Soft Tissue Calcifications and Ossifications in the Head and Neck

Dr. May Lam
Oral and Maxillofacial Radiologist
Senior lecturer
BDSc (Hons) FRACDS (GDP) DClinDent (DMFR) MRACDS (DMFR)

Heterotopia

- **Definition:** The presence of a particular tissue type at a non-physiological site, but usually co-existing with original tissue in its correct anatomical location. In other words, it implies ectopic tissue, in addition to retention of the original tissue type.

- Two types:
  - Heterotopic calcification
  - Heterotopic ossification

Heterotopic Calcifications

- When deposition of calcium salts occurs in an unorganised fashion in soft tissue
- Divided into 3 categories:

Dystrophic calcification	Metastatic calcification	Idiopathic calcification (or calcinosis)
• **Forms in degenerating/ diseased/dead tissue** • Normal serum calcium and phosphate levels • Often localised to site of injury	• Mineral precipitation into normal tissue due to **higher than normal serum levels of calcium** (e.g. hyperparathyroidism, hypercalcemia of malignancy) **or phosphate** (e.g. chronic renal failure) • Typically occurs bilaterally and symmetrically	• **Deposition of calcium in normal tissue** • Normal serum calcium and phosphate levels • E.g. chondrocalcinosis, phleboliths

Heterotopic Ossification

- When mineral is deposited in soft tissue as organised, well-formed bone
- "Heterotopic bone" = bone that has formed in an abnormal (extraskeletal) location
  - May be all compact bone, or exhibit some trabeculae and fatty marrow
- Size ranges from 1mm to several cm in diameter
- One or more may be present
- Examples:
  - Post-traumatic ossification,
  - bone produced by tumours,
  - ossification from diseases such as progressive myositis ossificans and ankylosing spondylitis

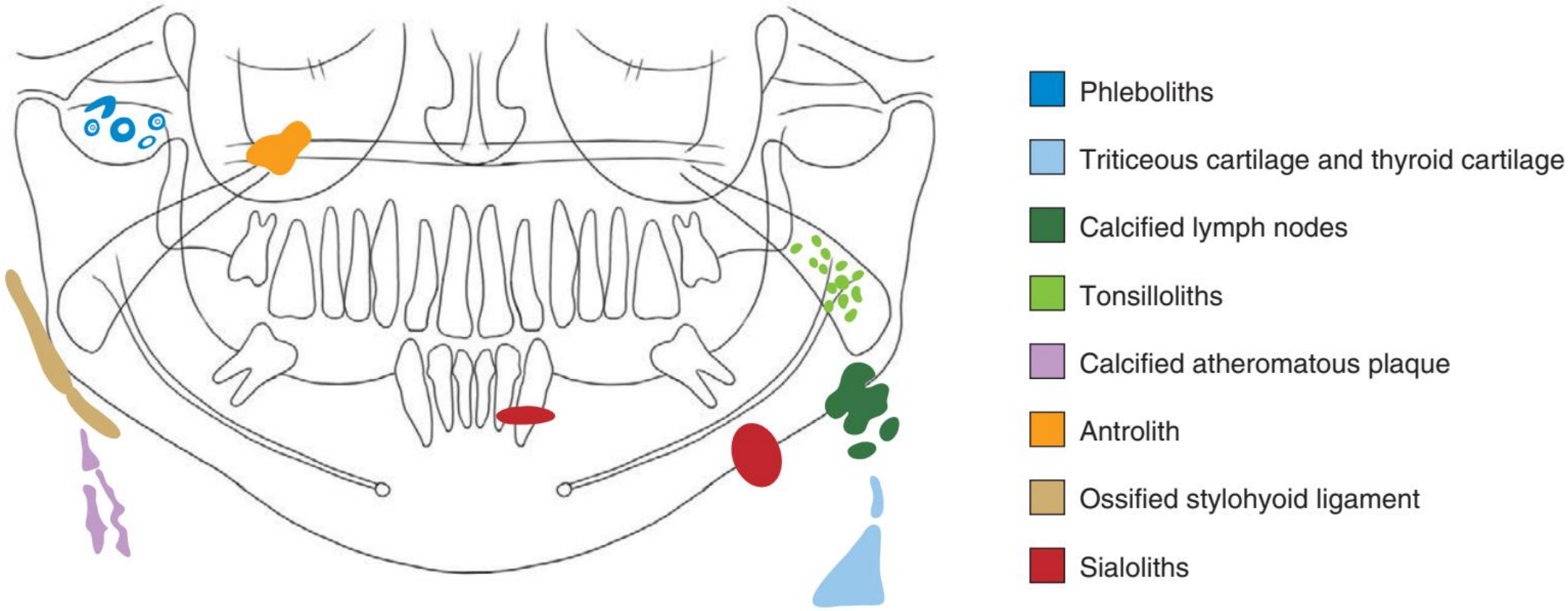


FIGURE 28-1 Schematic of panoramic radiograph demonstrating the typical geometry and location of selected soft tissue calcifications and ossifications.

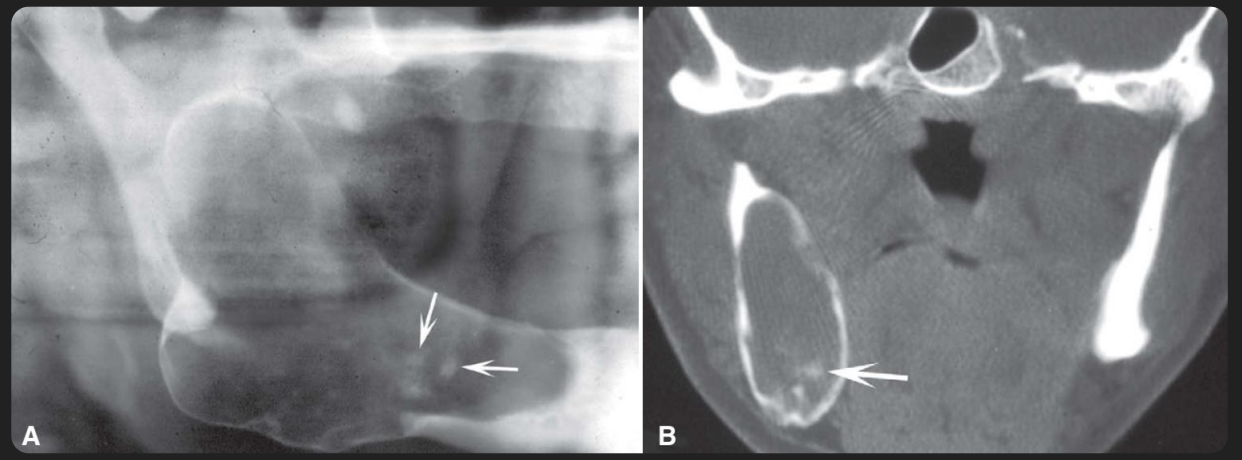
White and Pharoah, 2014

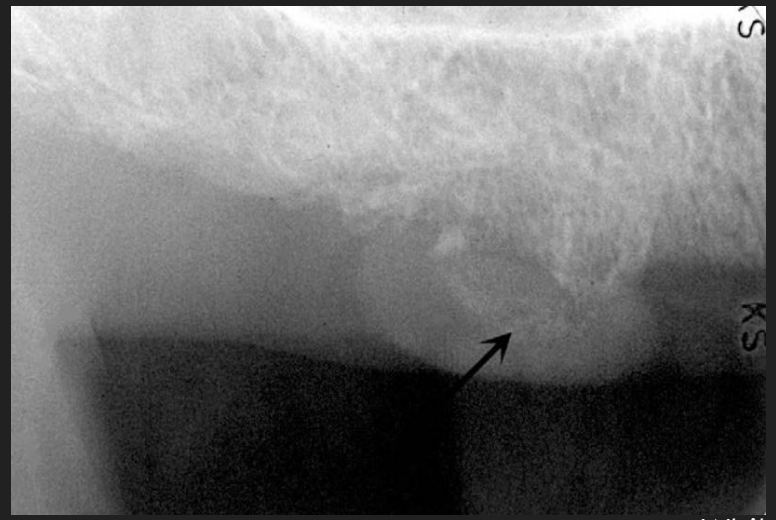
1. Dystrophic Calcifications

1. *Calcified lymph nodes*
2. *Post-inflammatory tonsillar calcifications*
3. *Calcified atherosclerotic plaque*
4. *Arteriosclerosis*

1. Dystrophic Calcification

- E.g. long standing chronically infected cyst or polyp
- Location: gingiva, tongue, lymph nodes, and cheek
- Clinical Sign/Symptoms:
  - Typically none
  - Enlargement and ulceration of overlying soft tissue
  - Palpation of solid mass of calcium salts
- Imaging Features:
  - Varies from being barely perceptible as fine grains of radiopacities to larger, irregular radiopaque particles (but rarely exceed 0.5cm in diameter)
  - One or more radiopacities may be seen
  - *Periphery:* irregular or indistinct
  - *Internal:* may be homogeneous or contain punctate areas

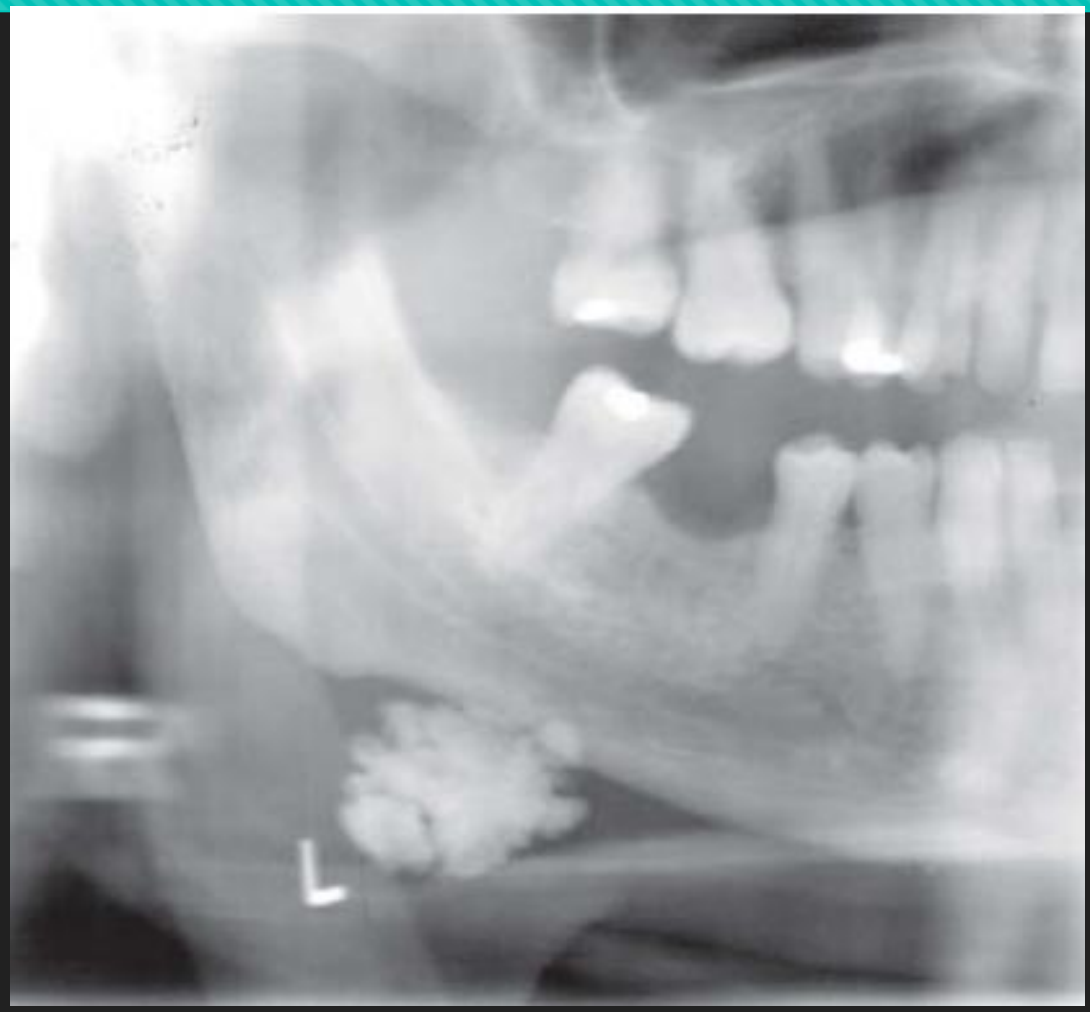




White and Pharoah, 20

1.1 Calcified Lymph Nodes

- Deposition of hydroxyapatite-like calcium salts within the lymph node (LN), nearly effacing all nodal architecture
- An isolated calcified LN in the level I nodes are usually related to post-inflammatory calcification
- More extensive dystrophic calcification in LN that are chronically inflamed due to various diseases (frequently granulomatous disorders e.g. TB, sarcoidosis, etc.)
  - Implies either active or previously treated disease
- Occasionally associated with malignancies

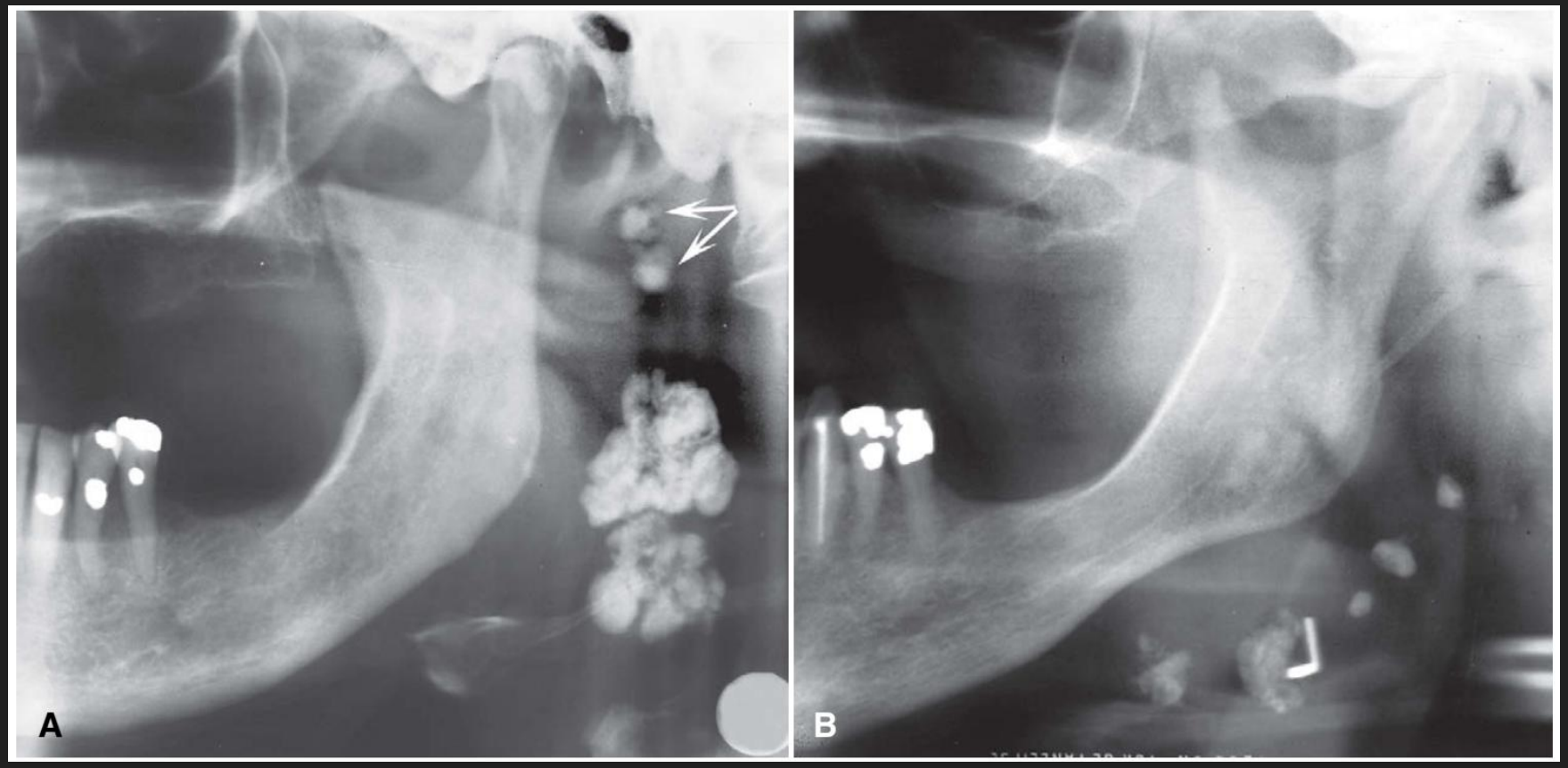


1.1 Calcified Lymph Nodes

- Clinical Features:
  - Generally asymptomatic
  - Often incidental finding
  - When nodes can be palpated, are hard, lumpy, round-oblong masses
  - Most common: Submandibular and superficial/deep cervical nodes (Level Ib and II nodes)
    - Less common: Preauricular and submental nodes
- Management:
  - Typically no treatment
  - Need to manage underlying cause

1.1 Calcified Lymph Nodes

- Location:
  - Submandibular region – at or just below Md angle or between posterior border of ramus and C-spine
  - May affect a single node or linear series of nodes ("LN chaining")
- Periphery/Shape:
  - Well-defined
  - Usually **irregular**
  - Often lobulated, like shape of cauliflower



1.1 Calcified Lymph Nodes

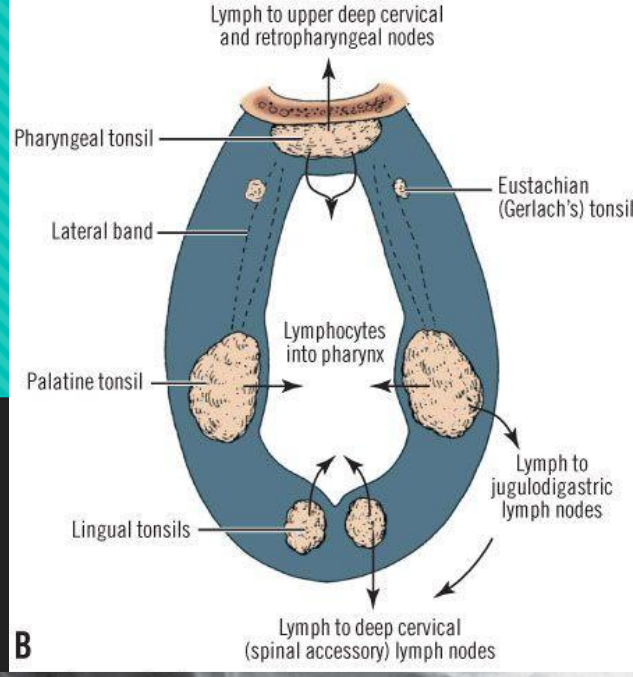
- Internal Features:
  - May vary in degree of opacity
  - Occasional laminated appearance
- Surrounding Features: N/A

