Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.comdoi: 10.21276/jamdsr Indian Citation Index (ICI) Index Copernicus value = 100

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Prevalence of Soft tissue calcification in panoramic radiograph

[1]Nirmit Shah, [2]Pranay Patel, [3]Shailaja Sankireddy, [4]Purvi Gohil, [5]Hiren Mangukiya, [6]Ravi Gadhiya

ABSTRACT:

Aims & objectives: To evaluate prevalence of soft tissue calcification in orofacial region in dental panoramic radiographs, to estimate and compare soft tissue calcification an male and female and to evaluate the incidence of different soft tissue calcifications i.e. tonsilolith,phlebolith,carotid artery calcification, sialolith, stylomandibular ligament calcification and stylohyoid ligament calcification in dental OPGs. **Material and method**: panoramic radiographs of 500 adult male and female patients who has come to dental college for various dental treatments were scruitinized for calcification. Soft tissue calcification were recorded according to the anatomical location , age and gender of patients. Calcifications were categorized by dividing panoramic radiograph into 12 boxes arbitrarily, by a line horizontally drawn towards the occlusal plane and another line drawn parallel to it along the lower border of mandible. Vertical lines are drawn along the posterior aspect of the ramus on both sides and along the center followed by two another vertical lines drawn in between them. Accordinglyopg is devided into 12 equal boxes and number 1-12 accordingly. Calcifications were recorded taking their anatomic site and the box into which they appeared into consideration. **Results:**500 OPGs were analysed, with 468 calcifications observed in the radiographs of 500 individuals. Calcifications of the stylohyoid and stylomandibular ligament were most common, with atheroma, sialoliths, tonsilloliths rhinoliths and antroliths also identified. A statistically significant relationship was observed between the presence of calcifications of the stylohyoid and stylomandibular ligaments, atheromatous calcifications in the carotid artery and tonsilloliths in individuals older than 40**. Conclusion**:multiple calcifications can be noted in orofacial region in dental OPGs.most common calcification is carotid artery calcification. The present study emphasizes the radiographic appearances of various soft tissue calcifications occurring in the maxillofacial region, so as to aid in a better diagnosis. We found the soft tissue calcifications to be more predominant in women with increased occurrences over 40 years of age.

Keywords: calcifications, panoramic radiographs.

Received: 12 June, 2024 Accepted: 18 July, 2024

Corresponding author: Nirmit Shah, Post Graduate Student, Department of Oral Medicine and Radiology, College of Dental Science and Hospital, Amargadh, Gujarat, India

This article may be cited as: Shah N, Patel P, Sankireddy S, Gohil P, Mangukiya H, Gadhiya R. Prevalence of Soft tissue calcification in panoramic radiograph. J Adv Med Dent Scie Res 2024;12(8):1-5.

INTRODUCTION

Calcium is a micronutrient that is required for a variety of physiological functions such as cellular activities, neuronal activity, tooth and bone formation,etc.[1] Deposition of calcium salts in the tissues can be manifested in various physiological and pathological conditions.[2]Calcium salts, primarily calcium phosphate gets accumulated in the soft tissues in an unstructured manner resulting in pathological calcifications which is also referred to as heterotropic calcification.[3]

Pathologiccalcifications can be either dystrophic which occurs in degenerating and necrotic tissues or metastatic which occurs due to the precipitation of excess calcium and phosphate in normal tissues.[4]Occasionally, such calcifications may occur bilaterally and symmetricallysecondary to the skeletal deposits from a malignancy. [5, 6]When calcium salts are deposited in a soft issue, it is unorganized in fashion and is called heterotropic calcification, which is divided into three categories.

