

Prevalence of Soft Tissue Calcification in Orthopantamograph

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Soft tissue calcifications are categorized into dystrophic, metastatic and idiopathic calcifications. The current aim of the study was to analyze the prevalence of soft tissue calcifications in head and neck region using digital dental panoramic radiography.

Materials and Methods: A cross-sectional retrospective study with digital panoramic radiographs of 500 dental patients who visited the Oral Radiology department from November 2018 to January 2019 were analyzed for soft tissue calcifications.

Results: The most common soft tissue calcification identified were submandibular sialolith 37.5%, followed by 25% of calcified stylohyoid ligament, 12.5% of phlebolith and 12.5% of tonsillolith 12.5% Carotid artery Calc ification

Conclusion: The prevalence of soft tissue calcifications was low which increases with age. Soft tissue calcification occurs more common in male than in female. Once a soft tissue calcification is diagnosed incidentally in a routine dental radiograph it can aid in prevention of the disease.

Keywords: *Soft tissue calcifications; sialolith; phlebolith; tonsillolith; atherosclerotic plaque; panoramic radiography.*

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1. INTRODUCTION

Calcium is a micronutrient which is essential for many activities in the body such as bone & teeth formation, neuronal activity, cell division & growth, etc [1]. Accumulation of calcium salts in the body tissues, normally calcium phosphate gets deposited accumulated in the skeletal tissues known to be Calcification [2].

Pathologic calcifications are of three types:

1. Dystrophic calcification, which is the abnormal deposits of calcium in the degenerating and necrotic tissues.
 2. Metastatic calcification, in which calcium salts are deposited as a result of excess salts in the circulating blood in previously undamaged tissue [3-5].
 3. Calcinosis, which is a calcification commonly located in subcutaneous tissue in an unordered fashion in soft tissues it is termed as heterotopic calcification [6]. The soft tissues injury like infection, inflammation, trauma, blunt injury are the most common causes for dystrophic calcifications [7]. Calcifications of various structures located in the head and neck regions are commonly found in patients seeking dental care [8-11]. Anatomical location, distribution, number, size, and shape are among the most important diagnostic features of these calcifications [12]. The aim of the study was
- To evaluate the prevalence of soft tissue calcifications in oral and maxillofacial regions in digital panoramic radiography.

- To evaluate incidence of tonsillolith, sialolith, phlebolith, and lymph node, stylomandibular ligament, stylohyoid ligament and any other soft tissue calcifications seen in digital OPGs.

2. MATERIALS AND METHODS

A longitudinal retrospective study was designed to evaluate 500 digital panoramic radiographs of patients who visited the oral radiology department in Ultra Best Dental Science College for diagnosis of pathologies linked to implantology, orthodontics, oral surgery or general diagnosis. The radiographs were of 260 males and 240 females. The radiographs analyzed for soft tissue calcifications were taken from May 2019 to August 2019. The panoramic images were obtained from OPG machine X-Mind Pano CephD+ with specifications like 68 Kilovolt, 9 milliamperage with 12 seconds of exposure time. Each radiograph was taken by a specialized radiology technician. Faulty radiographs, over-projection of structures or lack of clarity in diagnosis were discarded from the study. All the rest of the images were included. After the review and scrutiny by the board members, approval was granted to conduct the research. Calcifications were classified according to the site, number, distribution, shape and appearance [13-15]. OPG was divided into eight boxes arbitrarily by a line drawn horizontally across the occlusal plane. Vertical lines were drawn along the anterior aspect of the ramus on both sides and along the nasal septum and midline and numbered from 1-8 (Fig. 1).