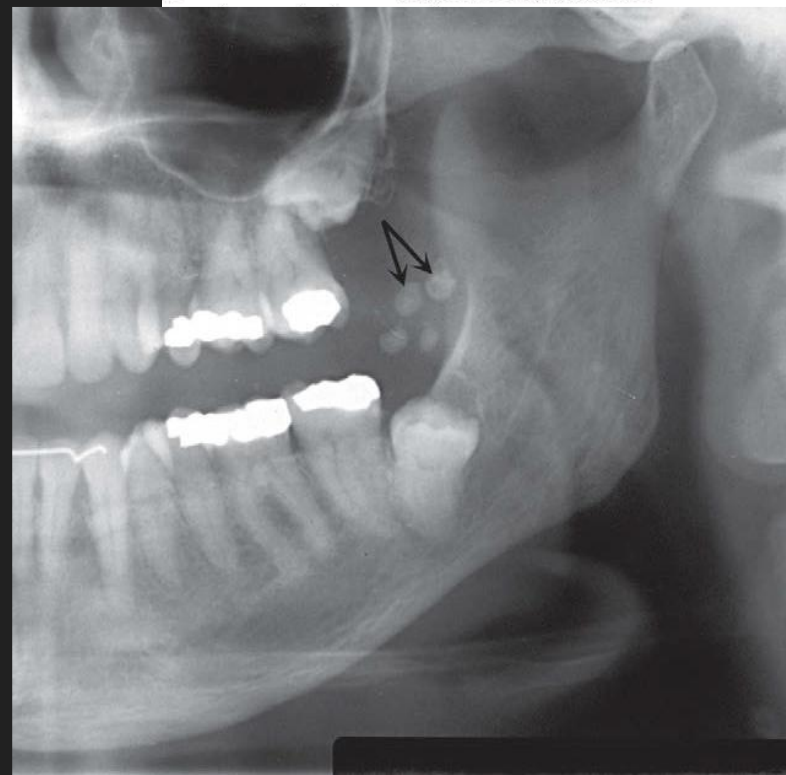
DDx	
Sialolith	• May be difficult to differentiate if only a single calcified LN as both appear in a similar region • Typically smoother outline • Check clinically for symptoms related to submandibular salivary gland
Phlebolith	• Usually smaller and multiple with targetoid appearance • Shape may mimic a portion of a blood vessel

1.2 Post-inflammatory tonsillar calcifications

- Synonyms: tonsilloliths, dystrophic calcifications in the tonsils, tonsillar calculi, tonsil concretions

- Clinical Features:
  - Hard, white/yellow objects projecting from the tonsillar crypts
  - Usually palatine tonsil
  - Typically no clinical signs and symptoms
    - Larger calcifications – pain, swelling, fetor oris, dysphagia or foreign body sensation on swallowing



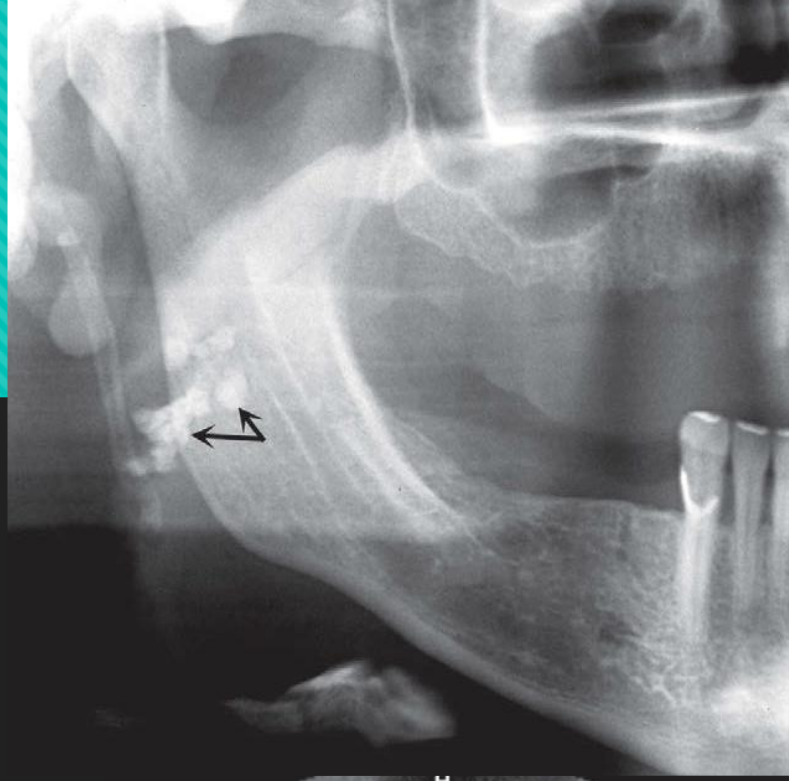


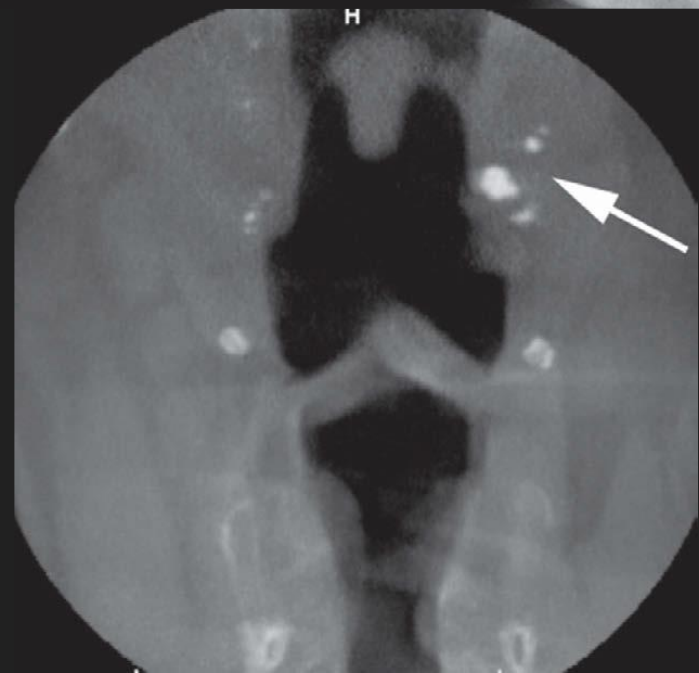
1.2 Post-inflammatory tonsillar calcifications

- Disease Mechanism:
  - Formed when repeated bouts of inflammation enlarge the tonsillar crypts
  - Incomplete resolution of organic debris can serve as a nidus for dystrophic calcification
- Management:
  - Asymptomatic – no treatment
    - Unless elderly with manual deglutition disorders or immunocompromised patients for risk of aspiration pneumonia
  - Symptomatic – manual expression or surgical removal if large

1.2 Post-inflammatory tonsillar calcifications

- Location:
  - [PAN] Superimposed over mid-ramus region where dorsum of tongue crosses ramus in the oropharyngeal air spaces, often inferior to IAC
  - [CT] medial to ramus, next to lateral wall of pharyngeal air space
- Periphery/Shape:
  - Cluster of multiple small radiopacities
  - Rarely large size
- Internal Features:
  - Slightly more radiopaque than cancellous bone
  - Roughly same as cortical bone
- Surrounding Features: N/A



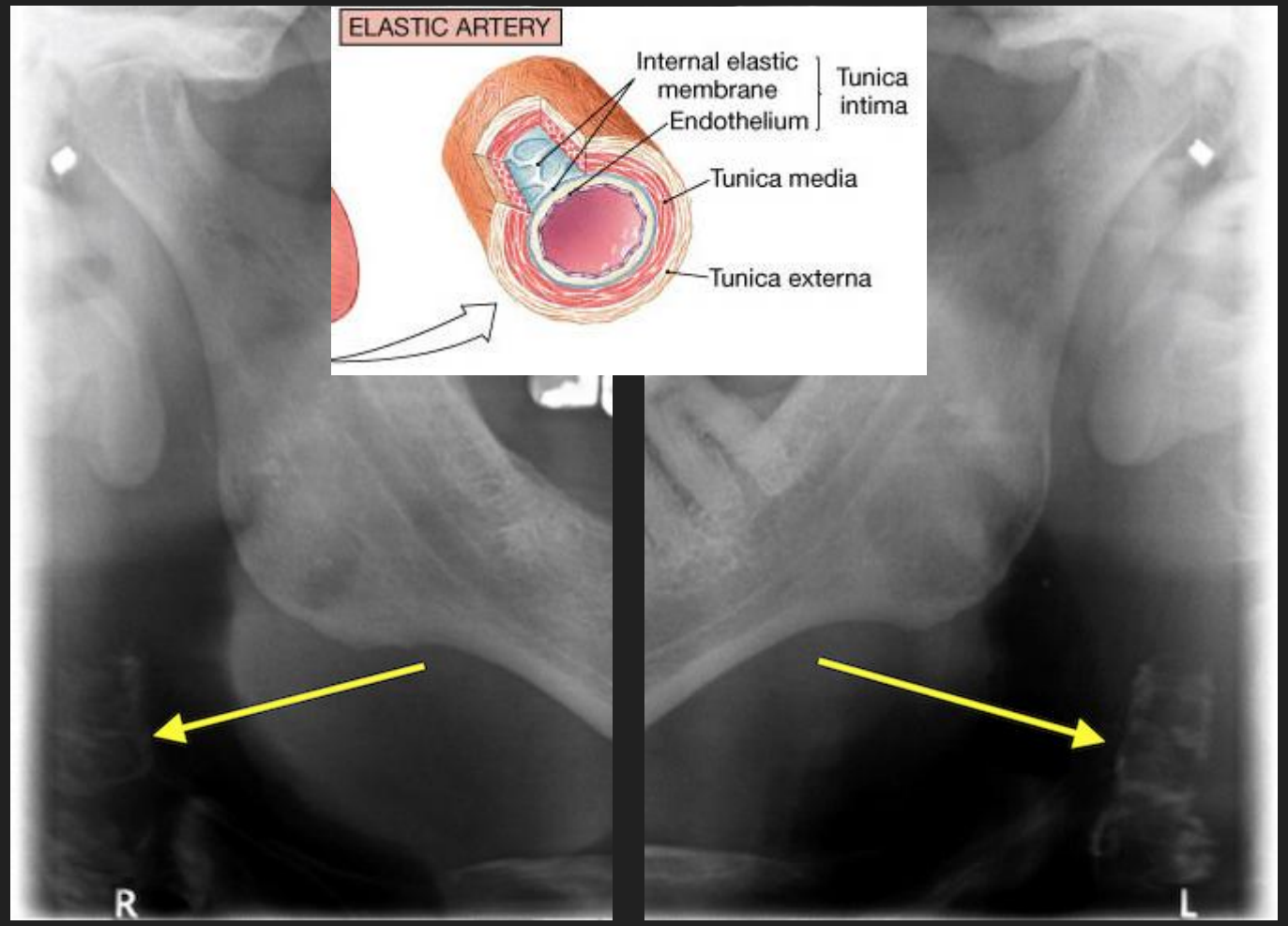


1.2 Post-inflammatory tonsillar calcifications

Lymph node calcifications	• Usually larger and occur where LNs are expected to exist
Sialolith	• Usually more ovoid and smooth, located within the duct. • Classically internal laminated appearance
Parotid parenchymal calcifications	• Usually smaller and rounded. • On an OPG, these are usually projected over or posterior to the posterior aspect of the ramus
Bone island	• Differentiation may be difficult on a panoramic or lateral radiographic.
Phlebolith	• Targetoid appearance (lucent centrally) • MSCT +/- MRI may be required
Tumours	• Calcifications can be associated with tumours. If there is clinical suspicion for a tumour, MSCT is recommended over CBCT.

1.3 Calcified Atherosclerotic Plaque

- Definition: dystrophic calcification occurring in atheromatous plaques in the intima of large or medium sized vessels
- Disease Mechanism:
  - Atheromatous plaques begin as fatty streaks composed of lipid-laden macrophages (foam cells)
    - Composed of soft necrotic core surrounded by chronic inflammatory cells, smooth muscle cells, and neovascularisation, covered by a fibrous cap
    - Often undergo calcification

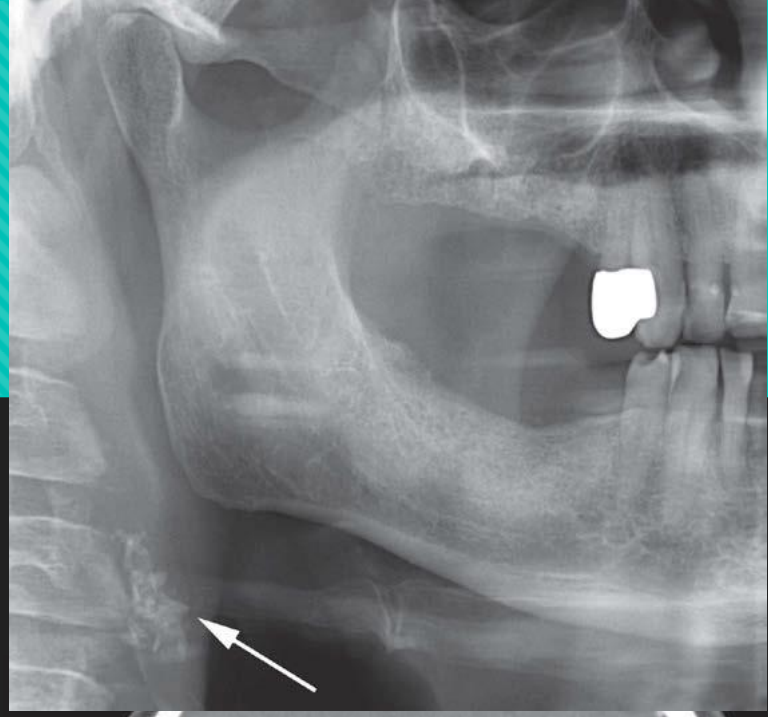


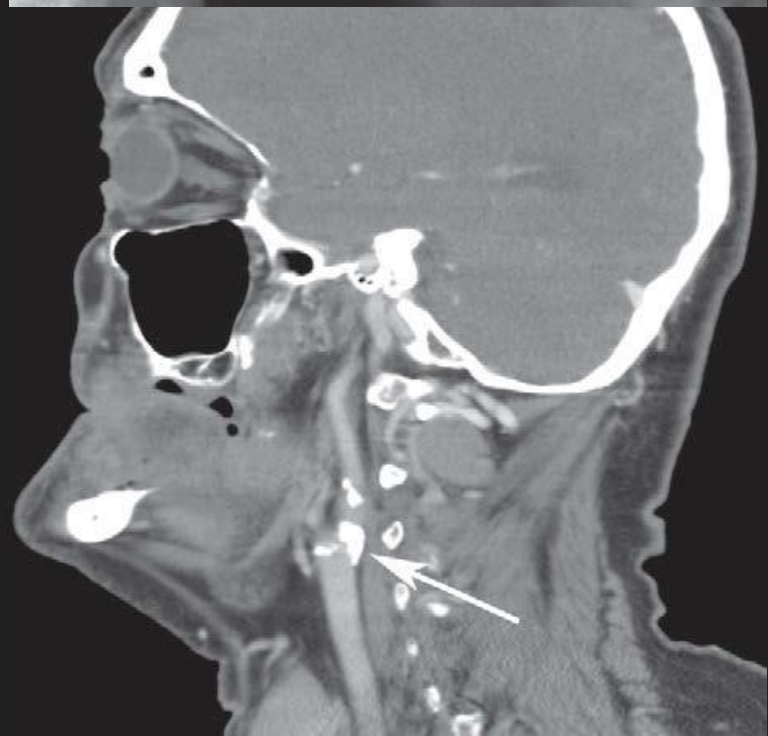
1.3 Calcified Atherosclerotic Plaque

- Aetiology:
  - Not completely understood
  - Thought to involve chronic endothelial injury leading to inflammatory response, accumulation of lipids, platelet aggregation and activation of smooth muscle cells
- Disease Progression:
  - Stenosis, occlusion, ischaemia, infarction, distal embolism, haemorrhage, aneurysmal dilatation
- Management:
  - 1 in 7 patients with CAP on OPG will have a clinically significant carotid artery stenosis (Constantine et al. 2019)
  - Referral for medical review if:
    - Patients with established risk factors for cerebrovascular and cardiovascular disease
    - Younger patients
    - Substantial carotid calcifications

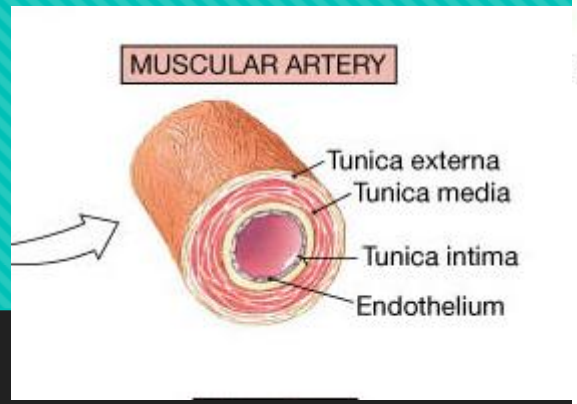
1.3 Calcified Atherosclerotic Plaque

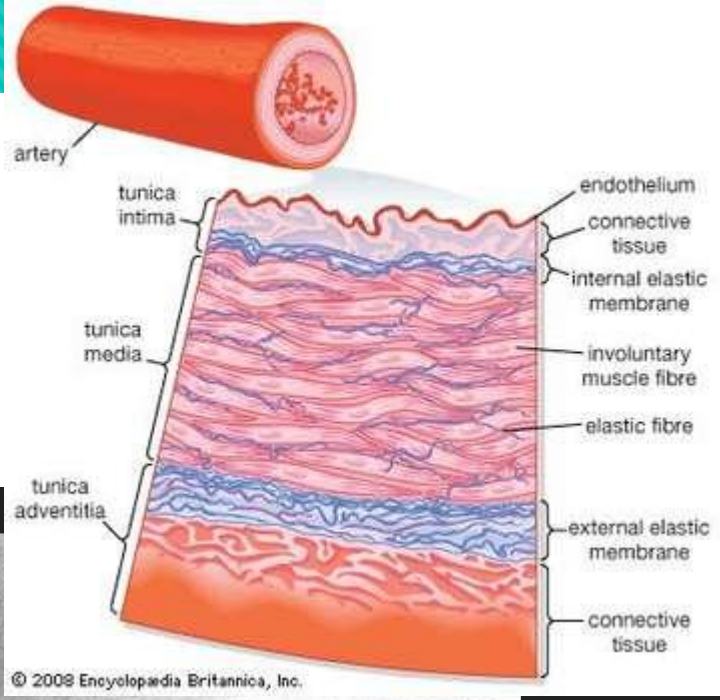
- Location:
  - First develop at arterial bifurcations due to increased endothelial damage from shear forces at these sites
  - [PAN] either superior or inferior to greater cornu of hyoid, adjacent to C3-4 or intervertebral space between them
- Periphery/Shape:
  - May be singular or multiple
  - Well-defined and irregular
  - May be C-shaped or circular in morphology
  - Vertical linear distribution
- Internal Features:
  - Heterogeneous radiopacity with radiolucent voids
- Surrounding Features: N/A