- Metastatic calcification
- Idiopathic calcification
- Dystrophic calcification

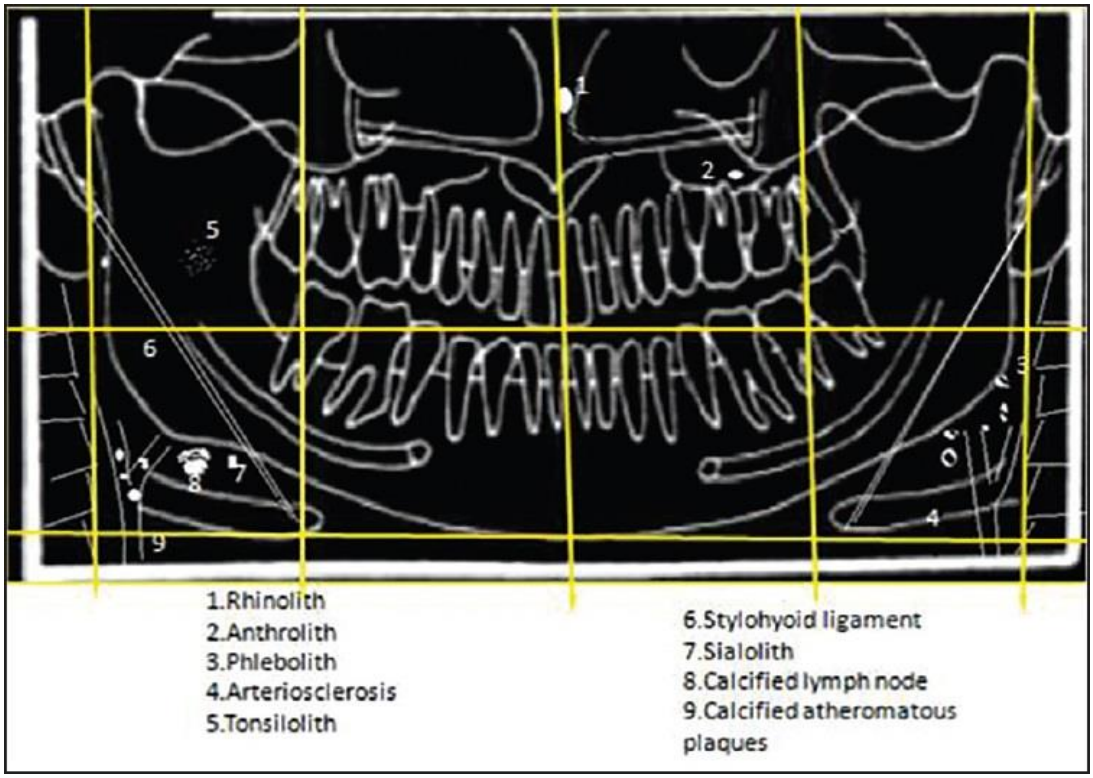
Whenever serum levels of calcium phosphate increase, minerals participate into normal tissue causing metastatic calcification, which usually occurs bilaterally and symmetrically. However idiopathic calcification occurs in soft tissue even when there are normal serum calcium and phosphate levels. Dystrophic calcification is pathologic and occurs in degenerative and dead tissue despite normal serum calcium and phosphate levels, soft tissue damage caused by trauma, inflammation, injections, presence

of parasites, changes arising from disease and calcifications localized to site of injury. Soft-tissue calcifications are extremely common. Because the imaging findings are nonspecific, soft-tissue calcifications are often problematic for radiologists, sometimes prompting unnecessary interventions. In addition, the nomenclature is quite confusing.Extra-skeletal calcifications such as calciphylaxis, calcifications within the brain such as primary familial brain calcification, calcifications of tumour, arthritic bone spurs, gall and kidney stones are some of the typical sites of soft tissue calcifications. [6, 7]Soft tissue calcifications in the orofacial region are commonly detected as incidental findings during routine radiographic examinations with orthopantomograms(OPGs). [4, 8] Evaluation of such calcification should be carried out in a systematic manner considering the anatomical location, distribution, shape, size and number of calcifications to arrive at an appropriate diagnosis. [9]Digital panoramic imaging is a routinely employed modality for diagnosing pathologies of the jawbones.It is considered as an initial imaging modality that allows appropriate discernibility of the structures of the maxillofacial region. [10] There are various pieces of evidence available in the literature that delineates the detection of soft tissue calcifications in OPG, but the prevalence of such calcinosis differs widely among various studies and the population studied. [5]The calcifications that can be encountered in panoramic radiographs include rhinolith, Antrolith, tonsillolith, phlebolith, sialolith, carotid artery calcifications, calcified lymph nodes and stylohyoid ligament. [11] With the increased utilization of digital panoramic imaging in routine dental practices, understanding of the soft tissue calcifications and their characteristics is necessary for formulating a diagnosis and establishing an appropriate referral strategy. [12, 13]However, it is also possible to classify such calcifications by compartment, and that classification can be quite useful in the radiological diagnostic assessment. On imaging examinations, soft-tissue calcifications are findings that are as common as they are nonspecific, ranging from a nonspecific local reaction (in response to a traumatic insult) to the manifestation of a systemic condition. [1,2] In addition to this lack of specificity and the long list of differential diagnoses, the nomenclature is confusing and not very intuitive. [3,4]