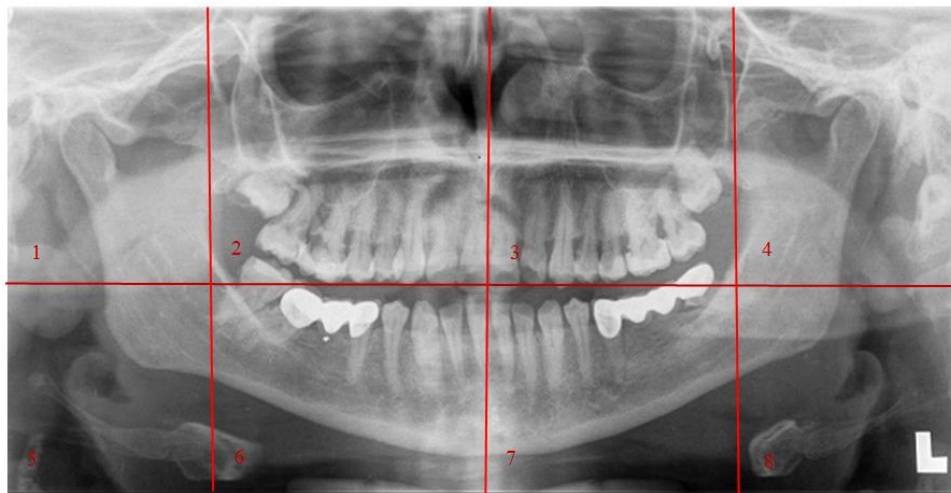


Fig. 1. OPG divided into eight boxes arbitrarily

The statistics software SPSS version 19.0 was used, applying the Chi squared test and Fisher's exact test; $\alpha=0.05$ was considered statistically significant.

3. RESULTS

- Out Of the 500 radiographs examined for evidence of soft tissue calcifications. The age ranges from 18-60years, of which 260 were male and 240 were female. A total of 8 calcifications (1.66%) were identified in 7 individuals, of which 5 were female and 3 were male.

The calcifications found were tonsilloliths, atheromas, sialoliths and calcified lymph nodes; no images compatible with phleboliths were found on the images. With respect to the presence of calcifications in terms of gender,

only statistically significant differences were found in tonsilloliths ($p=0.007$)

A large number of the calcifications found were small, of low density and unilateral. There were no significant differences with regard to the uni- or bilaterality of the calcifications and there were also no significant differences in terms of laterality and gender. The statistics software SPSS version 19.0 was used, applying the Chi squared test and Fisher's exact test; $\alpha=0.05$ was considered statistically significant.

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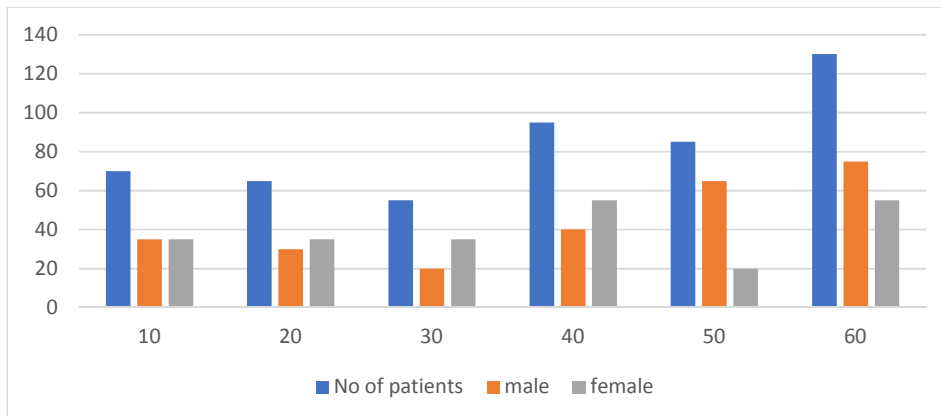