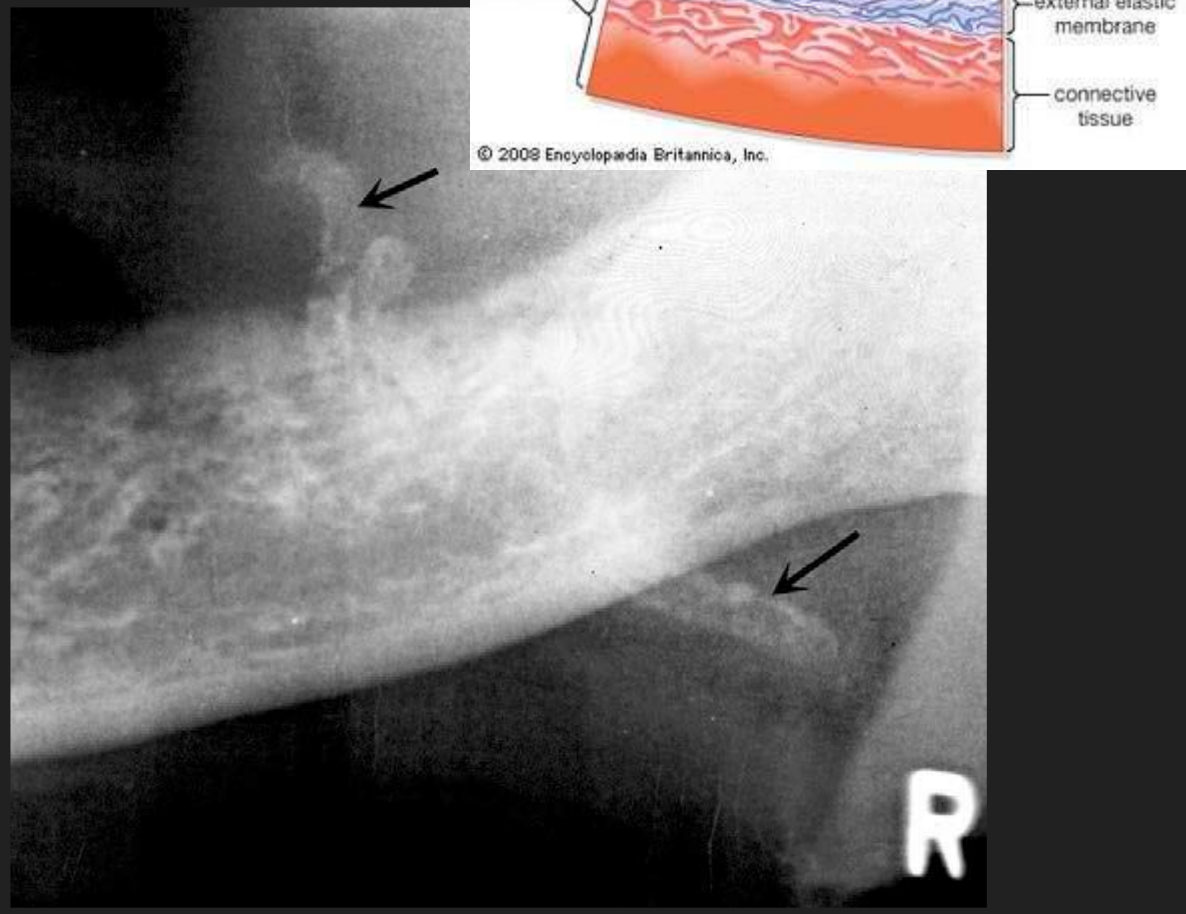


1.4 Arteriosclerosis





- Synonyms: Mönckeberg's medial calcific sclerosis
- Definition: Thickening and loss of elasticity of the walls of muscular arteries due to calcification of the tunica media
- Disease Mechanism:
  - Deposition of calcium within the medial coat of vessel → fragmentation, degeneration, and eventual loss of elastic fibres
  - No luminal narrowing
- Aetiology:
  - Uncertain
  - More common with advancing age, diabetes, and chronic renal disease

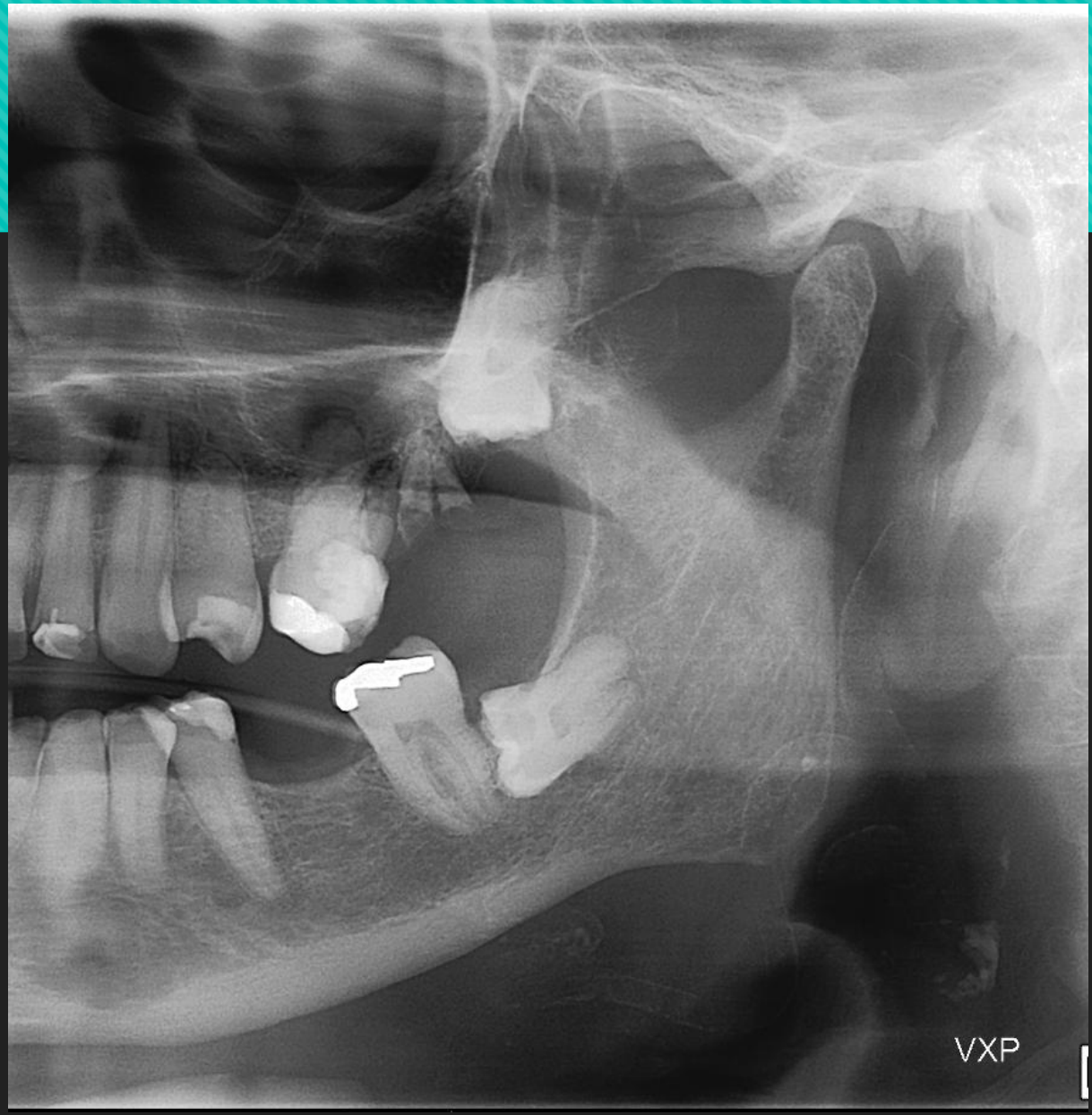


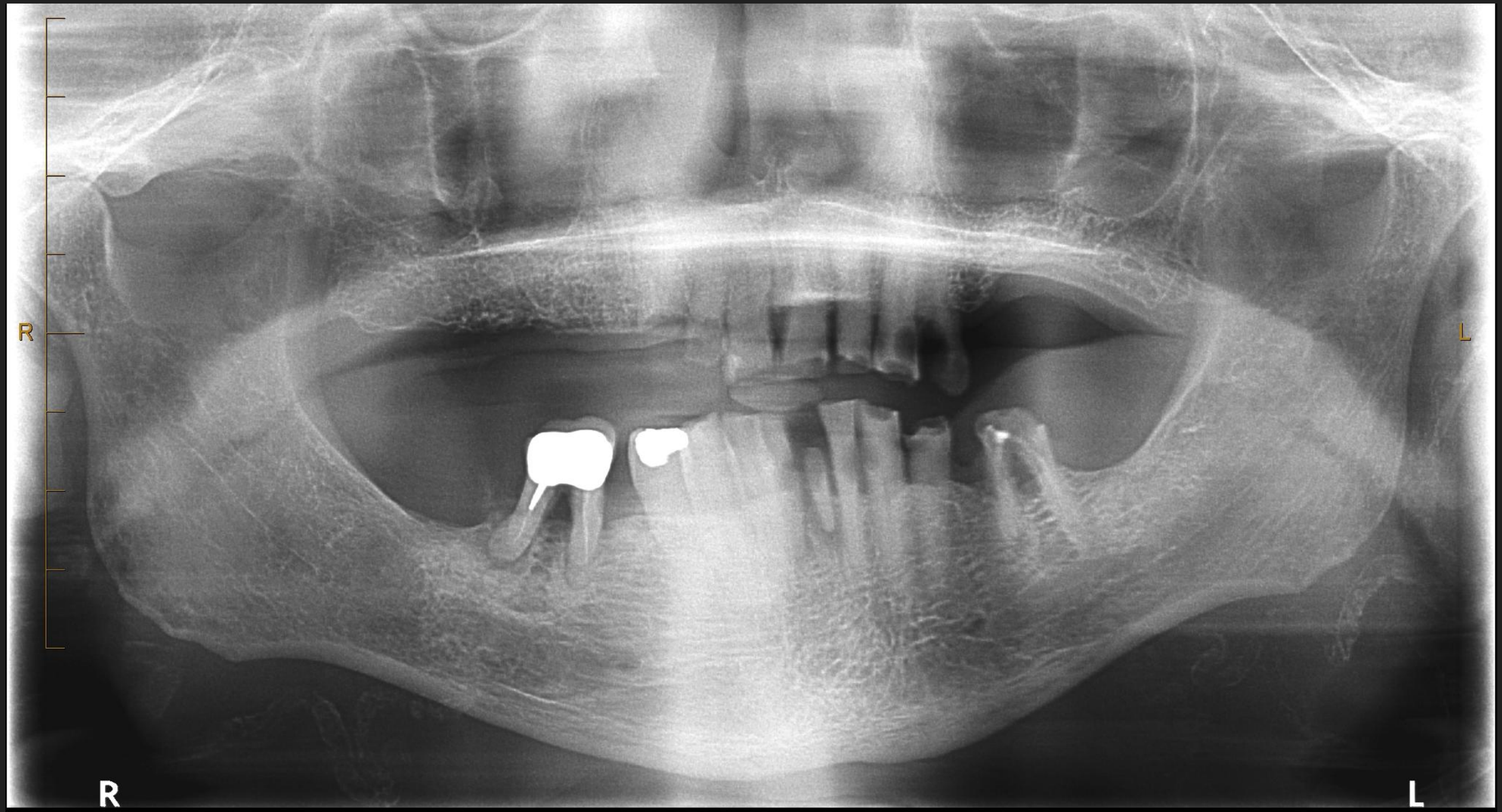
1.4 Arteriosclerosis

- Clinical Features:
  - Initially asymptomatic
  - Late in disease: peripheral vascular disease, cutaneous gangrene, myositis as a result of vascular insufficiency
- Management:
  - Evaluation for occlusive arterial disease or peripheral vascular disease

1.4 Arteriosclerosis

- Location:
  - Facial artery > Carotid artery on PAN
- Periphery/Shape:
  - Outline of an artery (due to calcific deposits in the wall)
  - When viewed from the side: a parallel pair of thin, radiopaque lines with a straight course or tortuous path
    - Described as 'tram-track' or 'pipe stem' appearance
  - In cross-section, circular, tubular, or ring-like pattern
- Internal Features:
  - No internal structure as the diffuse, finely divided calcium deposits occur solely in the medial wall of vessels
- Surrounding Features: N/A

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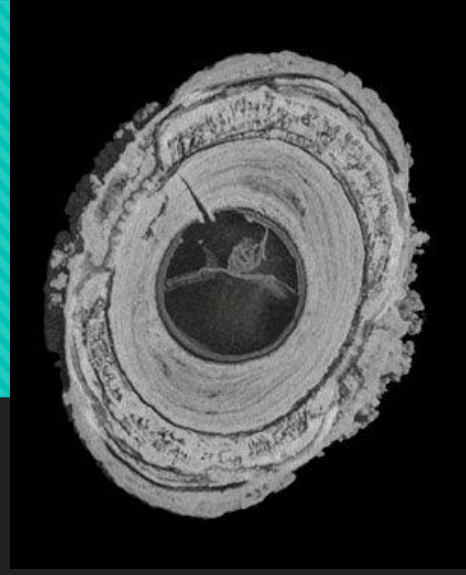
2. Idiopathic Calcification

1. Sialolith
2. Phlebolith
3. Laryngeal cartilage calcification
4. Antroliths and Rhinoliths

2.1 Sialoliths



Kraaij, S. et al. 2014

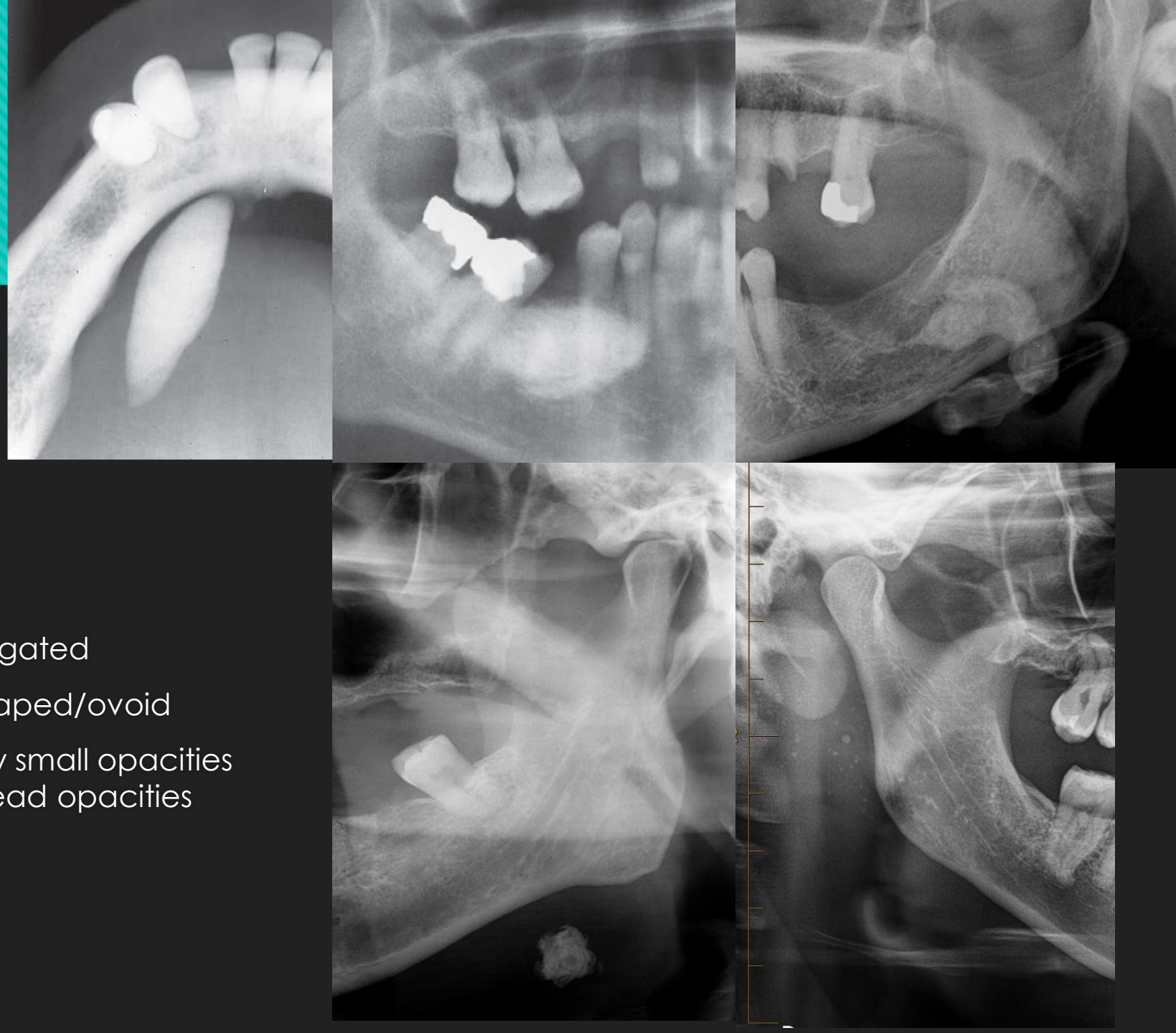
- Definition: Salivary gland stones
  - "Ductal sialolith" vs "Parenchymal calcifications"
- Disease Mechanism:
  - Ductal sialolith:
    - Arises due to alteration in mechanical conditions (e.g. slow flow rate or physiochemical characteristics of gland secretion)
    - Leads to nidus formation and subsequent precipitation of Ca and PO_4 salts
  - Parenchymal calcifications:
    - May be related to a previous inflammatory condition or ongoing chronic sialadenitis (e.g. Sjogren's syndrome)
- Epidemiology:
  - Ductal sialoliths:
    - Usually occur singly (70-80%)
    - Most common in submandibular glands of middle-aged or older men
  - Parenchymal calcifications:
    - Generally multiple in the parotid gland

2.1 Sialoliths

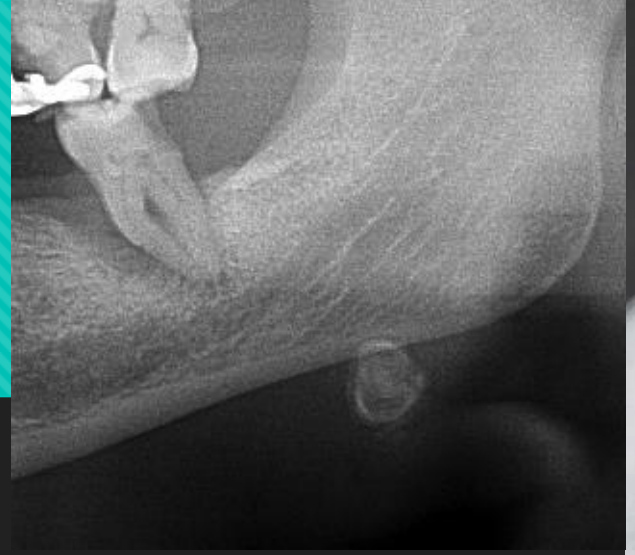
- Clinical Features:
  - May be asymptomatic
  - History of pain and swelling in floor of mouth/gland/cheek
    - Discomfort intensifies during mealtimes, when salivary flow is stimulated – usually abates if the stone does not occlude the duct completely
- Prognosis and Recurrence:
  - 9% recurrent sialolithiasis
  - 10% with sialolithiasis also have nephrolithiasis
- Management:
  - Small stones can be ‘milked out’ by bimanual palpation through ductal orifice
  - If too large or located in proximal duct, may require lithotripsy or sialendoscopy
  - Surgical removal of stone/gland in cases of exceedingly large or intraparenchymal sialoliths
  - Parenchymal calcifications require treatment of the underlying sialadenitis

