **No surgical intervention except biopsy to confirm diagnosis**
- **After extraction the jaws undergo remodeling and facial symmetry is restored**
- **Neoperiostitis or new periosteum formation may occur in certain conditions.**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