Fig. 2. No of patients in different age group

Submandibular Sialolith

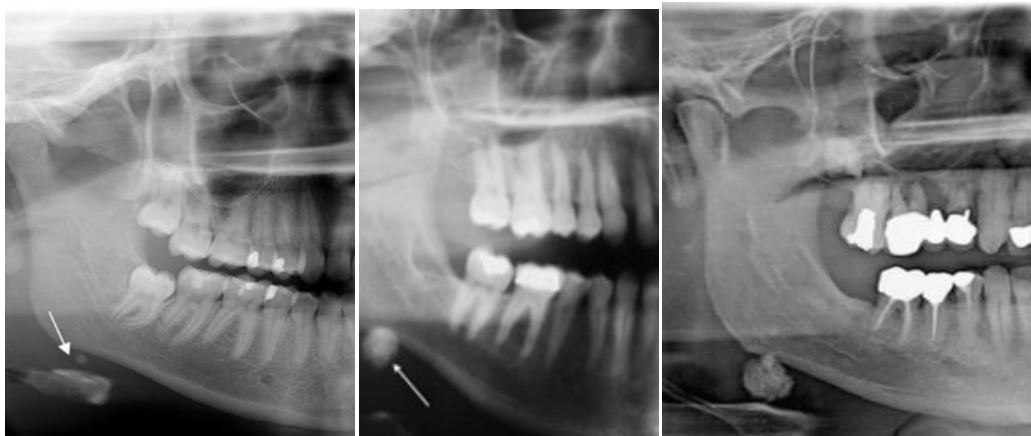


Fig. 3. Submandibular sialolith evident in the angle of mandible

Stylohyoid Ligament Calcification

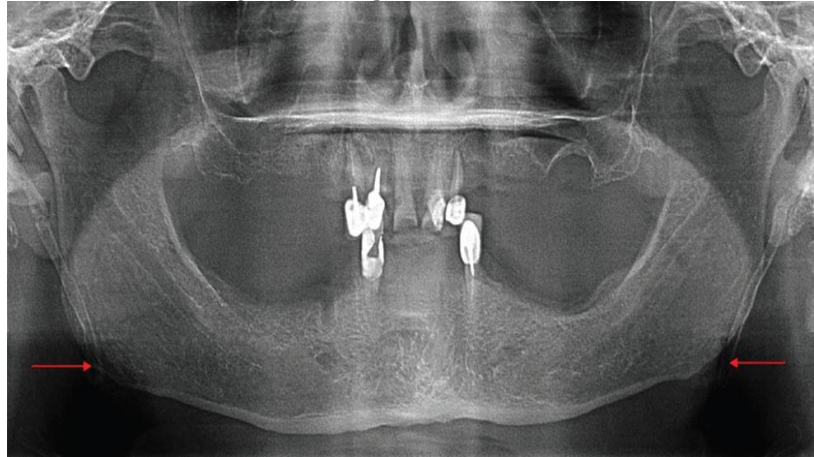


Fig. 4. calcification evident in the stylohyoid ligament

Calcified Lymph Nodes

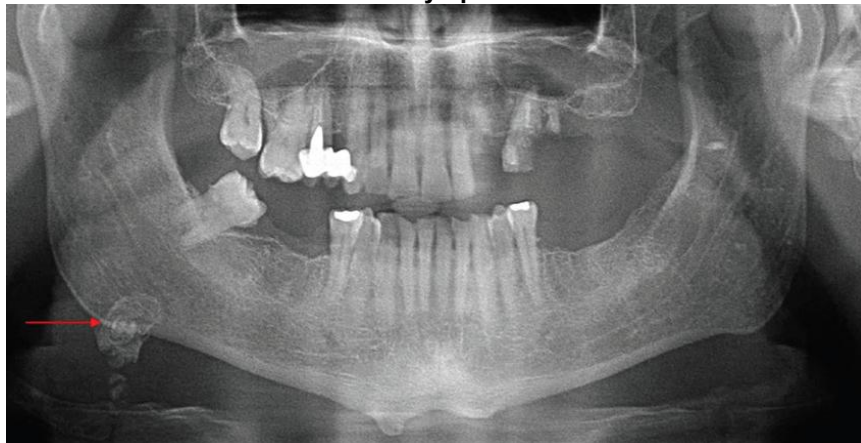


Fig. 5. Calcified lymph nodes evident

Tonsilith

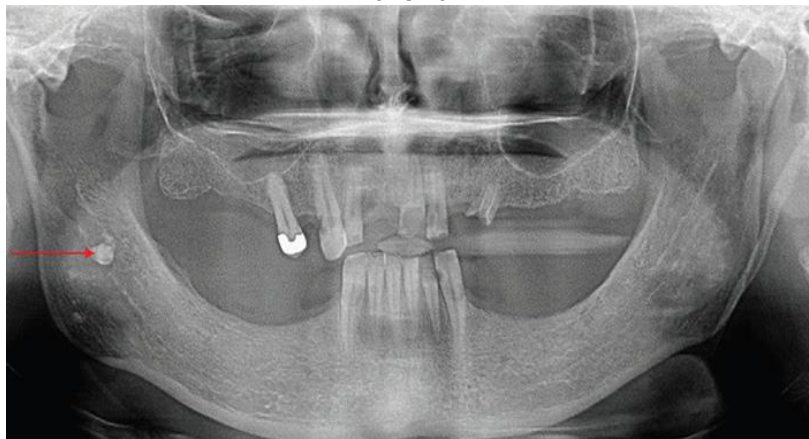


Fig. 6. Tonsilith evident in the right ramus of mandible

Carotid Artery Calcification



Fig. 7. Carotid artery calcification evident

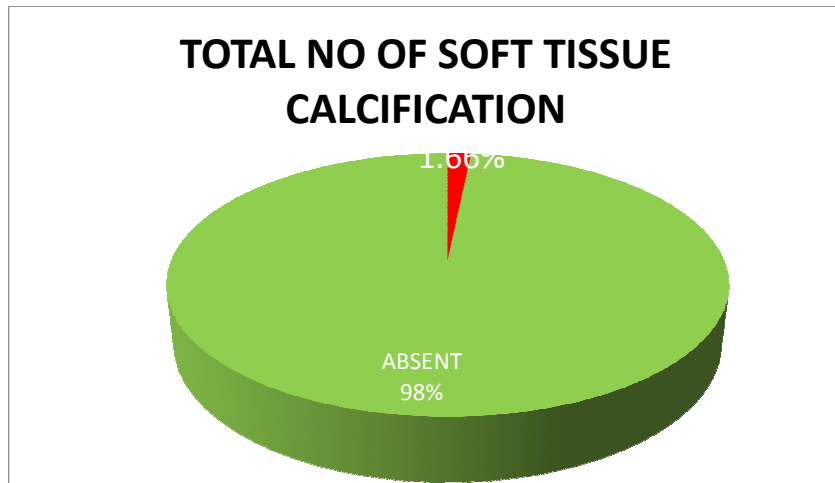


Fig. 8. Total no of calcification present