Soft tissue calcifications in panoramic radiographs (OPG) can be caused by various factors, including dental and non-dental conditions. These calcifications can be identified in structures such as the carotid arteries, tonsillar areas or salivary glands. The prevalence of these calcifications may vary depending on the population studied and specific criteria used for assessment.It is important to note that the prevalence of soft tissue calcifications on OPGs can vary widely depending on the population being studied, as well as the specific radiographic criteria used to define and classify these calcifications.The diagnosis of incidental calcified lesions and some diseases in the oral soft tissues can be challenging. It is important that the dentist knows how to identify them properly, as some calcifications be associated with an increased mortality. An understanding of these lesions can therefore facilitate appropriate referral for further investigation if necessary.

MATERIAL & METHODS

Panoramic radiographs of 500 adult male and female dental out patients who had visited the dental college for various dental treatments were scrutinized for calcifications. Soft tissue calcifications were recorded according to anatomical location, gender andage.Calcification were classified according to the site, number, distribution, shape and appearance and they were categorized by dividing panoramic radiograph into 12 boxes arbitrarily, by a line horizontally drawn towards the occlusal plane and another line drawn parallel to it along the lower border of the mandible.Vertical lines are drawn along the posterior aspect of the ramus on both sides and along the centre followed by two another vertical lines drawn in between them. Accordingly OPG is divided into 12 equal boxes and number 1-12 accordingly. Calcifications were recorded taking their anatomical site and there's box into which they appeared into consideration.



RESULTS

All the radiographs were taken in a digital radiographic unit. The data was entered into Microsoft Excel. Out of the 500 patients whose radiographs were viewed for evidence of calcification, the number of radiographs with evidence of calcification was 40 (8%). Two maxillofacial radiologists with more than 8 years of experience in the field examined the radiographs for calcifications. After inter-examiner correlation, 23 radiographs were ruled out and it was found out that the calcification seen in women is more than that of male.

analysis of radiographs collected	
Column1	**Column2**
total no of radiographs collected	500
total no of radiographs showing calcifications	40
total no of radiographs showing no calcification	460
total no of radiographs excluded	17
total no of rdiographs included	23

Ages ranging from 18 to 60 years were examined. Mean age of participants withcalcification was 46.5 ± 13.8 and mean age of participants without calcification was 33.7 ± 18.35 with P-value <0.05 (Mann-Whitney U test).

Column1	**Column2**
characteristic of included radiographs according to age group	
18-30years	4
31-45years	10
46-60years	9

Distribution of soft tissue calcification according to gender and age group

Sr. No.	Type of calcification	Gender	age group 18-30years	age group 31-45 years	age group 46-60 years	Yates Correction χ	P-value
1	calcified arteriosclerosis	Male	0	1	2	0.365	0.833
		Female	0	1	3		
2	calcified stylohyoid ligament	Male	0	1	1	0.188	0.91
		Female	0	0	1		
3	tonsilolith	Male	0	0	1	0.188	0.91
		Female	0	1	1		
4	phlebolith	Male	0	1	1	0.5	0.778
		Female	1	1	0		
5	anthrolith	Male	0	0	0	0.5	0.778
		Female	1	1	0		
6	sialolith	Male	0	0	0	0.5	0.778
		Female	1	1	0		
7	rhinolith	Male	0	0	0	0.25	0.883
		Female	0	1	0		
8	calcified lymph node	Male	0	1	0	0.25	0.883
		Female	0	0	0		