2.1 Sialoliths

- Location:
  - 83-94% submandibular gland
  - 4-10% parotid gland
  - 1-7% sublingual gland
- Periphery/Shape:
  - *Ductal:* cylindrical, smooth, elongated
  - *Hilum:* larger, more irregularly shaped/ovoid
  - *Parenchymal:* ranges from a few small opacities within a focal region to widespread opacities throughout the gland

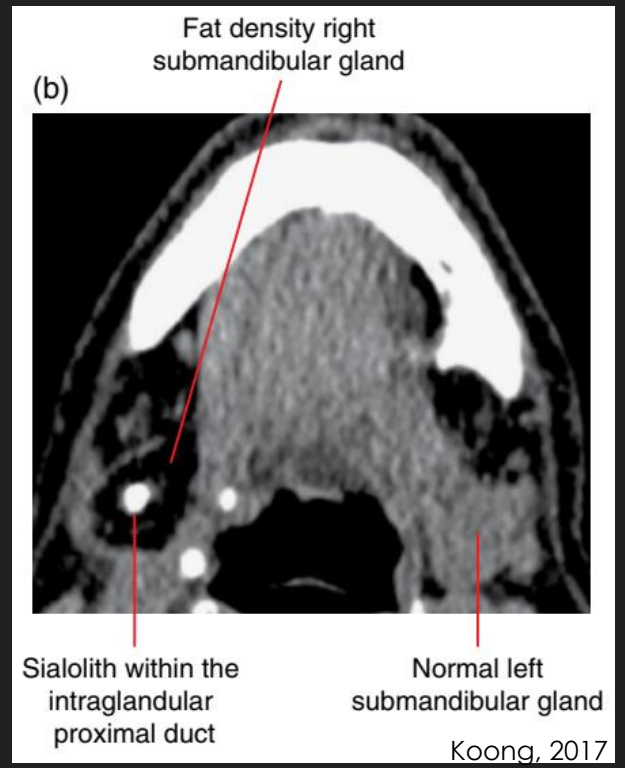


2.1 Sialoliths



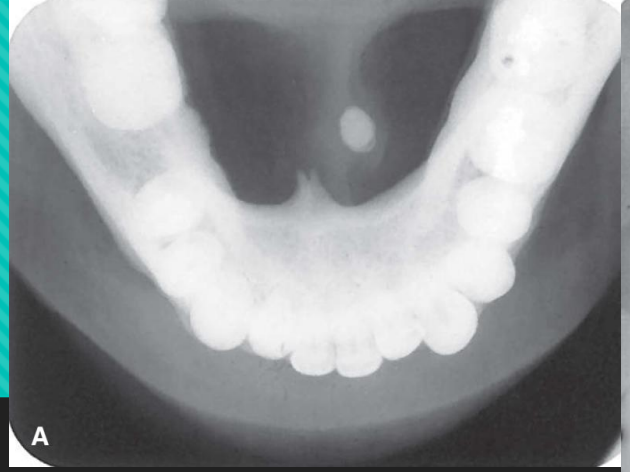
- Internal Features:
  - Either homogeneously radiopaque or laminated
  - <20% of submandibular and 40% of parotid sialoliths are radiolucent due to low mineral content of parotid secretions – requires a sialogram for visualisation
  - Radiolucent sialoliths very rare in the sublingual gland

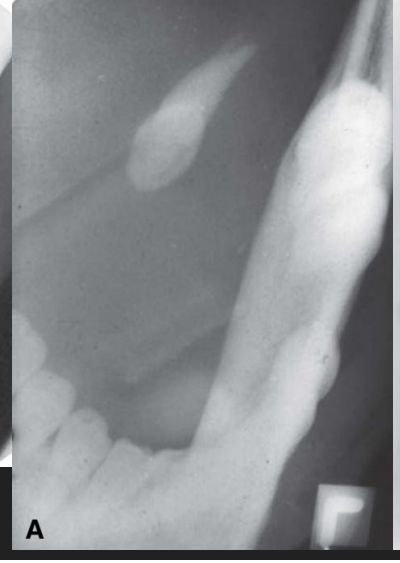
- Surrounding Features:
  - Ductal sialoliths may contribute to sialodochitis, sialadenitis, cellulitis, and atrophy of the salivary gland

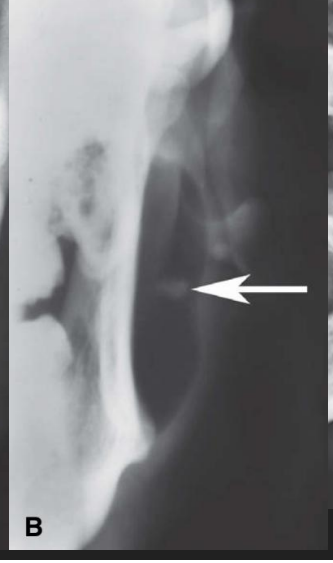


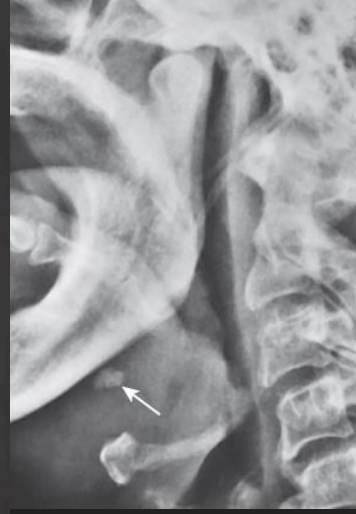
Koong, 2017

2.1 Sialoliths

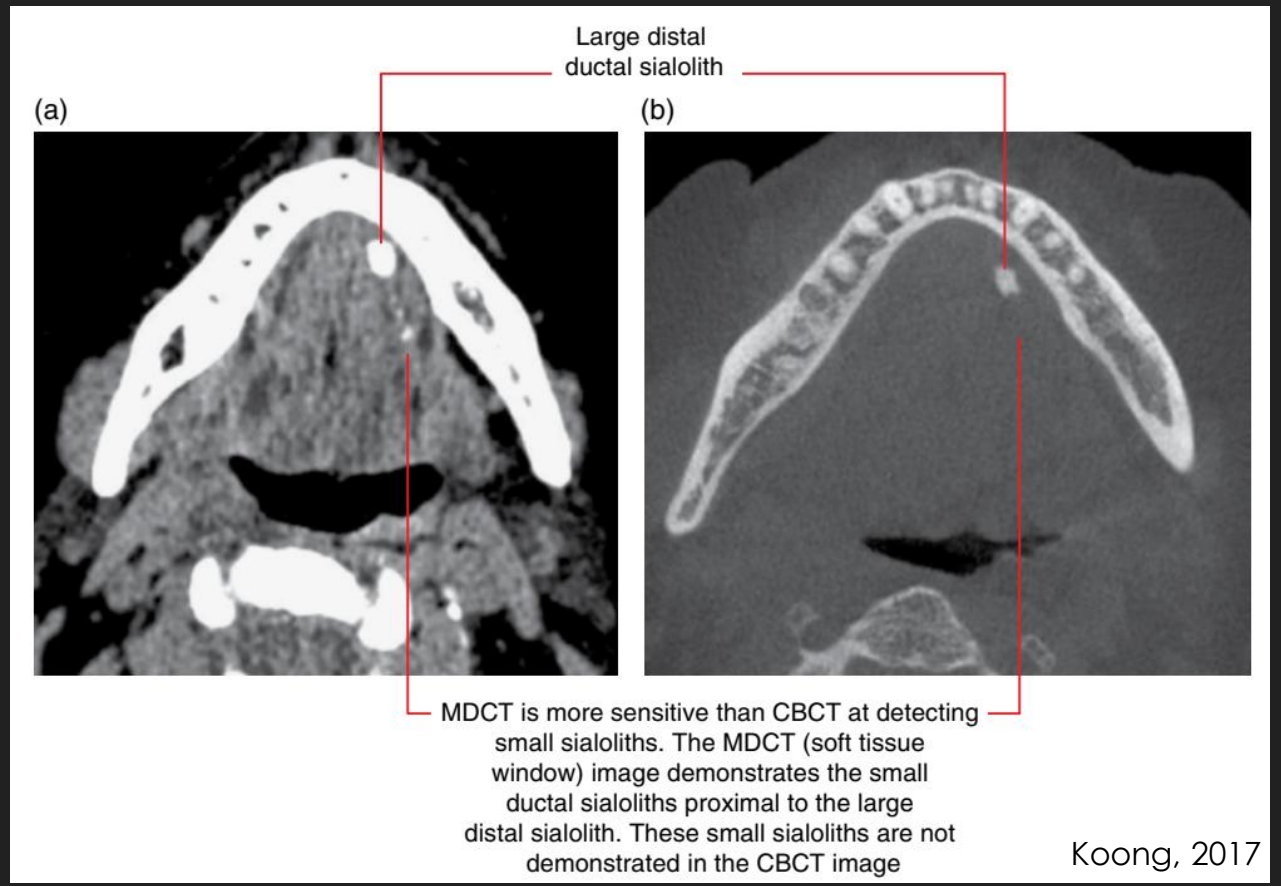








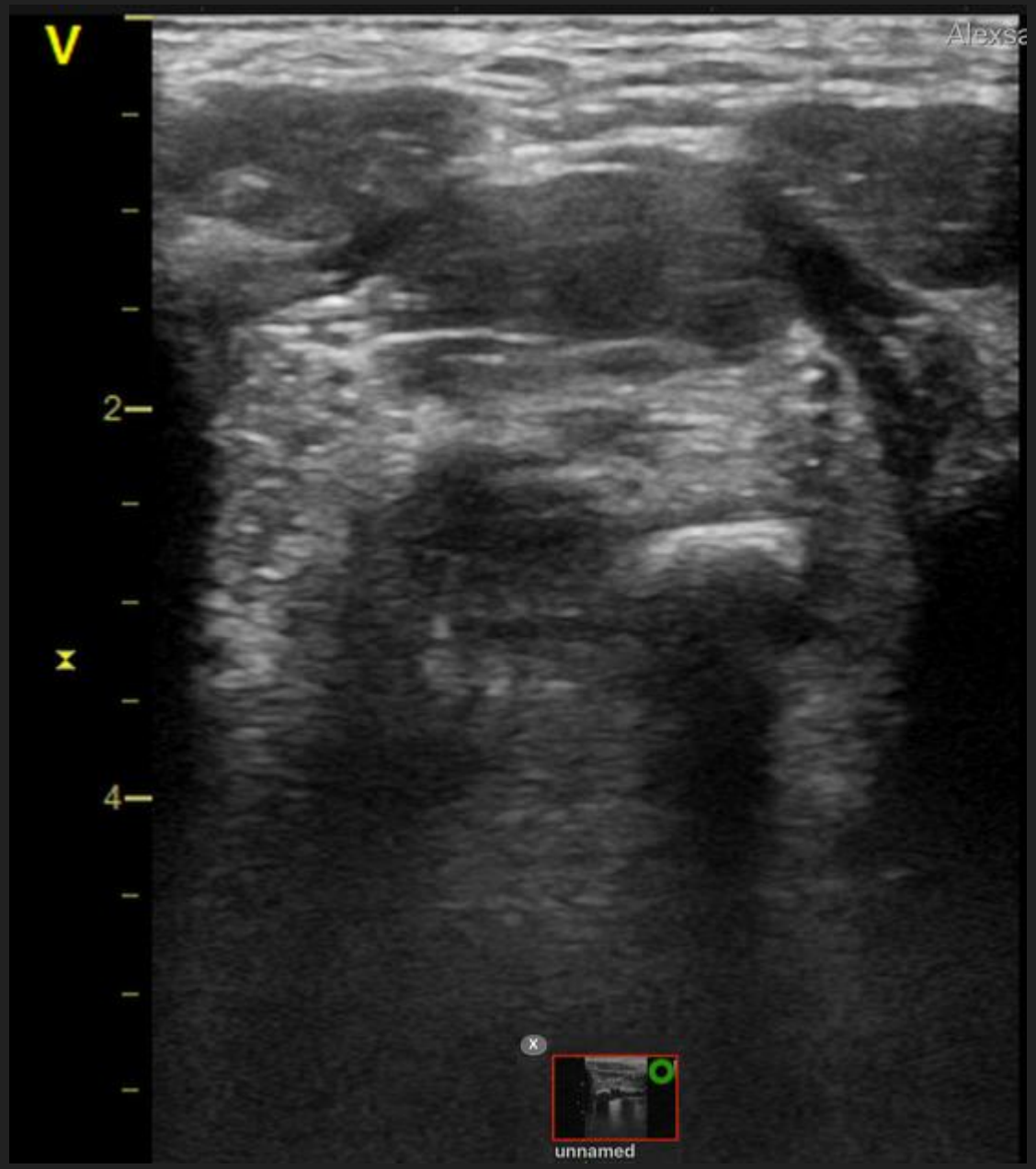
- Further imaging techniques:
  - Plain films:
    - Rarely used today as they only detect moderately large, fairly dense calcifications and further imaging is often required.
  - CBCT:
    - Not indicated for sialoliths due to poor soft tissue contrast and inability to detect small changes in radiodensities.
  - US or MSCT is preferred

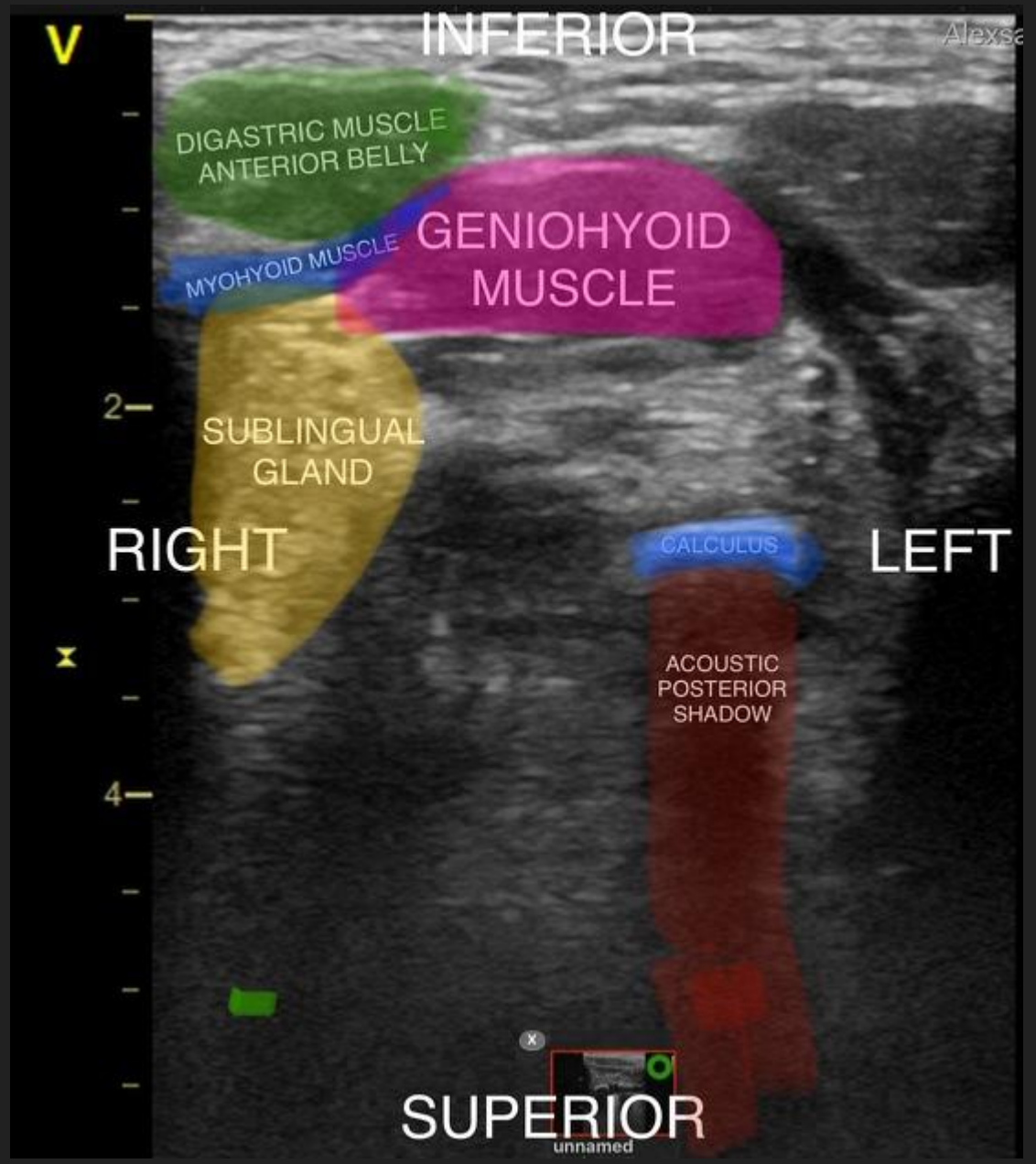


Koong, 2017

2.1 Sialoliths

- Further imaging techniques:
  - US:
    - Very good initial imaging choice, esp. parotid gland
    - *Advantages:* no ionising radiation, real time imaging, accessibility, inexpensive, good soft tissue discrimination
    - *Disadvantages:* limited to superficial structures, technique sensitive, operator dependent, hard to interpret
  - MSCT:
    - May be performed as sialography
    - *Advantages:* multiplanar imaging, good soft tissue and hard tissue contrast, small changes in radiodensity can be detected, provides 3D information in conventional sialography, can detect 'mucus plugs'
    - Disadvantages: higher radiation dose, cost
  - MRI:
    - Not typically needed for sialolith evaluation, although may be used as an alternative to conventional MSCT sialography in evaluating ductal pathosis





https://radiopaedia.org/cases/sialolithiasis-submandibular-gland-7

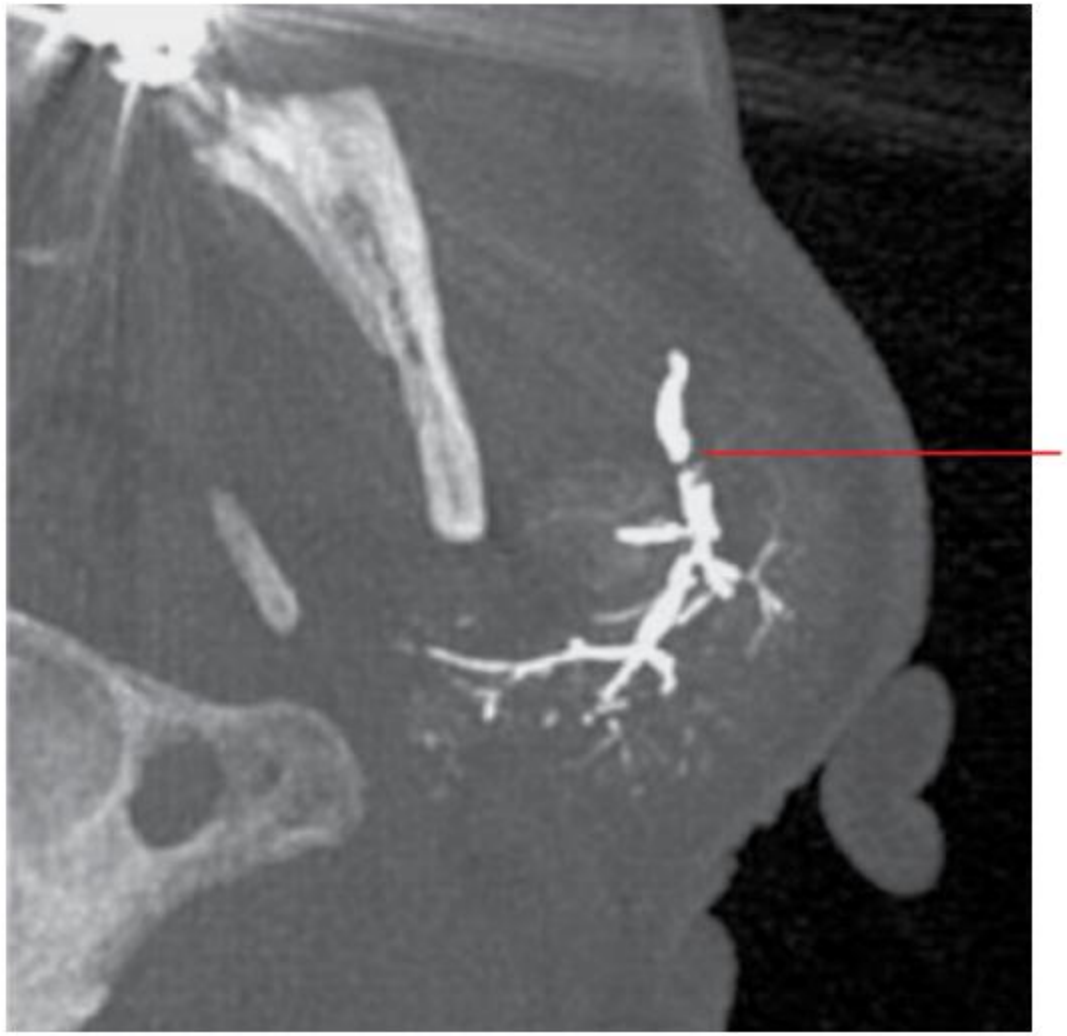


Figure 16.24 Mucus plug/non-calcified ductal sialolith related to the left parotid gland (recurrent swelling related to meals): axial maximum intensity projection MDCT sialogram image.