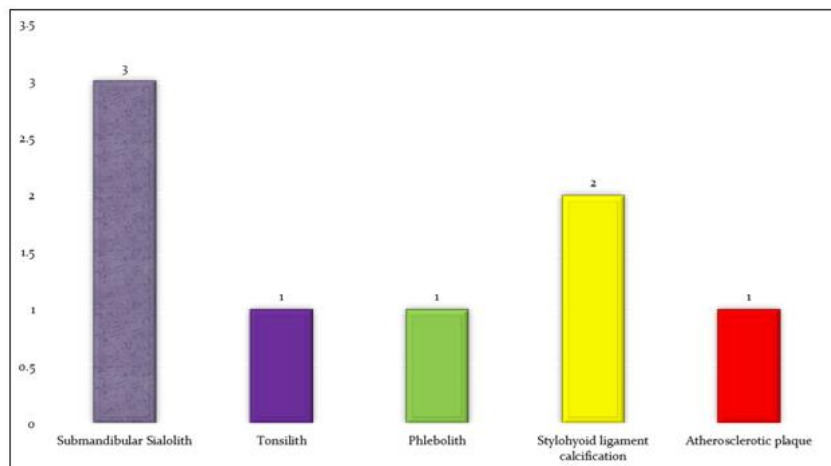


Fig. 9. Distribution of calcification

4. 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 [16]. When superimposed over the bone, determination of whether the calcification is located in either the bone or the soft tissue is a complex task. Among the lesions to be considered for the differential diagnosis are the carotid artery, lymph nodes, salivary gland, oropharyngeal tissues, and stylohyoid ligament calcifications. According to many authors, sialoliths are described as an aggregation of calcareous structures in the salivary glands and their ducts. [1] 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. [1,17]

