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Case Report

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Considerations in Detecting Soft Tissue Calcifications on Panoramic Radiography

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Abstract:
Head and neck soft tissues calcifications can result from physiological or pathological mineralization. Some of these calcifications may be found on panoramic radiography because of their proximity to the focal trough and their superimposition over hard and soft tissue structures. Such radiographic images are common and create a diagnostic challenge. Differentiation of these entities can be done when radiographic features and locations are taken into consideration. Since cone-beam computed tomography (CBCT) has been used in dentistry, fortuitous discovery of such calcifications has increased. However, by providing images in the third dimension, CBCT facilitates their precise localization. Adequate diagnosis of these calcifications may enhance their approach and management by clinicians. The aim of this article is to describe the radiographic characteristics of some head and neck calcifications in dental practice on panoramic X-rays and CBCT.

Key Words: Calcification, cone-beam computed tomography, head and neck, panoramic radiography

Introduction

Calcifications of various structures located in the head and neck regions are commonly found in patients seeking dental care. These calcifications may be fortuitously detected on conventional imaging techniques used in dental practice such as panoramic radiography. However, many of them look alike which make localization and identification difficult.[1]

These are deposits of calcium salts, mostly calcium phosphate in the soft tissues.[2] In the head and neck, they can be present as physiologic or pathologic mineralization.[1] The latest, usually associated with chronic inflammation or scars, is more likely to be found in ligaments, articulation's cartilage, glands, and vessel tissues.[1,3]

There are three types of pathologic calcifications:[1-3]

1. Dystrophic calcification, generally occurring in degenerating and necrotic tissues
2. Metastatic calcification, in which calcium and other salts are deposited in previously undamaged tissue as a result of excess salts in the circulating blood
3. Calcinosis, which is a calcification commonly located in subcutaneous tissues.

Anatomical location, distribution, number, size, and shape are among the most important diagnostic features of these calcifications.[3]

The aim of this report is to describe radiographic findings of some cases of soft tissue calcifications superimposed over the ramus and the angular region of the mandible and to help the clinician establishing appropriate diagnosis and management.

Case Reports

Case 1

The panoramic image of a 21-year-old male patient revealed multiple irregulars in shape collection of small, punctuate radiopaque entities, posterior to the inferior third of the right ramus and angle of the mandible, projecting the image of the body of C3 (Figure 1a).

Further investigation revealed a history of severe viral parotitis (mumps) that occurred at a young age and lasted more than 3 months with residual swelling described then by the physician as a lymph node reaction which would take a long time to disappear without any major concerns.

The long-standing inflammation of the parotid gland can disturb the excretory system of the affected parts of the gland causing the salivary flow to slow down and even completely discontinue. Stagnant saliva and post inflammatory small fibrotic areas contribute to stasis, making the salivary system more prone to the development of sialoliths.[4]
Cone-beam computed tomography (CBCT) was requested to determine the relationship of the mandibular canal with the wisdom teeth. The calcifications were then evaluated: they appeared to be situated at mid-distance between the lateral aspect of the neck and the right lateral aspect of the airway (Figure 1b).

Adding medical history to the radiographic findings might also suggest the diagnosis of calcification of one or multiple lymph nodes, normally embedded within the parotid gland.

Case 2

The panoramic image of a 60-year-old male patient consulting for replacing multiple maxillary, and mandibular absent teeth showed a round radiopaque structure projecting the image of the right mandibular ramus, 2-3 mm inferior to the mandibular foramen. Few smaller radiopacities were noted slightly inferior and posterior. The patient was asymptomatic (Figure 2a).

CBCT showed a 5 mm × 7 mm high-density structure within the parapharyngeal soft tissues on the right side with multiple, smaller, punctuate calcifications inferior to the larger one. The calcifications are within the palatine tonsils region, evoking the diagnosis of tonsilloliths. This is a rare case of such big calcification inside the tonsils (Figure 2b).

Case 3

An 82-year-old female patient presented for extraction of remaining maxillary roots. The medical history revealed only a recurrent tonsil inflammation.

The panoramic radiograph showed multiple small radiopacities, bilaterally projecting over, and spreading along, the whole surface of the inferior two-thirds of the mandibular ramus (Figure 3a).

Before pre-prosthetic surgery, CBCT was requested, and it was beneficial to exactly locate these high densities (Figure 3b).