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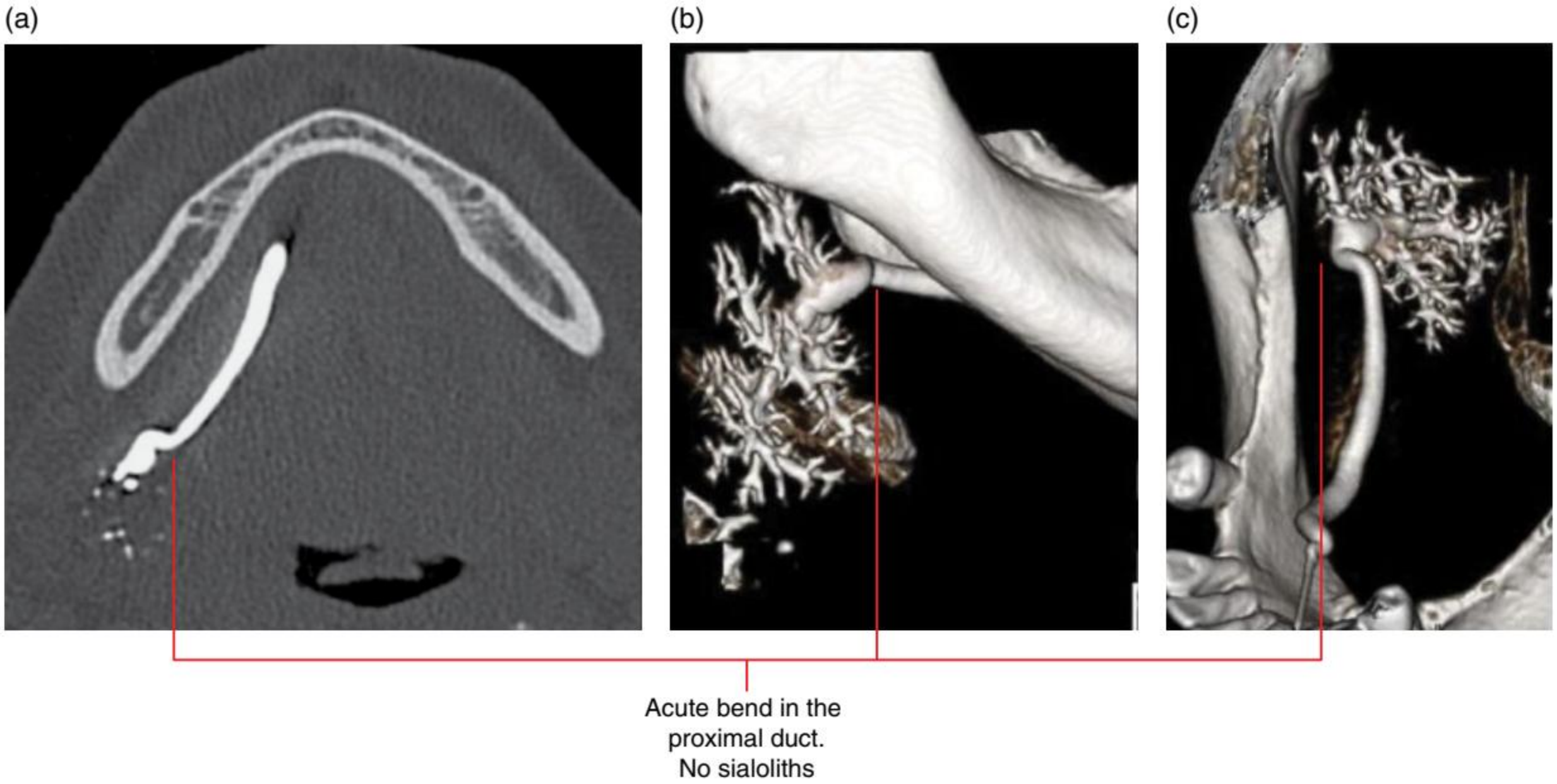
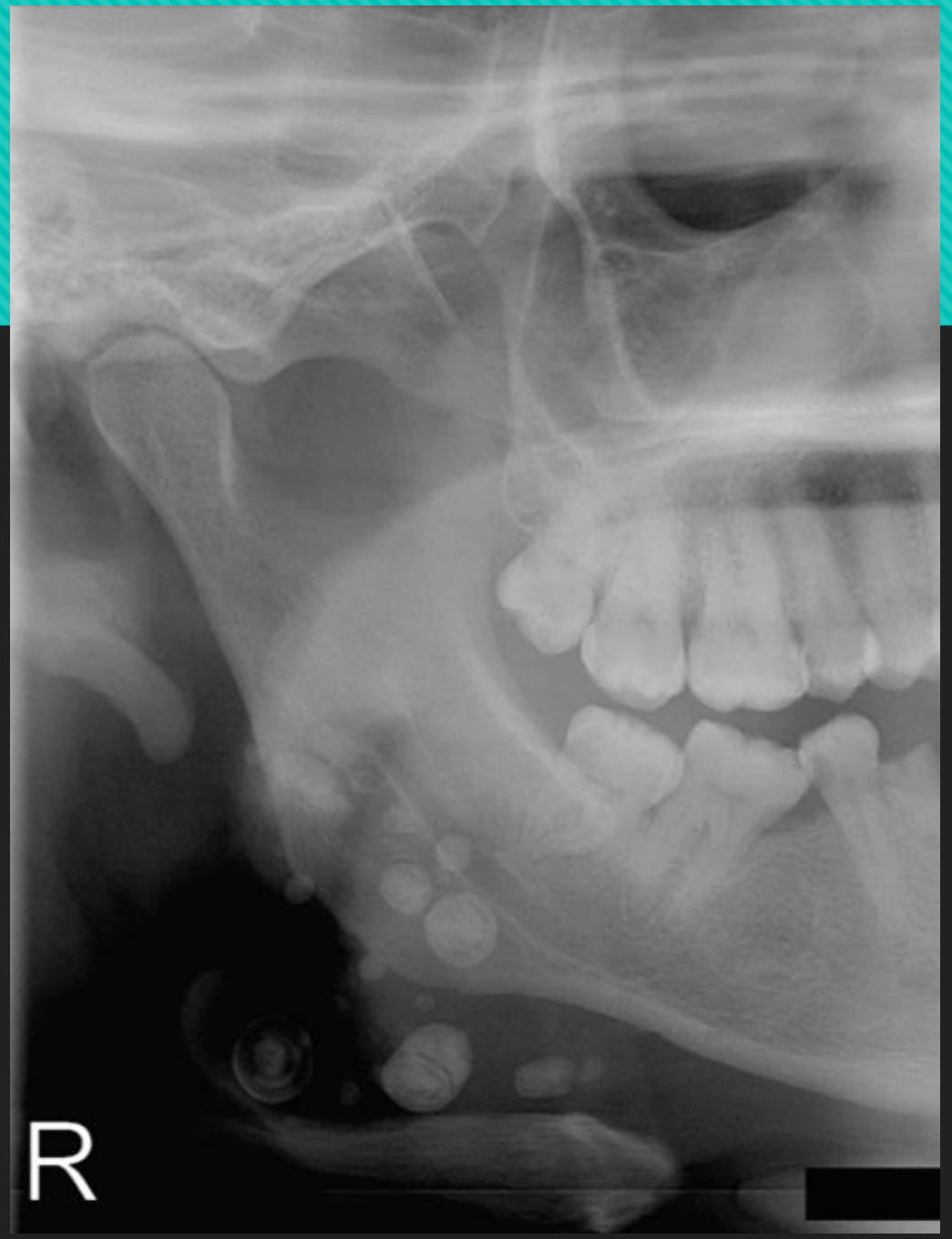


Figure 16.25 Acute bend of the right submandibular gland proximal duct (recurrent swelling related to meals): axial (a) and surface-rendered (b,c) MDCT sialogram images.

2.2 Phleboliths

- Definition: calcified thrombi found in veins, venulae, or sinusoidal vessels of haemangiomas (esp. cavernous type)
- Disease Mechanism:
  - Venous stagnation → intravascular thrombi → become organised and mineralised
  - Mineralisation begins in core of thrombus
  - Consists of calcium carbonate-fluorohydroxyapetite

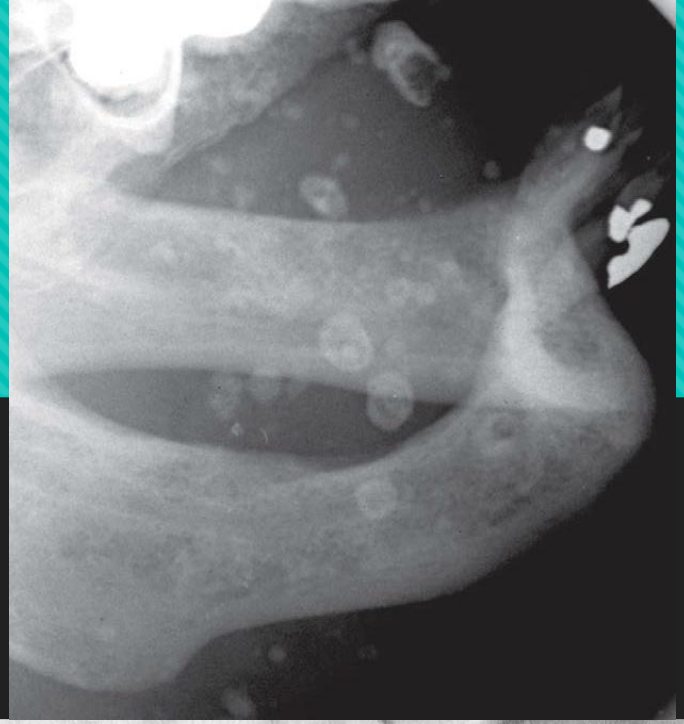


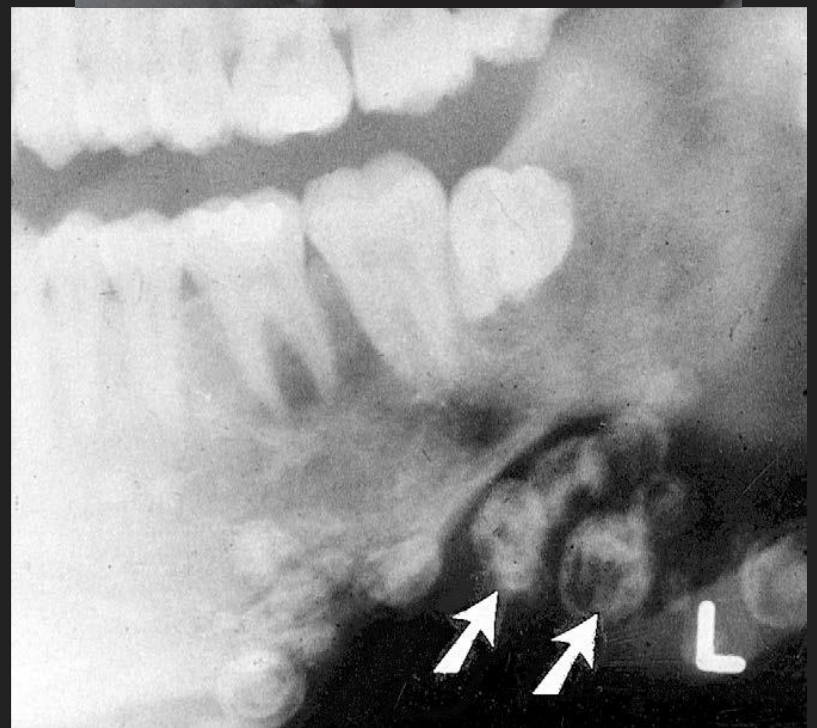
2.2 Phleboliths

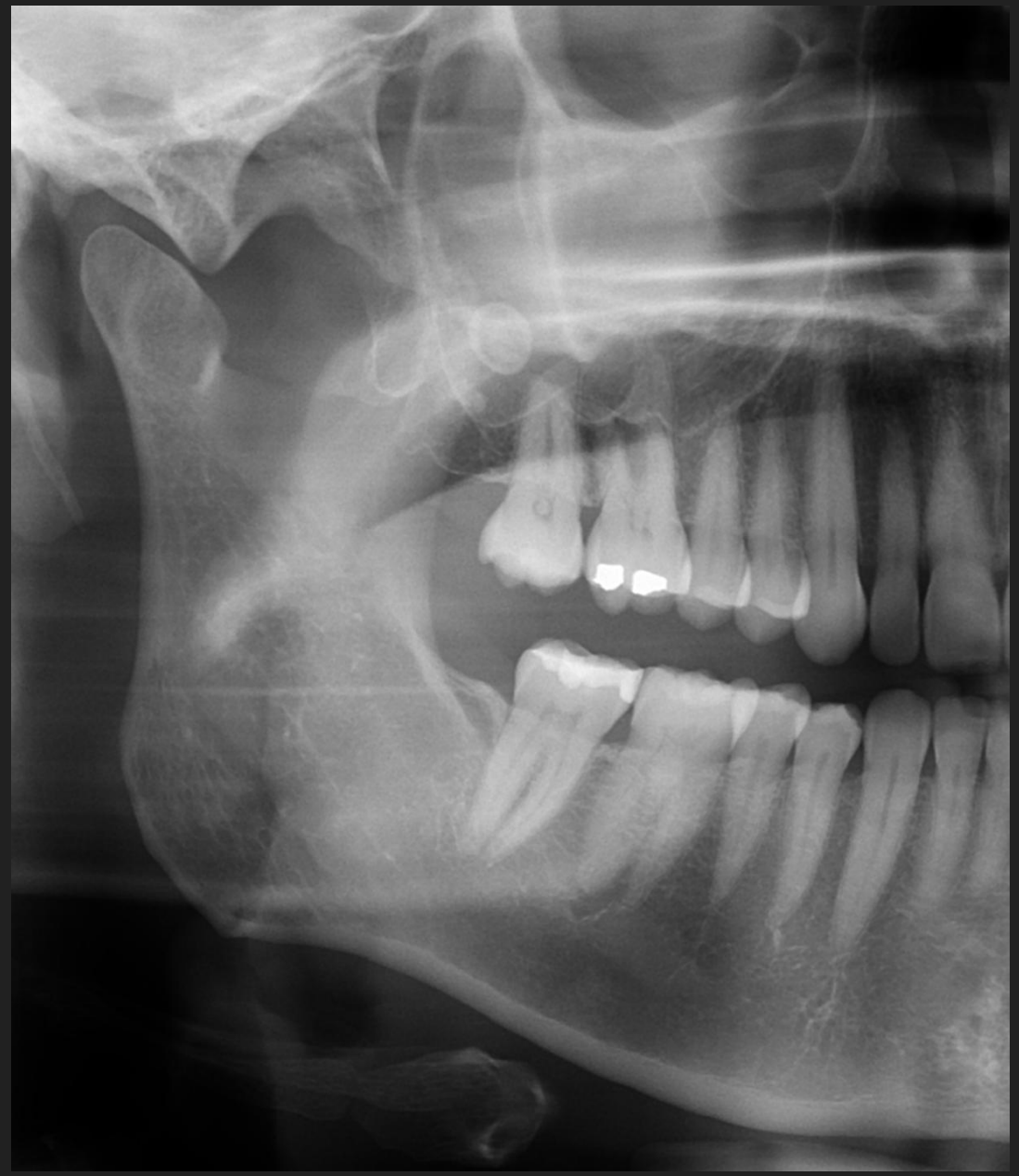
- Clinical Features:
  - In the head and neck, almost always signify presence of haemangioma
  - In adults, may be the sole residua of a childhood haemangioma that has regressed
  - Soft tissues may be swollen, throbbing, or discoloured by presence of veins or haemangioma
  - Haemangiomas often fluctuate in size (associated with body positioning or Valsalva manoeuvre); should blanch/change in colour with pressure
  - Auscultation may reveal a bruit in cases of cavernous hemangioma but not in the capillary type
- Management:
  - May need further imaging with MSCT or MRI +/- contrast to visualise the vascular malformation
  - Central haemangiomas are treated without delay due to risk of lethal exsanguination
    - Embolisation, surgery, or sclerosing techniques