Soft tissue calcification could happen due to physiologic process and as a result of wide range of pathologies [18-20]. In some cases, presence of calcifications can be suggestive of a specific diagnosis. Caglayan et al. reported a higher incidence of soft tissue calcification in patients with chronic renal failure, compared with normal population. [21]

4.1 Connective Tissue Disease (Scleroderma)

Calcinosis circumscripta manifests as dense, white dermal plaques or subcutaneous nodules usually identified near a joint [1]. These calcifications are commonly associated with connective tissue diseases including the early stages of polymyositis, dermatomyositis, systemic lupus erythematosus, progressive systemic sclerosis, scleroderma and calcinosis, Raynaud phenomenon, esophageal dysmotility, sclerodactyly, and telangiectasia (CREST) syndrome [22].

The soft tissue calcifications were termed depending on their criterias such as location, size, number, etc. *Antrolith* is a well-defined, smooth or irregular, single radiopacity seen above the floor of the maxillary sinus. [23] *Rhinolith* is a well-defined, smooth or irregular,

single radiopacity seen in the antrum of maxillary sinus. [24] *Phlebolith* is a small, multiple concentric radiopaque rings with a homogenously radiopaque internal aspect. *Tonsillolith* is the mid-portion of ramus along the oropharyngeal air-way space where dorsum of tongue crosses the ramus and angle, appears as unilateral, well-defined, round to oval, small and multiple (cluster) radiopacities. *Sialolith* can be found on major salivary glands such as submandibular or parotid gland [25-27]. *Arteriosclerosis or carotid artery calcifications* is the postero-inferior to the angle of the mandible close to intervertebral space C3-C4 appears as irregular, nodular masses, curvy vertico-linear or irregular radiopaque line. [28] Calcified stylohyoid ligament Between posterior ramus and cervical spine crossing angle of mandible, below and medial to angle. Radiopaque or outlines more radiopaque, may be segmented appears tapering, slender, regular, linear and longer than 30 mm radiopaque outline. Myositis ossificans Radiopacity along of muscle (s) of mastication. Calcified lymph node Irregular, lobulated, cauliflower-like, single or multiple radiopacities seen in submental, submandibular and cervical regions Calcified atherosclerotic plaque Seen superior to the greater cornua of hyoid bone adjacent to c3 and c4 vertebra. [29]