The anatomical location, distribution, number, size, and shape of theses calcifications are pathognomonic of tonsillitis as they commonly appear on panoramic.

Case 4

This case exhibits on the panoramic a smooth, single, well-demarcated, kidney-shaped structure presenting with multiple alternated layers of high density and relatively lower density bands; these features are suggestive of a long-standing, over-

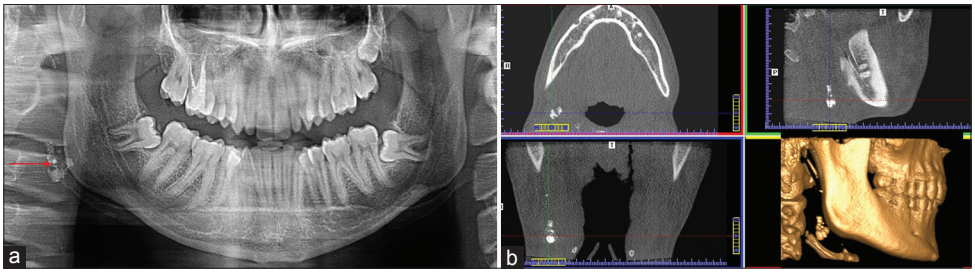

Figure 1: (a) Panoramic radiograph showing well-limited multiple radiopacities. (b) Axial and sagittal cuts showing hyperdense image within the codal part of the parotid gland.

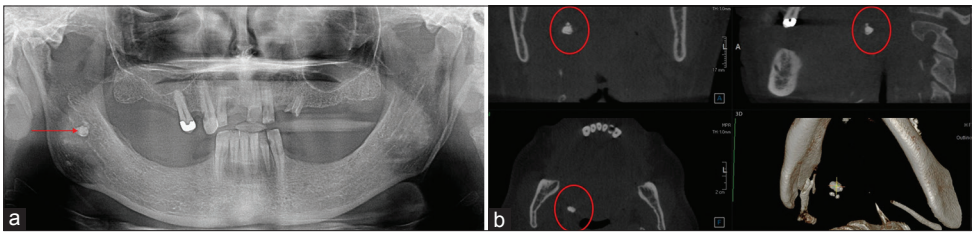

Figure 2: (a) Panoramic radiograph showing a round radiopaque structure projected over the right mandibular ramus. (b) Cone-beam computed tomography showing a high-density structure within the parapharyngeal soft tissues on the right side with multiple, smaller, punctuate calcifications inferior to the larger one.

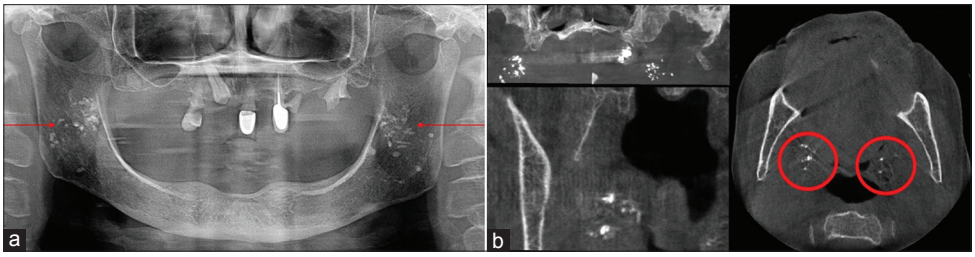

Figure 3: (a) Panoramic radiograph showing multiple small radiopacities, projected bilaterally over the whole surface of the inferior two-thirds of the mandibular ramus. (b) Cone-beam computed tomography imaging showing multiple clustered "rice grain" like ovoid high densities, immediately superficial to the lateral oropharyngeal airway space.

time building salivary gland calculus situated within the hilum of the gland (Figure 4).

Case 5
This case shows a radiopacity with similar size and shape than the former case; however, the outline is ragged and irregular with a cauliflower appearance. Multiple, smaller in size opacities are noted in a chain pattern extending 2-3 cm inferiorly (Figure 5).

These features are more consistent with calcified lymph nodes usually seen as a long-term secondary reaction to a chronic inflammatory process in the neighboring area.

Case 6
This is an asymptomatic patient who presented for prosthetic needs (complete denture); the routine panoramic image revealed the typical presentation of calcification of the stylohyoid ligament as a linear high-density area extending from the sphenoid bone to the lesser horn of the hyoid bone (Figure 6).