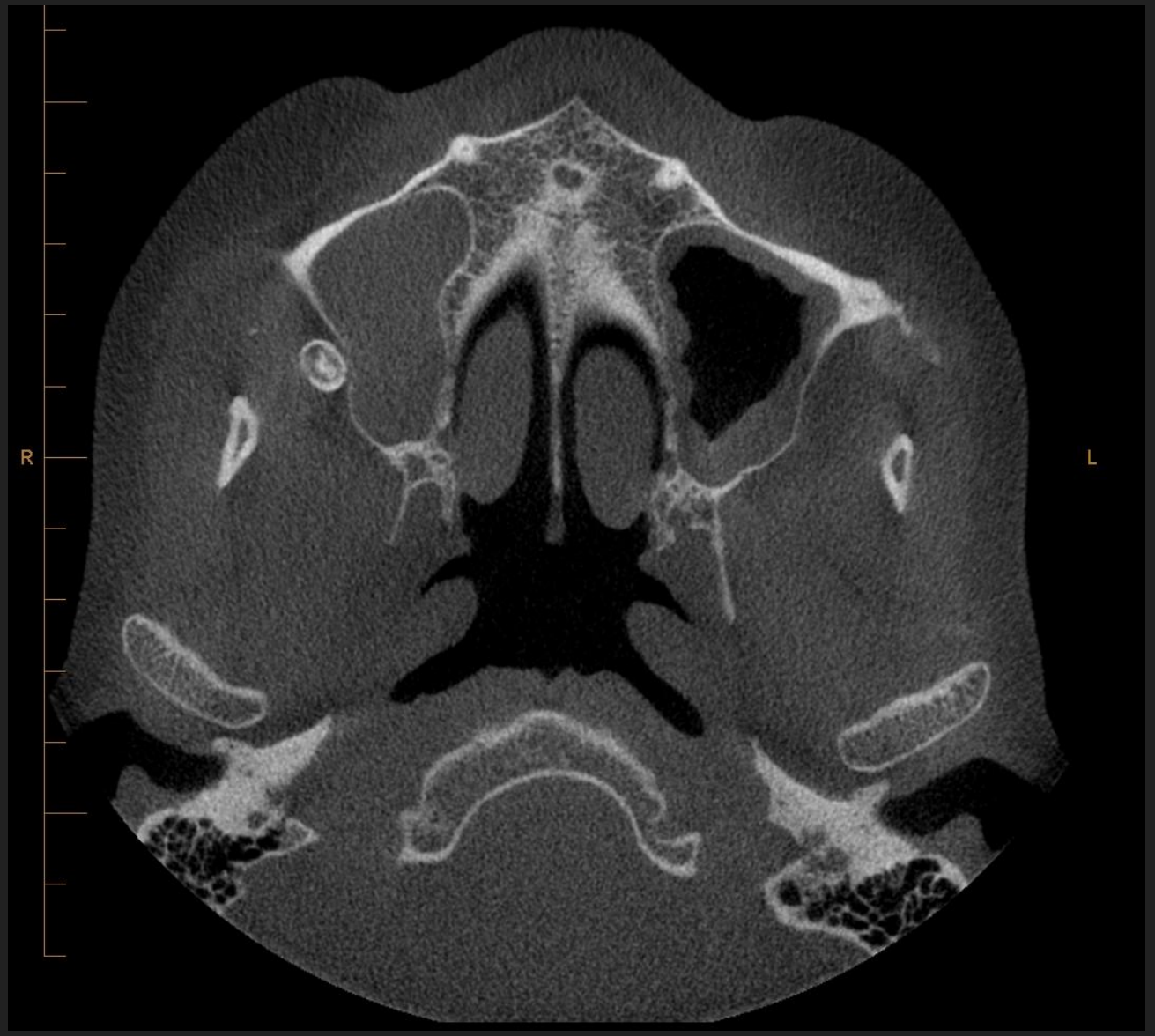
2.2 Phleboliths

- Location:
  - Most commonly found in haemangiomas (Mand>Max; typically manibular body, ramus, or within IAC)
- Periphery/Shape:
  - In cross-section: Round/oval shape with smooth periphery, up to 6mm in diameter
  - If viewed from the side, resembles a straight or slightly curved sausage
- Internal Features:
  - Laminated, bulls-eye or targetoid appearance
  - May be homogeneously radiopaque
  - Radiolucent flow voids may be seen
- Surrounding Features: N/A





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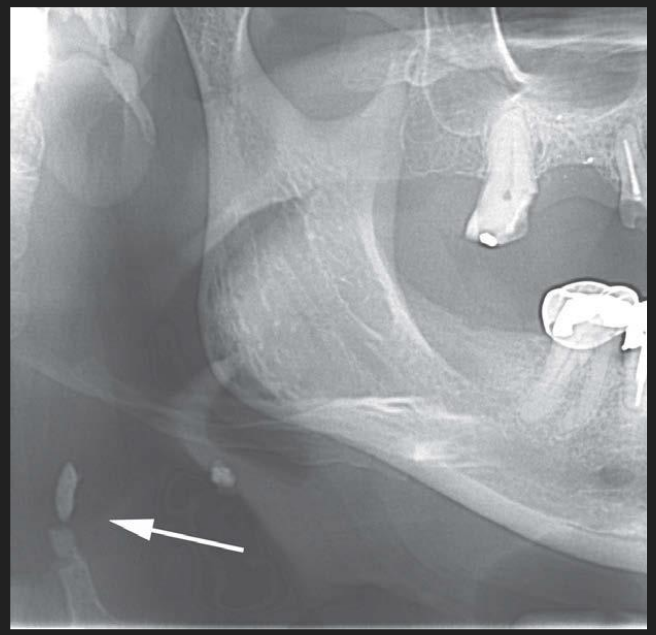
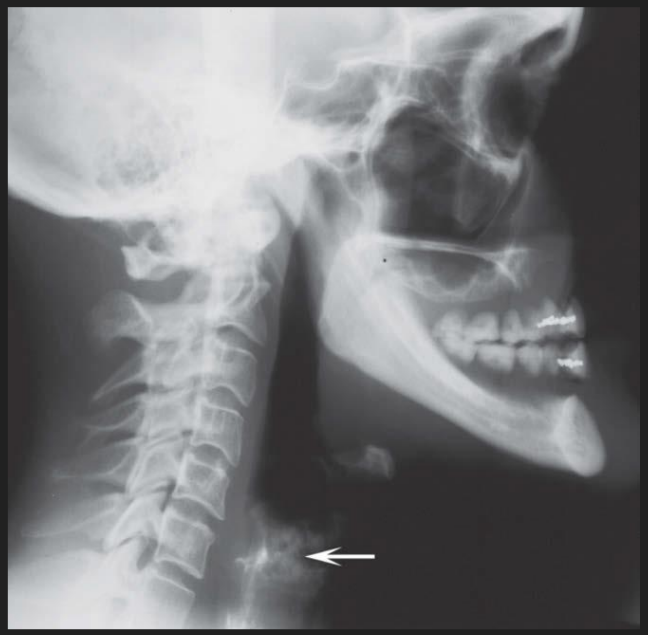
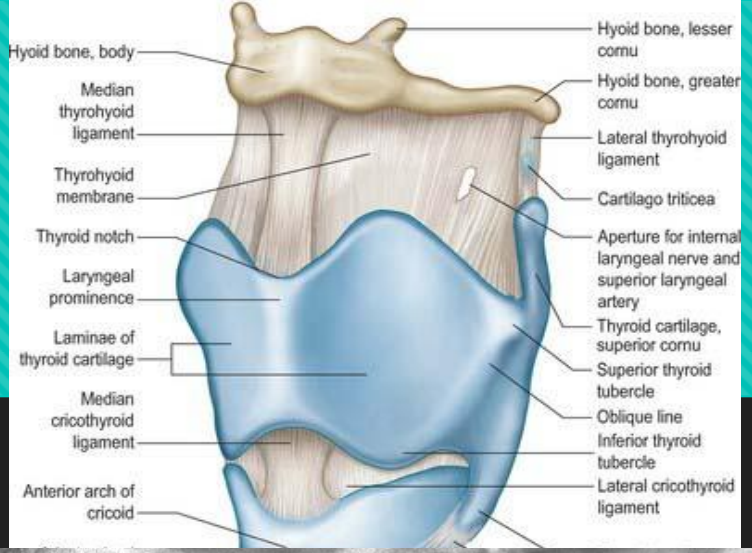
2.3 Laryngeal Cartilage Calcifications

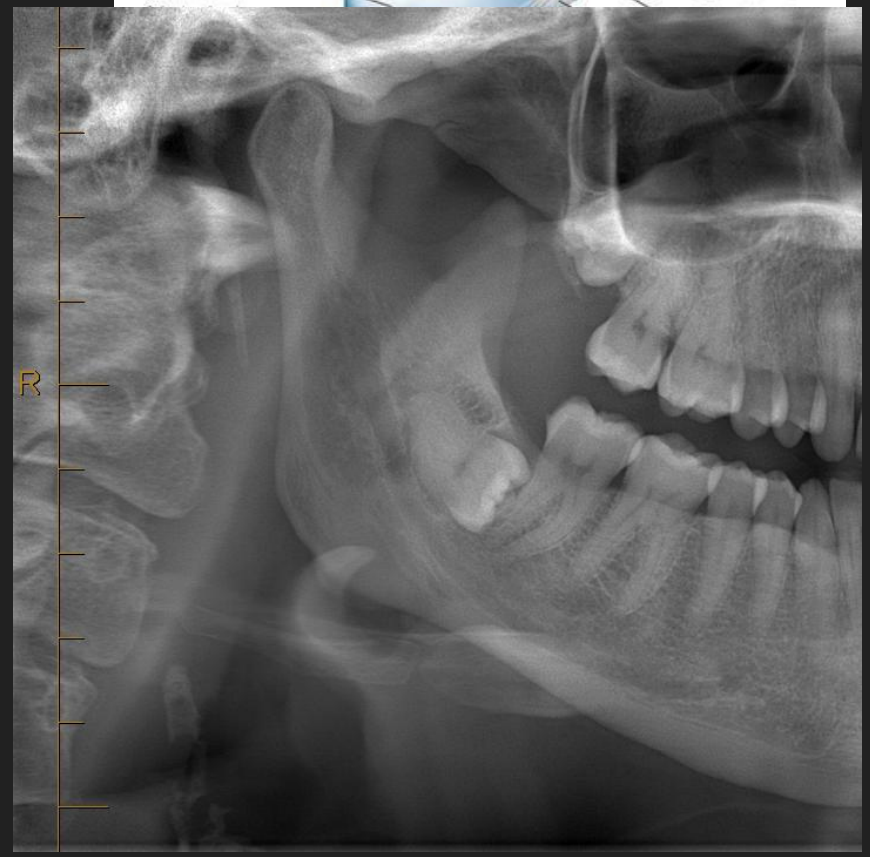
- Mechanism:
  - Progresses as a physiologic process
  - Endochondral calcification and ossification of the hyaline laryngeal cartilages begins on attainment of skeletal maturity
- Clinical Features:
  - Asymptomatic
  - Typically an incidental finding
- Management:
  - No treatment needed





2.3 Laryngeal Cartilage Calcifications

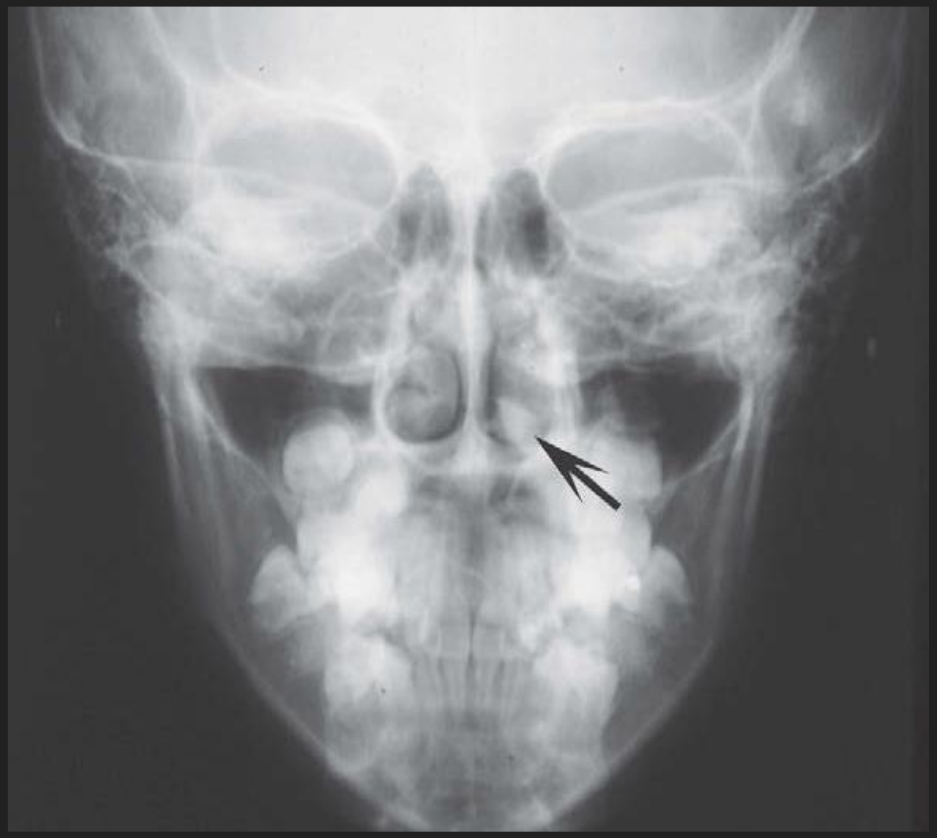




- Location:
  - *Triticeous cartilage:* small, paired, found within lateral thyrohyoid ligaments
    - [PAN] located inferior to greater cornu of hyoid and adjacent to superior border of C4
  - *Superior cornu of thyroid cartilage:* medial to C4
- Periphery/Shape:
  - Triticeous: "grain of wheat" measuring 7-9mm (L) and 2-4mm (W) with smooth, well-defined, regular geometry
  - Thyoid cartilage: usually on 2-3mm visible at lower edge of radiograph
- Internal Features:
  - Homogeneous radiopaque, but occasionally with an outer cortex
- Surrounding Features: N/A

2.4 Rhinoliths and Antroliths

- Disease Mechanism:
  - Arise from deposition of nasal, lacrimal, and inflammatory mineral salts by accretion around a nidus
  - Rhinolith nidus = typically an exogenous foreign object
    - Usually enters from anterior, but may be from posterior choana
  - Antrolith nidus = typically endogenous
    - Dystrophic calcification within chronically inflamed mucosa in long-standing sinusitis, or
    - A non-invasive aspergillosis mycetoma in patients with chronic sinus disease → necrotic fungus ball or hard mycolith

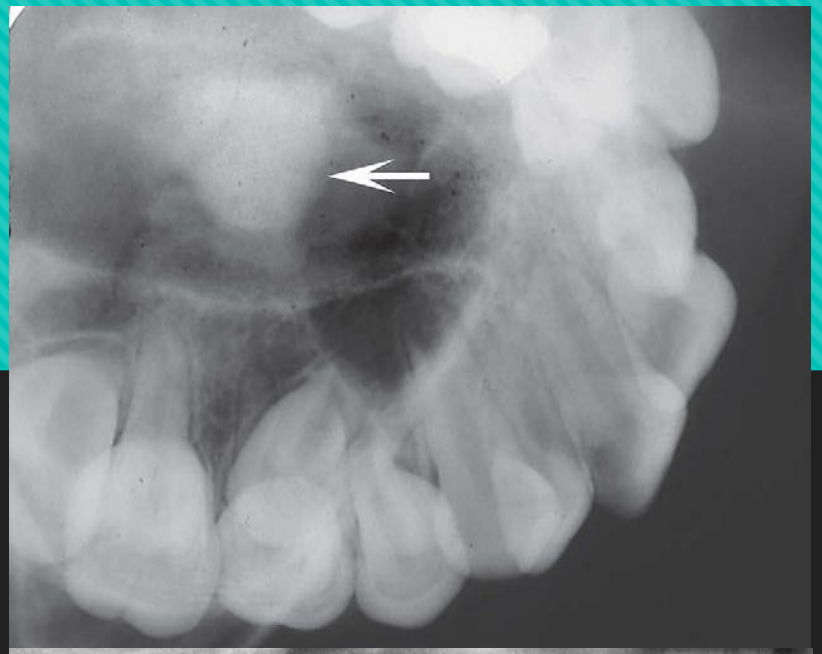


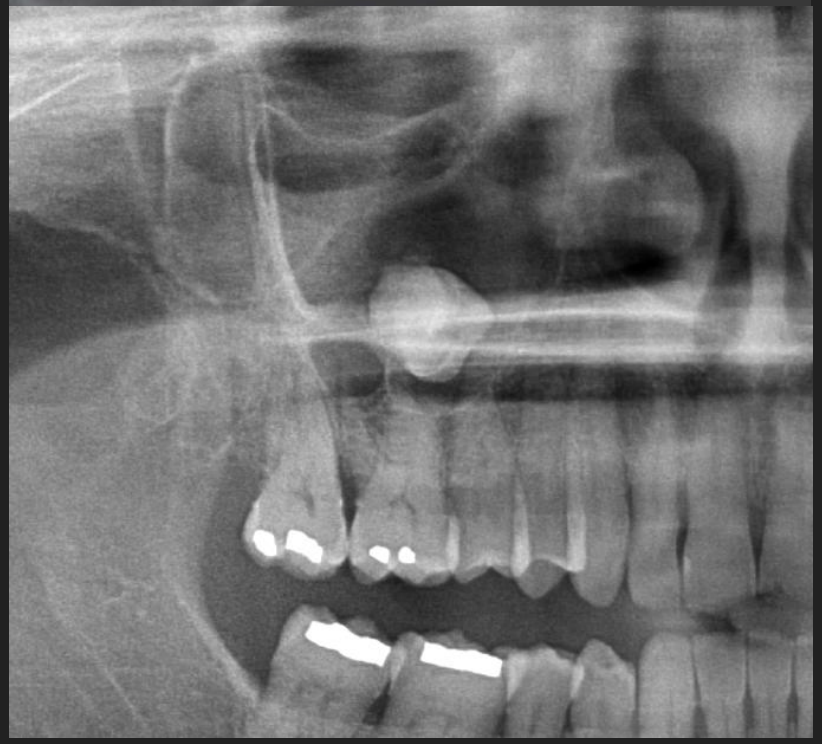
2.4 Rhinoliths and Antroliths

- Clinical Features:
  - Asymptomatic
  - Expanding mass may impinge on mucosa → pain, congestion, and ulceration
  - May have nasal obstruction, unilateral purulent or blood-stained rhinorrhoea, sinusitis, headache, epistaxis, anosmia, fetor, and fever
- Management:
  - Referral to ENT for endonasal or sinus endoscopic surgical removal
  - Lithotripsy has been used in some cases to debulk large rhinoliths

2.4 Rhinoliths and Antroliths

- Location:
  - Rhinoliths: develop in nose
  - Antroliths: develop in maxillary antrum
  - Concretions rarely form in frontal or ethmoid sinus
- Periphery/Shape:
  - Various shapes and sizes, depending on nature of nidus
- Internal Features:
  - Homogeneous or heterogeneous radiopacities, depending on nature of nidus
  - May have laminations
  - Occasionally, density exceeds surrounding bone
- Surrounding Features: N/A





