Original Article

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Prevalence of Soft Tissue Calcification in Panoramic Radiographs in Northern of Iran

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ABSTRACT

BACKGROUND AND OBJECTIVE: Soft tissue calcification is a relatively common issue in panoramic radiography. Some of these calcifications may have non-specific clinical symptoms as feeling of foreign body, dysphagia, otalgia and non-reflective cough. Therefore, for correct diagnosis and avoiding incorrect and excess treatments it's necessary to have information about prevalence of these calcifications in regional populations. This study aimed to determine the prevalence of soft tissue calcification in panoramic radiographs in a selected population in northern Iran.

METHODS: In this cross sectional study, panoramic radiographs of 5000 patients referring to Oral & Maxillofacial radiology department of Babol dental school from 2014 to 2017 were examined. Radiographs were evaluated for the presence of any calcification, and their prevalence and their relationship with age were evaluated in two groups of under and over 40 years of age and gender.

FINDING: The prevalence of the observed soft tissue calcifications including calcification of stylohyoid ligands was 484 cases (9.7%), tonsilolith 52 cases (1%), calcification of lymph nodes 9 cases (0.2%), calcification of carotid artery 22 cases (0.4%) and thyroid cartilage calcification was 17 cases (0.3%). No cases of rhinolith, antrolith, sialolith and phlebolitis were found. The amount of tonsilolith (34 to 18 cases) and lymph node calcification (7 versus 2 cases) were significantly higher in men. (p=0.002 and p =0.048).

Also, the prevalence of calcification of stylohyoid ligament (290 versus 194 cases) (p=0.001), tonsilolith (13% vs. 39 cases) (p=0.001), calcification of carotid artery (18 versus 4) (p=0.001), and thyroid (14 versus 3) (p=0.003) were significantly relevant with age.

CONCLUSION: The results of this study showed that soft tissue calcifications are prevalent and the most common is stylohyoid ligament calcification.

KEY WORDS: *Panoramic Radiography, Prevalence, Calcification of ligaments, Soft tissue.*

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Introduction

Calcium salts precipitate, mainly calcium phosphate, usually occur in the skeleton, and when the process takes place in soft tissue in an unorganized form, it is referred to as "heterotropic calcification" (1). Soft tissue calcifications are common in the maxillofacial area and are commonly found in routine radiographic examinations, such as panoramic radiographs (2). These calcifications may be present in the vessels, ligaments, glandular tissues, or with chronic inflammation and scarring (3). The most important diagnostic criteria are the anatomical position, distribution, number, size and shape of the anatomy (1), and should be differentiated from hyoid bone, triticeous cartilage, styloid process, thyroid cartilage and epiglottis (4). These calcifications include tonsilolith, calcified lymph nodes, elongated styloid process, phlebolitis, calcification of carotid arteries, (3) rhinolith, antrolith and sialolith (1). Some of these calcifications may have nonspecific clinical symptoms such as tonsilolith that cause foreign body sensation, dysphagia, ear pain and unstimulated cough (5) and stylohyoid ligament calcification leads to dysphagia and pain (6). Calcification of carotid artery is common in patients at risk of stroke, which is seen in panoramic radiography approximately between the C3 and C4 vertebrae to the hyoid bone (7, 8). In a study by Imani Moghaddam and colleagues, prevalence of calcification of soft tissue was estimated 6/8% and the highest was related to stylohyoid ligament (9) and in the study of Garay et al, prevalence of calcification of soft tissue in the area of the mandibular angle using panoramic radiographs was 2/62 and tonsilolith had the highest prevalence among them (2). In the study of Sutter et al., the prevalence of soft tissue calcification is 19% (10). Riberio et al. found that the calcification of stylohyoid ligament, carotid artery and tonsilolith was increased in people over 40 years of age (11). Since panoramic radiography due to low radiation dose, low cost and extended range of jaw and teeth examination in most dental therapies, including Orthodontics, prosthetics, surgery and .... is a selective technique and due to the high use of this technique by dentists, this group will get acquainted with normal and abnormal findings in this radiograph, some of which need to be investigated (9). In order to correctly diagnose and prevent inappropriate and additional treatments, it is essential to know the prevalence of these cases in the regional population. The aim of this study was to determine the prevalence of soft tissue calcifications found in panoramic radiographs in a population of northern Iran.

Methods

This cross sectional study after registration in Ethics committee of Babol University of Medical Sciences with code of MUBABOL.REC.1396.65 was performed on 5000 panoramic radiographs referring to Oral and Maxillofacial Radiology Department of Babol Dental School in between 2014-2017. Considering the prevalence of 3% in subgroups and 95% confidence level and accuracy of 0.5%, 4470 samples were estimated. All radiographs were processed using the Cranex Tome panoramic device (Soredex, Helsinki, Finland) and by PCT (Soredex, Helsinki, Finland) and DFW 2.7 software. All radiographs were examined by three observers, two oral and maxillofacial radiologists, and a specialist radiologist for the presence of any radio-opacity including tonsilolith, rhinolith, antrolith and sialolith, calcification lymph nodes, carotid artery calcification, phlebolitis and calcification of styloid process. The type and number of them were recorded. Diagnostic criteria based on radiographic presentation were used to identify the calcification types. Some cases were recorded as calcification of the stylohyoid ligament that the length of the styloid process from the base of the skull to the tip of the appendix was more than 25 mm (1).

Also, the frequency of calcification types was considered in two groups of lower and more than 40 years and based on gender. Panoramic radiographs have been evaluated for proper calcification, and radiographs of patients with pathologic deformities or surgical defect of the bone were excluded. Data were analyzed using SPSS (Inc, Chicago, IL) version 17 and statistical analysis of x2 and $p \leq 0.05$ was considered significant.