Case 7
This patient presented for routine dental treatment; his panoramic image showed the presence of multiple asymptomatic small, irregular in shape and size, radiopaque areas inferior to the angle of the mandible at the level of C3-C4 (Figure 7).

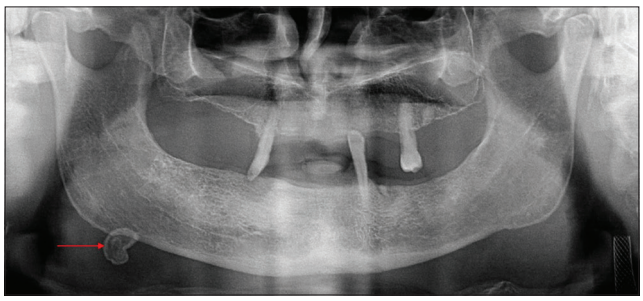

Figure 4: Panoramic showing smooth, single radiopacity, well-demarcated, kidney-shaped structure presenting with multiple alternated layers of high density and relatively lower density bands.

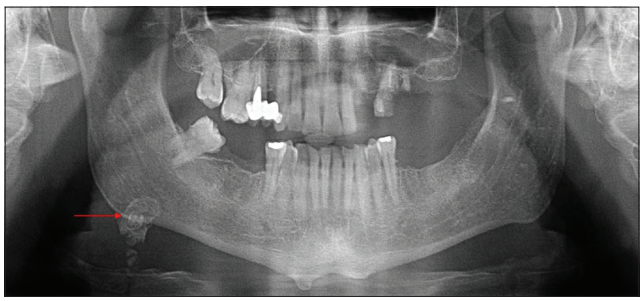

Figure 5: Panoramic showing a ragged outline radiopacity with a cauliflower appearance.

The density is present at the chain-like structures extending in a vertical direction with 2-3 cm length. They are <1 cm wide in the anteroposterior direction. The radiopacities are not homogeneous; they can present with multiple degrees of density/calcification.

These are typical features of carotid artery calcification (CAC).

Discussion
Head and neck soft tissue calcifications are relatively common. They are usually incidentally detected on routine radiographic examination. Calcifications' form, quantity, distribution, and localization are key diagnosis factors to be considered.[3]

When superimposed over the bone, determination of whether the calcification is located in either the bone or the soft tissue is a complex task.[5] Among the lesions to be considered for the differential diagnosis are the carotid artery, lymph nodes, salivary gland, oropharyngeal tissues, and stylohyoid ligament calcifications.[3,6]

According to many authors, sialoliths are described as an aggregation of calcareous structures in the salivary glands and their ducts. It is also referred to as a salivary stone or salivary gland calculus. It is one of the most frequent disorders of salivary glands, second to viral parotitis. Males are affected twice as often as females; however, some authors found no race or sex predilection.[7,8]

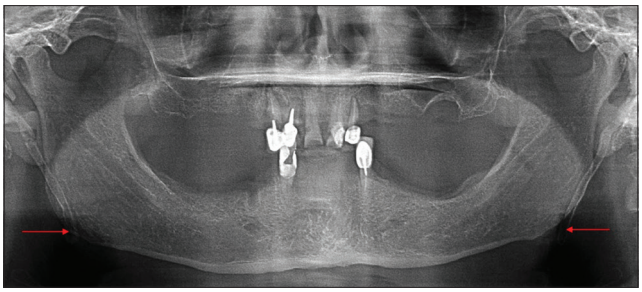

Figure 6: Panoramic image showing a linear radiopaque structure extending from the sphenoid bone to the lesser horn of the hyoid bone (calcification of the stylohyoid ligament).

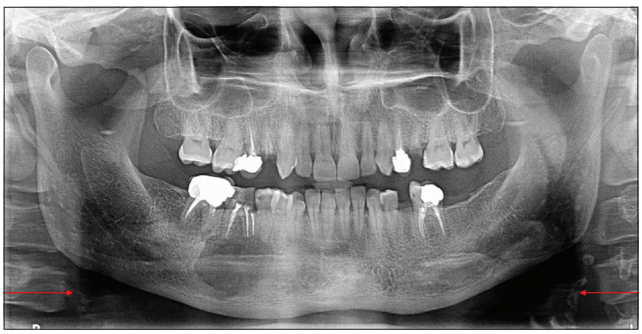

Figure 7: Panoramic image showing the presence of multiple small radiopaque areas inferior to the angle of the mandible at the level of C3-C4 in a vertical direction.