Our results revealed that most of the calcifications occurred on the left side and the prevalence of calcifications on the left and right sides comprised 51.9% and 48% respectively. There was a statistically significant association of occurrence of Tonsillolith in the right side of males (p=0.011). In addition, the occurrence of carotid artery calcification in the left (p=0.011); right (p=0.029) sides and calcified stylohyoid ligament in the left (p=0.041); right (p=0.009) sides in females were found to be statistically significant. However, there was no significant difference in the occurrence of antrolith, rhinolith, phlebolith, sialolith, calcified lymph nodes among males.

DISCUSSION

Panoramic radiograph is a radiological technique that provides an overview of the jaws and adjacent structures. Asymptomatic patients may show anatomical variations or alterations that may be randomly displayed on panoramic radiographs. These alterations may contribute to clinical complications and damage the patient's oral and general health. Therefore, it is of utmost importance that dentists be able to recognize the evidence of these variations and alterations on panoramic radiographs and request additional examinations that provide a more accurate diagnosis. Thus, we conclude that the panoramic radiograph, within its limitations, contributes effectively to the initial diagnosis of anatomic variations and alterations, and the dental professional can identify the risks and refer their patients to a specialist. gland and in its duct.The most commonly observed soft tissue calcification in the present study was calcification of the carotid artery constituting 4.4% of all included radiographs. The results were statistically significant and were consistent with the findings of Bayer et al., Saati et al. and Garay et al. who reported a higher prevalence of calcifications of carotid artery in the middle-aged female population3 , 17 , 21 . Women were more typically affected in the post-menopausal period (>50 years) owing to the diminished oestrogen levels. The role of oestrogen in the metabolism of lipoproteins is well established in the literature, and it is known to inhibit the formation of atheromatous plaques4 , 22 . The link between the risk of ischemic stroke and the occurrence of carotid artery calcifications has been a source of debate. Significant narrowing of an arterial lumen with a lucent defect is indicated by a massive calcification. According to the literature, the calcium levels in cervical carotid arteries serves as an independent marker for the detection of ischemic symptoms23 . Literature evidences have accounted stroke to be the second-leading cause of death globally (11.6%). Risk of stroke in the presence of atherosclerosis of the carotid artery is 8%. The most common cause of death worldwide is coronary heart disease, cancer, and stroke. Asians have a lower rate of coronary heart disease and a higher prevalence of stroke. In India age-adjusted prevalence rate of stroke was between 250 and 350/100000 of the population.[15] Hypertension is the most important risk factor. Stroke represents 1.2% of total deaths in India. The dentist

could be the first person to detect impending signs ofatherosclerosis on routine radiographs or radiographs taken for various dental reasons. Atherosclerosis is an insidious disease, often providing few signs and symptoms before life-threatening catastrophic consequences ensue in the form of a stroke. Hence, the dentists' careful evaluation of the OPG might be instrumental in saving a patient's life. Patients demonstrating possible carotid artery disease can be followed up with another better view. This would also make the OPG which is a widely used imaging tool for diagnosing dental status an economical tool for timely advice on the patient's medical health.

CONCLUSION

The present study emphasizes the radiographic appearances of various soft tissue calcifications occurring in the maxillofacial region, so as to aid in a better diagnosis. We found the soft tissue calcifications to be more predominant in women with increased occurrences over 40 years of age. Optimal knowledge of the normal anatomy of the maxillofacial skeleton is inevitable to arrive at a precise radiographic diagnosis of such calcifications.An appropriate referral protocol to a medical specialist is important if a dental practitioner suspects calcification of atheroma of the carotid artery.

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