3. Metastatic Calcification

3. Metastatic Calcifications

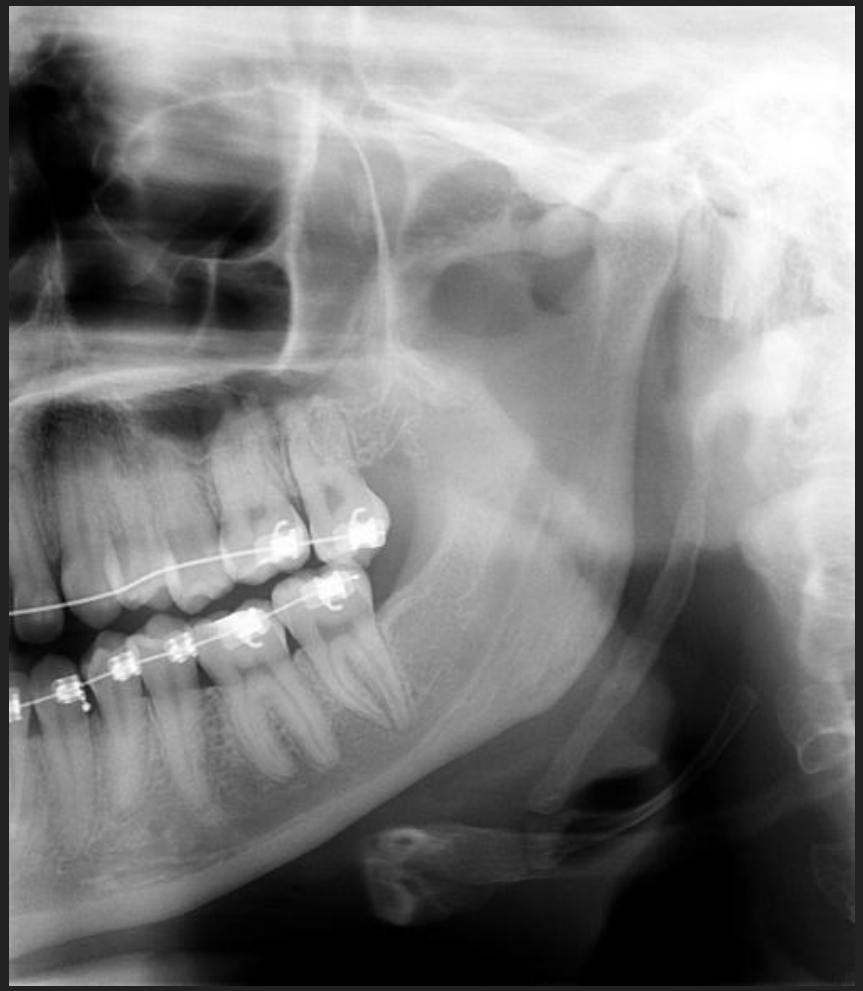
- Caused by conditions involving elevated serum Ca and PO_4 levels
- E.g. hyperparathyroidism, hypercalcaemia of malignancy
- Occurs in soft tissues of orofacial region
- Extremely rare

4. Heterotopic Ossifications

1. Stylohyoid ligament ossification
2. Osteoma cutis
3. Myositis ossificans

4.1 Stylohyoid Ligament Ossification

- Disease Mechanism:
  - The styloid process arises from second branchial arch (Reichert's cartilage).
  - The stylohyoid ligament is a remnant of the second branchial arch.
  - Ossification of the styloid process begins from the base of the skull downwards
  - Length of styloid process is variable, but maximum 3cm is considered to be normal
  - This ossification process may extend to the stylohyoid ligament
    - Commonly bilateral
- Epidemiology:
  - **Prevalence:** ~18% of population showed ossification of >3cm of the stylohyoid ligament
  - **Age:** may show some calcification at any age

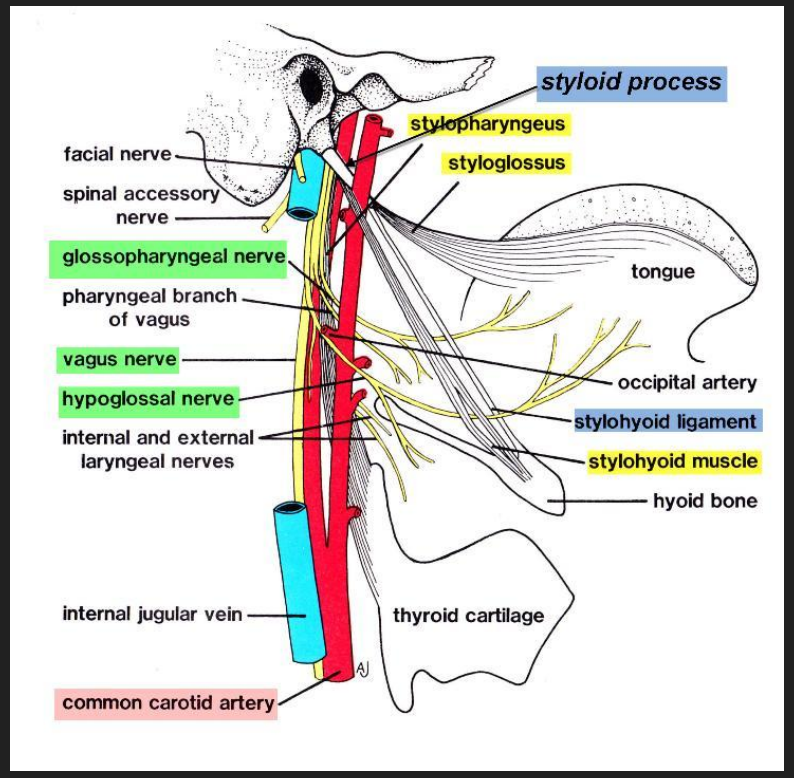


4.1 Stylohyoid Ligament Ossification

- Clinical Features:
  - Usually an incidental feature on panoramic images
  - The ossified ligament can be palpated at the palatine tonsil as a hard, pointed structure
  - Only a few patients have symptoms
  - Little correlation between extent of ossification and intensity of symptoms
  - Symptoms related to the ossification of the stylohyoid ligament is known as **Eagle Syndrome** with two subtypes:
    - Classic Eagle syndrome
      - Results from cranial nerve impingement
    - Carotid artery syndrome
      - Results from impingement of carotid vessels

Classic Eagle Syndrome

- Stylohyoid ligament ossification + Presence of clinical discomfort + a recent history of neck trauma (typically tonsillectomy)
- The ossified stylohyoid complex and local scar tissue are thought to cause symptoms by impinging on CN V, VII, IX, X or XII (pass in close proximity to the styloid process)
- Symptoms
  - Vague, nagging to intense pain in the pharynx on speaking, chewing, swallowing, turning the head or opening the mouth widely, especially on singing or yawning
  - A foreign body sensation in the throat on swallowing
  - Tinnitus
  - Otalgia



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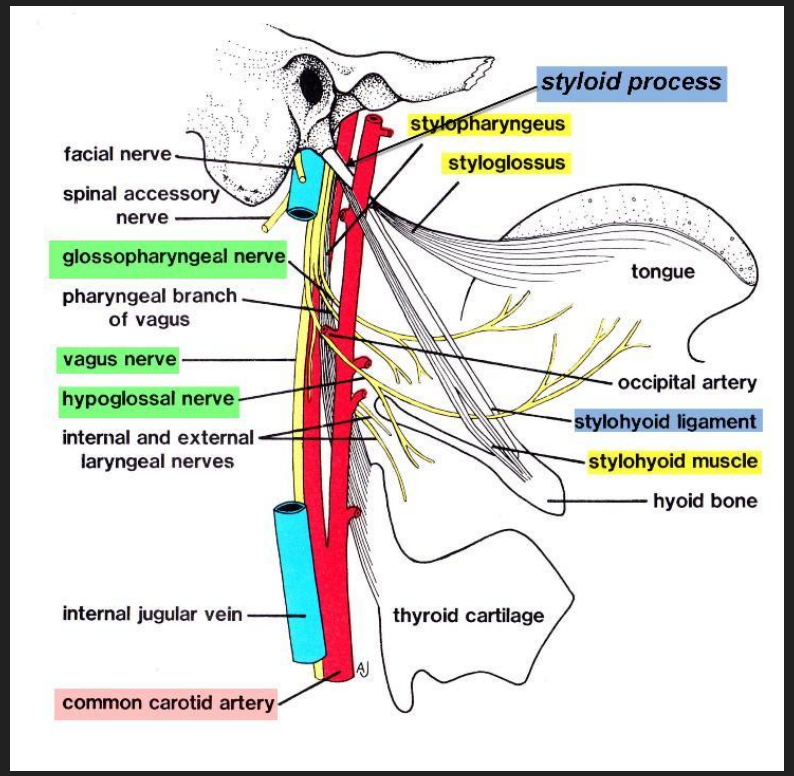
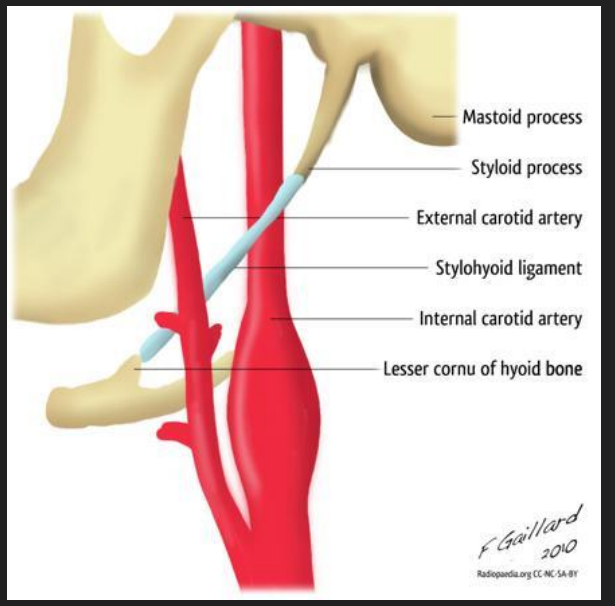




Carotid Artery Syndrome

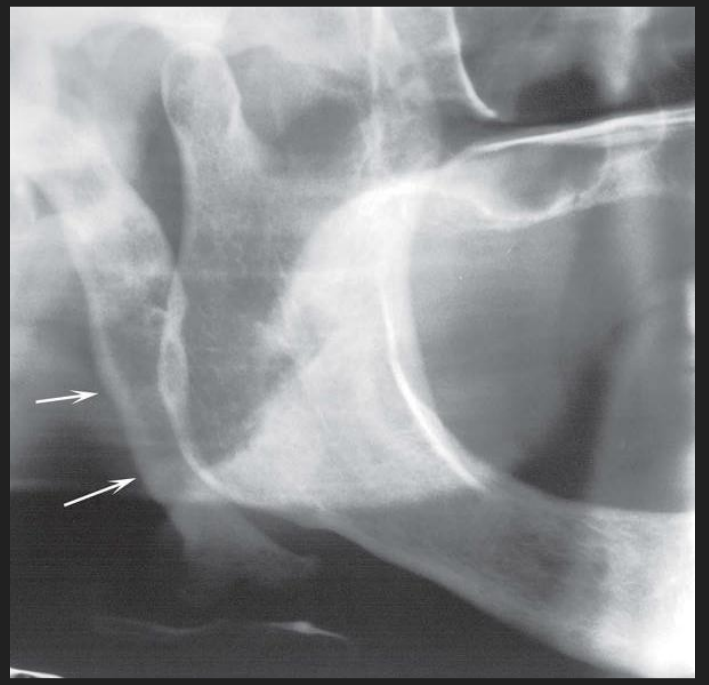
- Synonym: Vascular Eagle Syndrome
- Stylohyoid ligament ossification + Clinical symptoms WITHOUT a history of neck trauma
- >40yo
- More prevalent than Classic Eagle Syndrome
- Referred pain along the distribution of ECA or ICA
  - Due to mechanical impingement of the involved artery and stimulation of its sympathetic nerve plexus → carotidynia
  - May even occur in the absence of ossification of the stylohyoid complex
- Symptoms:
  - ECA: suborbital facial pain
  - ICA: eye pain, temporal/parietal headache, migraines, aphasia, visual symptoms, weakness and transient hemispheric ischemia with vertigo or syncope notably when turning the head to the ipsilateral side

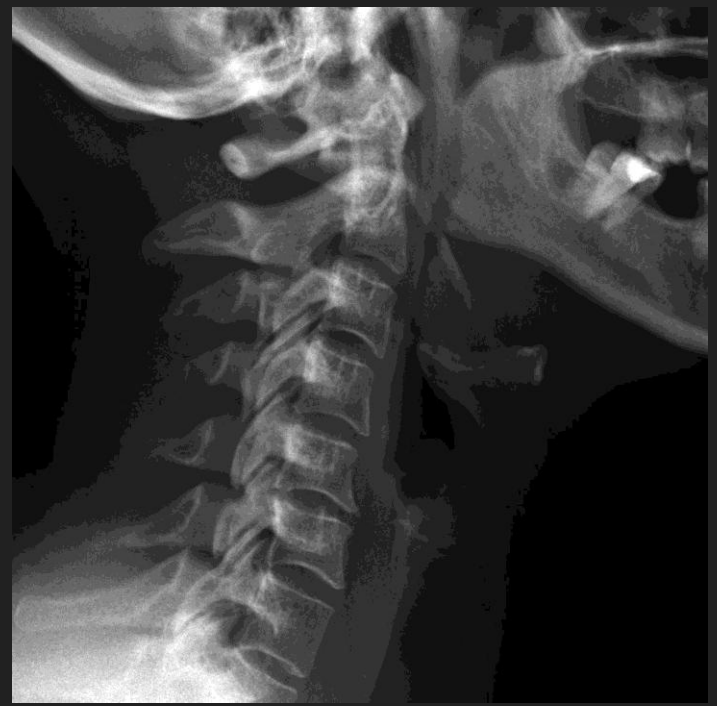
4.1 Stylohyoid Ligament Ossification

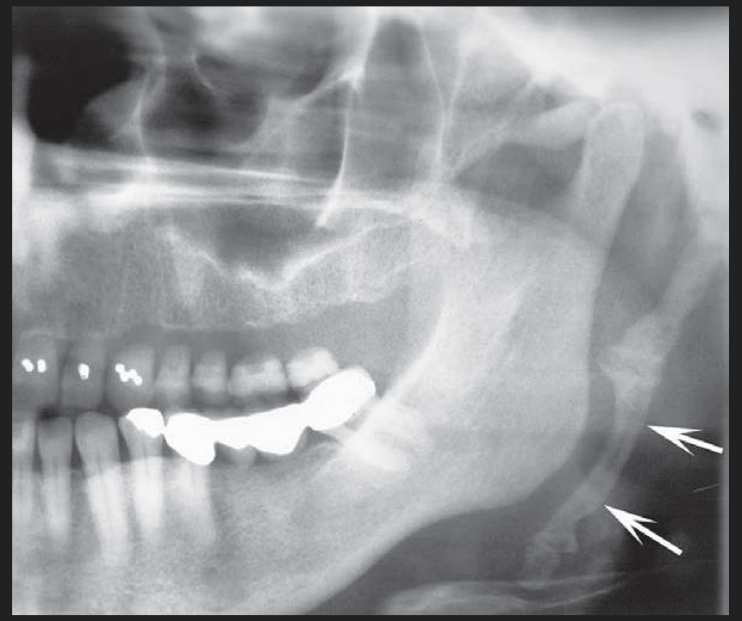
DDx for Stylohyoid ligament Ossification and Eagle Syndrome	
Symptoms are often vague, but symptoms + evidence of ligament ossification is usually distinctive for Eagle syndrome. NOTE: Presence of stylohyoid ligament ossification WITHOUT symptoms is not considered to be Eagle syndrome	
TMD	Diagnostic confirmation of stylohyoid ligament ossification can be achieved by topical anaesthesia to suppress gag reflex, palpation of tonsillar fossa to reproduce symptoms, and detection of the hard submucosal mass

- Management:
  - Most are asymptomatic: no treatment
  - Vague symptoms: conservative management, reassurance, steroid or lidocaine injections into tonsillar fossa
  - Persistent or intense symptoms: stylohyoidectomy (amputation of styloid process)

- Location:
  - Linear ossification extends from region of mastoid process, crosses the posteroinferior aspect of the ramus towards the hyoid bone
- Periphery/Shape:
  - Styloid process appears as long, tapering, thin radiopaque process of 0.5-2.5cm in length
  - Ossified ligament has roughly straight outline, although some irregularity may be seen on the outer surface
  - Pseudoarticulations (radiolucent, joint-like junctions) may interrupt the ligament
- Internal Features:
  - Small: homogeneously radiopaque
  - As the ossification increases in length and girth, the outer cortex of the bone becomes apparent (radiopaque band at periphery)
- Surrounding Features: N/A

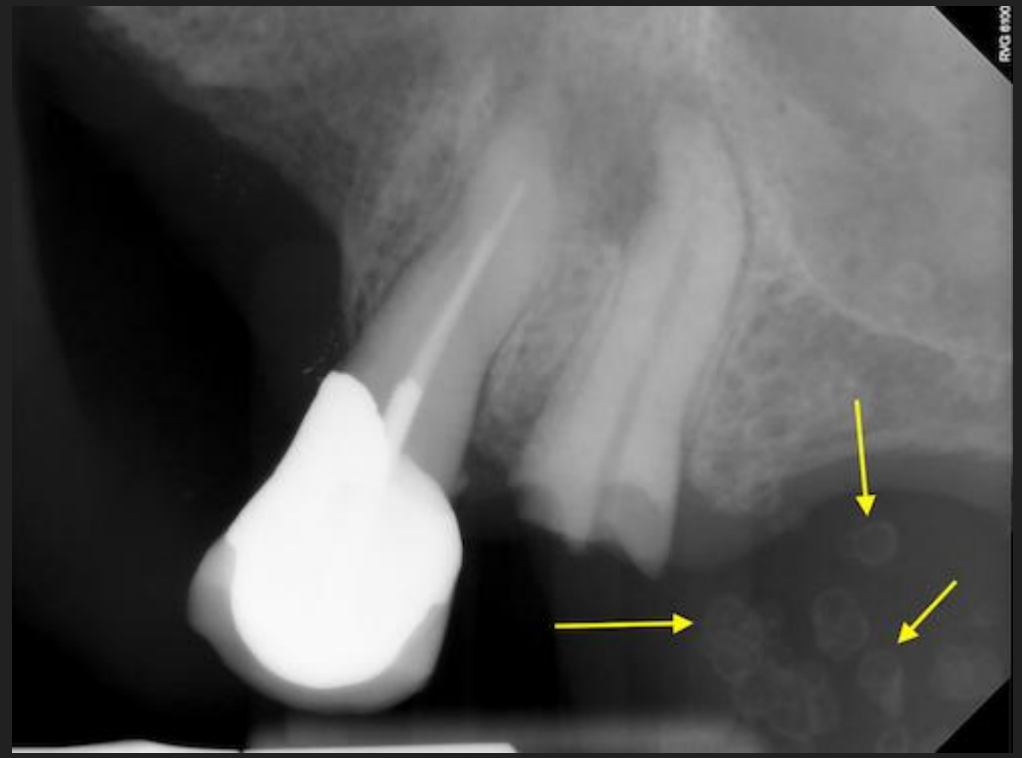






4.2 Osteoma Cutis

- Disease Mechanism:
  - A rare soft tissue calcification in the skin or subcutaneous tissues that manifests as focal development of bone within the dermis physically removed from any original osseous tissue
  - Divided into:
    - Primary (15%): occurring in normal tissue without any pre-existing condition
    - Secondary (85%): developing in damaged or disrupted skin (e.g. acne)
  - Occasionally found in diffuse scleroderma
    - Replaces the altered collagen in the dermis and subcutaneous septa