About 80 to 90% of sialoliths occur in the submandibular gland, 10-20% in the parotid, only 1-7% in the sublingual, and rarely in minor salivary glands. This is explained by the thickness, more mucous nature of submandibular gland secretions.[9]

Besides the high frequency of sialoliths in the submandibular gland, giant ones were described like the 35 mm length sialolith reported by Arslan *et al.*[9]

Two different radiographic aspects of tonsilloliths are presented in cases 2 and 3.

Tonsilloliths are a common cause of calcification in the pharynx, but there is a general lack of awareness of this entity among clinicians and radiologists.[10]

They are multiple small opaque masses situated within the thickness of the tonsils and other parapharyngeal soft tissues. Due to the angulation of X-ray projection of the panoramic, their image superimposes at the level of the mid-height of the ramus.[11,12]

In case 3, the panoramic image shows several small opaque structures superimposed on the anterior border of the airway space that may occasionally extend over the ramus. CBCT image illustrates multiple congregated "rice grain" like ovoid homogeneous dense opacities superficially to the oropharyngeal airway space.[5,6,13,14]

These calcified structures that form in the tonsillar crypts are fortuitously discovered on radiograph of up to 16% patients.[13] They may grow or regroup to reach a larger size. In generally, the patients do not present clinical signs; however, they might at some instances complain from chronic irritation of the throat, bad taste and odor, or otalgia.[13]

At the neck, lymph nodes are located in the cervical, submandibular, submental, and preauricular regions. Most patients with such calcifications are asymptomatic, with regional chronic inflammation histories such as sinusitis and tonsillitis.

Radiographically, these calcifications are usually distinct, irregularly shaped opacities typically described as "cauliflower-like." Since cervical lymph nodes are arranged both superficial and deep to the neck, differentiation is often based on radiographic aspect.[4,7,8,15,16]

They are mostly located in the submandibular region, adjacent to the mandibular angle.

The calcified styloid chain (CSC) is an excessive or abnormal calcification component including elongation of the styloid process and calcification of the stylohyoid ligament. The average normal length in adult ranges between 20 to 30 mm and higher measurement is considered as an elongation.[17]

It was first described by Marchetti Pietro (1652)[18] and took the name of Dr. Watt Eagle (1937) to become known as Eagle's syndrome.[19]

Although asymptomatic, 1-10% patients with CSC may present clinical signs resulting from the compression of the elongated calcified stylohyoid ligament on the anatomic structures of the region. Among these symptoms, a foreign body sensation during swallowing referred otalgia and dysphagia.[18]

In a typical panoramic radiography, the stylohyoid ligament ossification initiates at the mastoid process and traverses the ramus from its postero-inferior aspect toward the hyoid bone.[6] Kusunoki *et al.* reported a case of elongated styloid reaching 8 cm in length.[20]

The prevalence of CAC found on panoramic images during dental routine examination varies between 0.1 to 3.2% in patients older than 50 years and increases to 22-37% in populations having diseases at high atherosclerotic risk such as hypertension, cardiovascular disease, diabetes, hypercholesterolemia, obesity and physical inactivity, and tobacco consumers.[12]

In addition to the carotid arteries (common, internal, and external), the vertebral and/or lingual arteries may be affected.[21]

Regions of large shear forces such as the carotid bifurcation located laterally and inferiorly with respect the hyoid bone are the most affected by CAC.[1]

The probable morbidity and mortality induced by the CAC, requires, if suspected, immediate patient referral to a specialist physician to confirm the potential stenosis of the artery's lumen and its degree, the latter being closely associated to stroke risks.[21]

CACs are developed at the soft tissue beneath the mandible angle. On panoramic radiograph, they are located between the hyoid bone and the cervical spine.[22]

Yeluri *et al.* found a relationship between pulp stones and CAC and stated that an advanced evaluation of CAC must be done when multiple pulp stones were detected.[23]

Conclusion

Multiple calcifications can be noted in the head and neck area. They present many features that complicate their differentiation for a non-experienced observer. However, a close examination reveals that each one of them has an appearance typical enough to make a confident diagnosis as such.

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