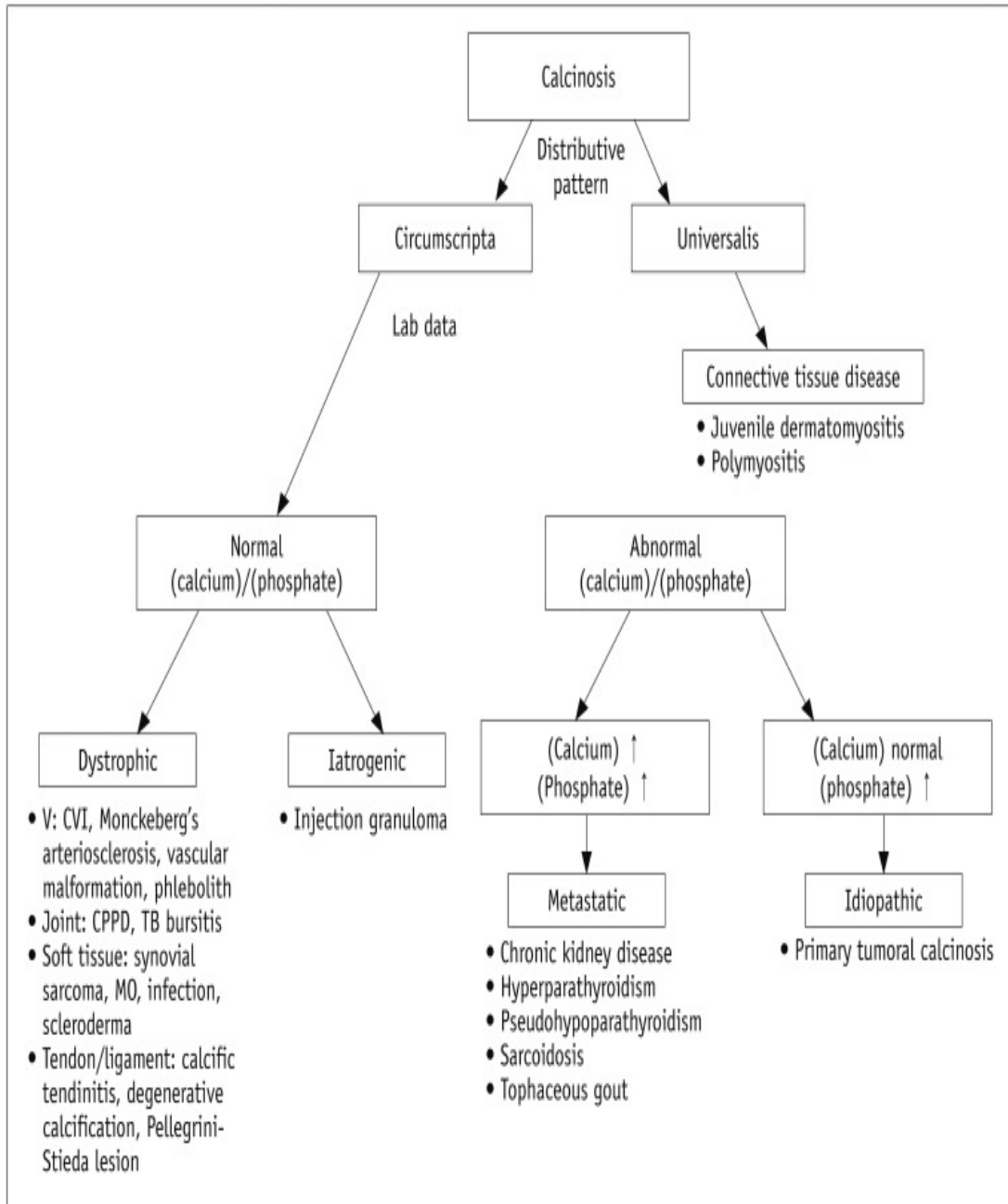
About 80 to 90% of sialoliths occur in the submandibular gland, 10-20% in the parotid, only 1-7% in the sublingual, and rarely in minor salivary glands. This is explained by the thickness, more mucous nature of submandibular gland secretions. Besides the high frequency of sialoliths in the submandibular gland, giant ones were described like the 35mm length sialolith reported by Arslan et al. [30]

The highly prevalent soft tissue calcification was atherosclerotic plaque was Atherosclerotic plaques commonly along the bifurcation level of the carotid artery. Its prevalence is between 3% and 5% of the population. [31]

Tonsilloliths are calcifications within a tonsillar crypt, involve primarily the palatine tonsil caused by dystrophic calcification as a result of chronic inflammation. Tonsilloliths are very uncommon [32]. Clinical symptoms includes non-specific chronic halitosis, irritable cough, dysphagia, otalgia and foreign body-like sensation or foul taste. Patients with tonsillolithiasis may also be asymptomatic, with their lesions being discovered incidentally on panoramic radiographs [22].

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 [16] 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 [28].



Flowchart showing Fig. 10. Distribution of soft tissue calcifications
 CPPD = calcium pyrophosphate dihydrate crystal deposition, CVI = chronic venous insufficiency,
 MO = myositis ossificans, TB bursitis = tuberculous bursitis, V= vascular

5. CONCLUSION

Numerous calcifications can be seen in the head and neck area. They present many features that complicate their differentiation for a non-experienced observer [33]. However; a close examination reveals that each one of them has an appearance typical enough to make a confident diagnosis as such. Even though soft tissue calcifications are incidental findings with low prevalence rate, the detection of some calcifications which are pathognomic to a specific disorder [34]. Once identified it may be of high importance especially in patients with carotid artery calcifications and tuberculosis. This will eventually improve the prognosis of the disease [16].

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

The synopsis of the present study was submitted at the Institutional Review Board, for ethical approval.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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