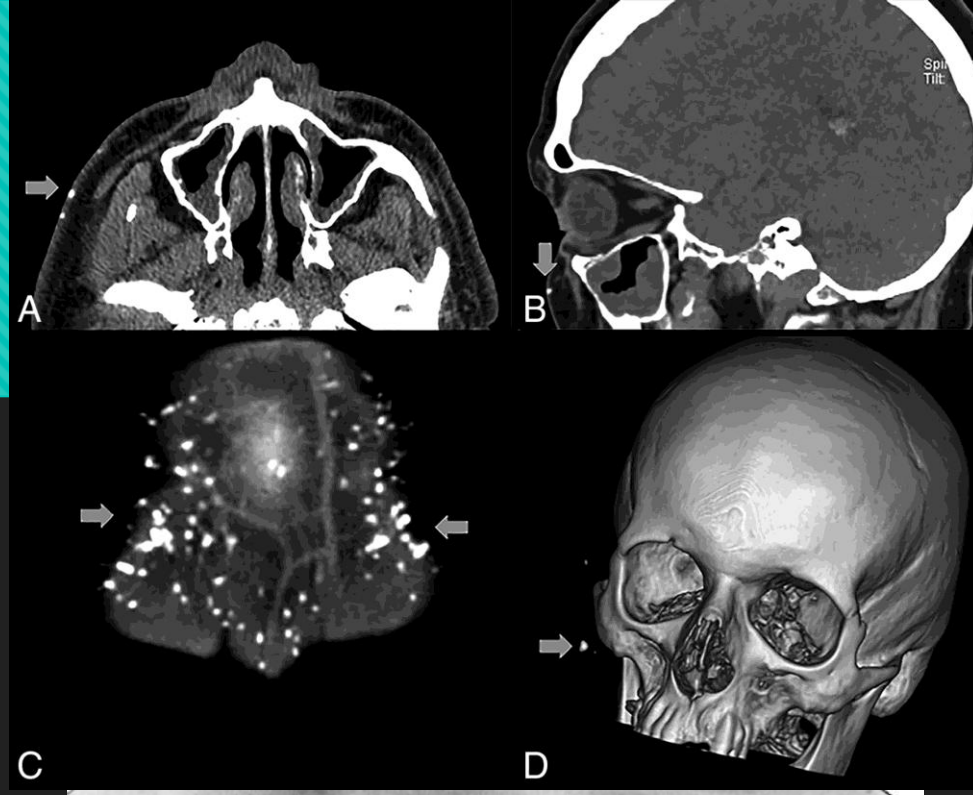


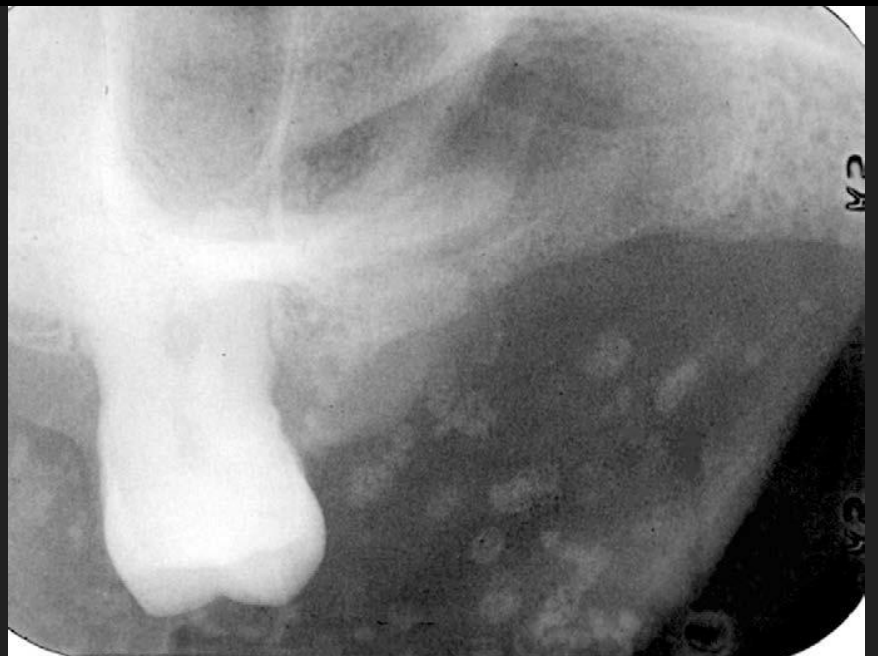
4.2 Osteoma Cutis

- Clinical Features:
  - Can occur anywhere
    - EO: face most common
    - IO: tongue most common (osteoma mucosae or osseous choristoma)
  - Does not cause any visible change in the overlying skin
    - Occasional colour change to yellowish-white
  - If large, individual osteoma may be palpated
  - If needle inserted, stone-like resistance is met
  - **Multiple miliary osteoma cutis**: numerous (dozens to hundreds) of lesions
    - Female: face; Male: scalp or chest
- Management:
  - No treatment required
  - Primary osteoma cutis often removed for cosmetic reasons
    - Resurfacing of the skin in multiple miliary osteoma cutis with Er:YAG laser + tretinoin cream, curettage and CO_2 continuous wave laser, or needle microincision-extirpation technique

4.2 Osteoma Cutis

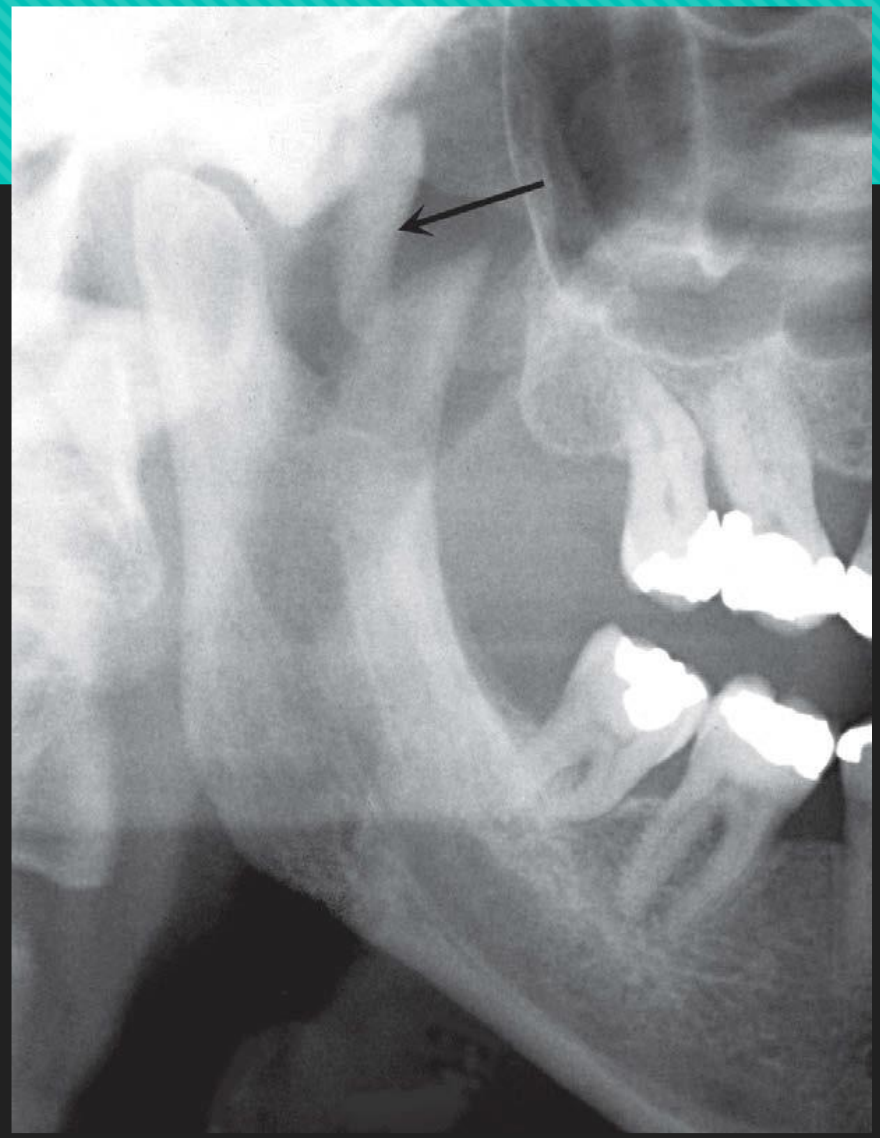
- Location:
  - Most commonly cheek and lip regions
  - May be superimposed over tooth root or alveolar process → appearance of area of dense bone
- Periphery/Shape:
  - Smoothly outlined, radiopaque, washer-shaped
  - Single or multiple
  - Usually very small (range: 0.1-5cm)
- Internal Features:
  - Homogeneously radiopaque with radiolucent centre (represents fatty marrow) → donut appearance
  - Trabecular occasionally develop in marrow cavity of larger osteomas
  - Snowflake-like radiopaque corresponding to clinical location of scar tissue in calcified cystic acne
- Surrounding Features: N/A





4.3 Myositis Ossificans

- Fibrous tissue and heterotopic bone form within the interstitial tissue of muscle and associated tendons/ligaments.
  - Leads to secondary destruction and atrophy of muscle (due to interdigitation of the fibrous tissue and bone which separates the muscle fibres)
- Two principle forms:
  - Localised
  - Progressive



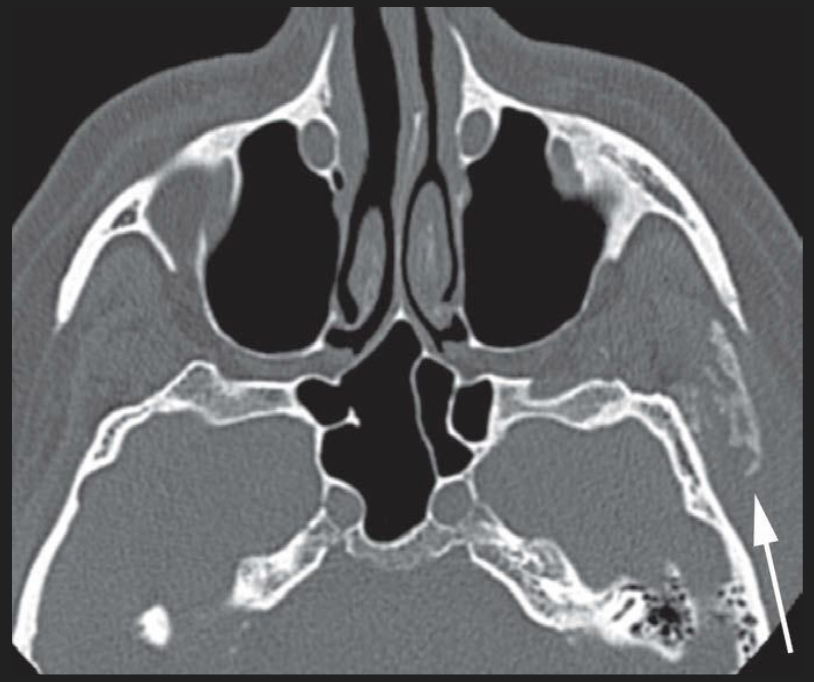
4.3 Localised (Traumatic) Myositis Ossificans

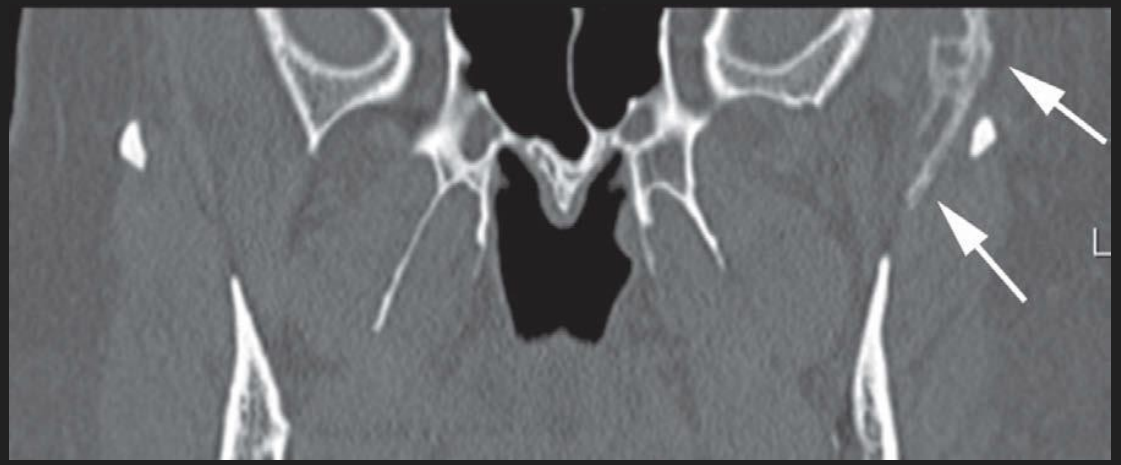
- Synonyms: post-traumatic myositis ossificans, solitary myositis
- Epidemiology:
  - Can develop at any age and gender (more common in young men who engage in vigorous activity)
- Aetiology: acute/chronic trauma, heavy muscular strain caused by certain occupations and sports, muscle injury from multiple injections (e. IANB)
- Disease Mechanism:
  - Skeletal muscle has limited capacity for regeneration following significant physical trauma
    - → haemorrhage into muscle, tendons, or fascia
    - → exuberant proliferation of vascular granulation tissue subsequently undergoes metaplasia to cartilage and bone during healing
  - NB: no inflammation is involved despite the term myositis
  - NB: the fibrous tissue and bone form within the interstitial tissue of muscle; no actual ossification of the muscle fibres occurs

4.3 Localised (Traumatic) Myositis Ossificans

- Clinical Features:
  - Site of trauma remains swollen, tender, and painful for longer than expected
  - Overlying skin red and inflamed
  - Opening jaws may be difficult
  - After 2-3 weeks, the area of ossification becomes apparent with palpation of a firm intramuscular mass
  - May enlarge slowly but eventually stops growing
  - May appear fixed or be freely moveable
- Management:
  - Rest and limitation of use to reduce extent of calcific deposit
  - Medical management with bone morphogenetic protein type I receptor inhibition to reduce heterotopic ossification
  - Surgical excision for lesions that cause a functional restriction or neurologic impairment
    - With intensive physiotherapy to minimise postsurgical scarring
    - Incomplete excision or excision at immature stage can result in recurrence

- Location:
  - Most common in head and neck: masseter and SCM
- Periphery/Shape:
  - Periphery more radiopaque than internal structure
  - Variation in shape: irregular oval to linear streaks (pseudotrabeculae) running in same direction as muscle fibres – characteristic for myositis ossificans
  - Heterotopic bone may lie along long axis of muscle
  - Generally <6cm in greatest dimension





- Internal Features:
  - Varies with time
  - (3-4 weeks) faintly homogeneous radiopaque
  - (2 months) further organisation into a delicate, lacy or feathery radiopaque internal structure (indicative of bone formation but without normal trabecular pattern)
  - (6-12 months) fully matured where entity becomes denser, more homogeneous and better defined
  - (after this) lesion may shrink
- Surrounding Features: N/A

4.3 Localised Myositis Ossificans – DDx

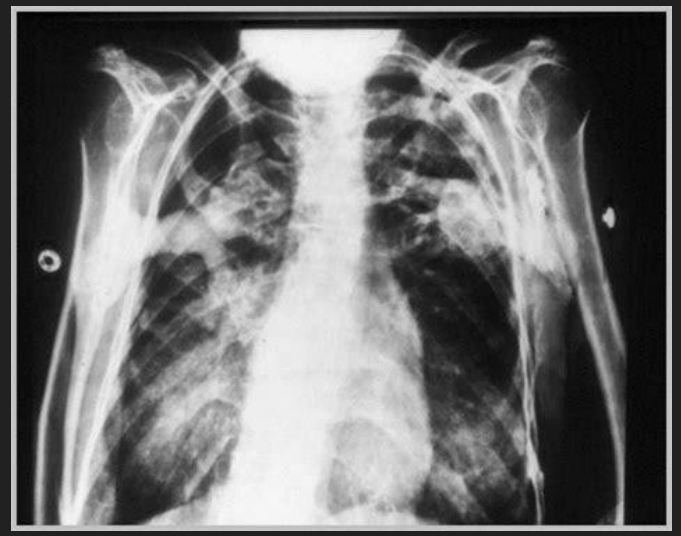
	DDx
Ossification of Stylohyoid ligament	Form and location of myositis ossificans often enough to make DDx
Other soft tissue ossifications	
Osteogenic neoplasms	e.g. osteogenic sarcoma – can form a linear bone pattern, however, lesion is contiguous with adjacent bone and signs of bone destruction often present

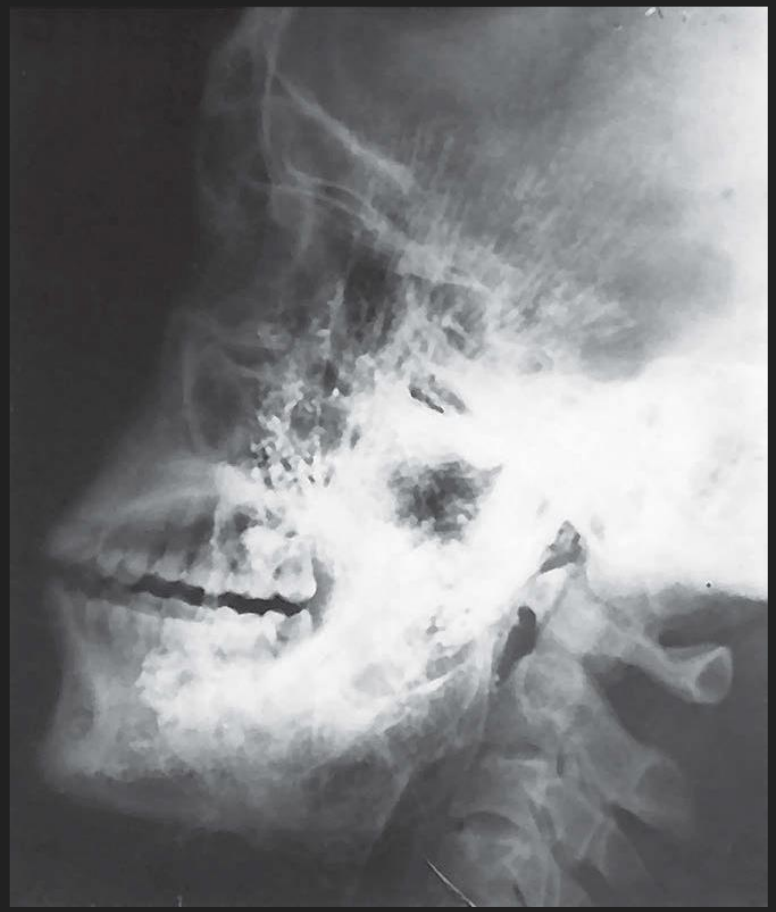
4.3 Progressive Myositis Ossificans

- Synonym: fibrodysplasia ossificans progressive
- Disease Mechanism:
  - Rare hereditary autosomal dominant disease
  - Symptoms from early infancy
- Epidemiology:
  - M>F
- Clinical Features:
  - Begins in striated muscles of neck and upper back, then extend to extremities.
  - Initially presents as soft tissue swelling with pain, with increasing stiffness and limitation of movement as ossification occurs, eventually resulting in the 'petrified man' condition.
  - Life expectancy: 3rd-4th decade
- Management:
  - No effective treatment exists
  - Excision of nodules that are traumatised and ulcerate frequently
  - Supportive therapy may be required in later stages of disease when interference with respiration or respiratory infection occurs

4.3 Progressive Myositis Ossificans

- Imaging features similar to localised form
- Heterotopic bone more commonly oriented along long axis of involved muscle
- Osseous malformation of the regions of muscle attachment (e.g. Md condyles) may be seen





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