Results

Of the 5000 examined panoramic radiographs, 2806 stereotypes were for women (56.1%) and 2194 stereotypes were for men (9.4%). The mean age of the patients was 39.48 ± 14.44 years, at least 10 years old and maximum 89 years old. The total number of calcifications is 584 cases (11.68%). The highest frequency of calcification was related to stylohyoid ligament 484 cases (7.9%) and then 52 cases (1%) tonsilolith. No cases of rhinolith, antrolith, sialolith and phlebolitis were found. Among these calcifications, calcification of lymph nodes are 7 cases in men versus 2 cases in women (8/77%) and 34 cases of tonsilolith in men versus 18 cases in women (4/65%) with more prevalence in men and calcification of carotid artery 15 cases in women and 7 men in men (2.68%) and

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calcification of thyroid cartilage are 11 cases in women and 6 cases in men (64.6%) and calcification of stylohyoid ligaments are 286 cases in women and 198 cases in men (2/59%) with more prevalence in women. There is a significant relationship between lymph node calcification and tonsilolith with sex (Table 1). In the age group of more than 40 years of age, the calcification of stylohyoid ligament, calcification of carotid artery and calcification of lymph nodes were significantly higher than the age group below 40 years. The prevalence of tonsilolith was significantly higher in the age group under 40 years (Table 2)

Table 1. Frequency of soft tissue calcifications by sex

radiopacity type	Total 5000 N(%)	man 2194 N(%)	woman 2806 N(%)	P-value
tonsilolith	52(1)	34(1.5)	18(0.6)	0.002
Stylohyoid Complex	484(9.7)	198(9)	286(10.2)	0.166
Calcified lymph nodes	9(0.2)	7(0.3)	2(0.1)	0.048
Calcification of carotid artery	22(0.4)	7(0.3)	15(0.5)	0.253
Thyroid calcification	17(0.3)	6(0.3)	11(0.3)	0.475

Table 2. Frequency of soft tissue calcifications by age group

radiopacity type	40year ≤ 2298 N(%)	40 year> 2702 N(%)	P-value
tonsilolith	13(0.5)	39(1.7)	0.001
Stylohyoid Complex	290(12.6)	194(7.2)	0.001
Calcified lymph nodes	3(0.1)	6(0.2)	0.052
Calcification of carotid artery	18(0.8)	4(0.1)	0.001
Thyroid calcification	14(0.6)	3(0.1)	0.003

Calcification of stylohyoid ligament was seen bilaterally in 94.8% (459 cases) and tonsilolith in 69.2% (36 cases) in multiple views. While lymph node calcification was 7 cases (8.77%), carotid artery calcification was 18 cases (8.81%) and 10 cases were (8.5%) thyroid cartilage calcification as solitary (Table 3) and in terms of age and gender was not significant.

Discussion

In this study, the highest amount of calcification was observed in stylohyoid ligament, which included 484 cases (7.9%), which had the lowest prevalence than other studies (12, 9, 6). It increased with age significantly and was more frequent in women than men, but the difference was not significant, which is consistent with the findings of other studies (13). In this study, 94.8% of cases were calcification of the stylohyoid complex as bilateral, which was similar to study of Imani Moghaddam et al. (9). According to a study by Scarfe et al., depending on the population sample, approximately 1/4-30% of the individuals showed evidence of stylohyoid calcification panoramic radiography (14). Differences in panoramic devices and differences in radiation angle can be considered as the main reason of different results. Also, the mean age of the subjects with a significant increase in calcification at higher ages can be effective in the variability of the results. In the study of Mahdiani et al., the CBCT was used to evaluate the calcification of stylohyoid ligament and its prevalence was estimated 63.3% (6). The difference was due to the difference in the ability to show calcification in CBCT compared with panoramic radiography.

In this study, 52 cases of tonsilolith were seen, mostly in men over the age of 40 years which was less prevalent compared to the study of Imani Moghaddam (9). In the present study, 69.2% of the tonsilolith were numerous and were similar to other studies (16,15). Neshat et al. belief that the etiology of this calcification are infectious agents such as bacteria, fungi and actinomyces in many cases (17). Cooper et al. refer to salivary stasis in salivary ducts after tonsillectomy surgery or recurrent infection as an agent (18). Therefore, the difference in results may be due to differences in the number of samples (the high sample size of this study) and the target population.

In the present study, 9 cases (0/2%) of calcified lymph nodes were found, which was significantly higher in men which was similar to results of other studies, but the prevalence was lower (9, 2). The reasons for this calcification include sarcoidosis, tuberculosis and BCG vaccination as etiologic agents (1).

Therefore, its rate varies in different societies and according to the large sample size of this study, the declared percentages were different. In the study, 22 (0.4%) cases of carotid artery plaques were observed, which increased significantly with age. In the study of Alves et al., its prevalence varied from 0.4 to 9.4%, depending on age and lifestyle, and was most commonly reported in those with systemic diseases(8). In the study of Sismana et al., prevalence was 62.8%

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and all participants were over 40 years of age (19). In a study by Pornprasertsuk et al. the prevalence was 2.5% and mean age of participants was over 60 years old (20). The difference in the results can be due to the difference in the number of samples and the average age of the studied population and race. In the present study, 17 cases (0.3%) of calcification of thyroid cartilage were observed.

There was no significant relationship with gender, but its increase with age was significantly correlated. In a study conducted by Mansur et al., the prevalence of this calcification was more common in women and was not associated with age (21). It is important to note that the studied sample size in this study is much higher than in previous studies. Due to the use of panoramic radiography by most dentists and the presence of soft tissue calcifications in these radiographs, careful observation of the calcified views should be used. In addition, by observing these calcifications, patients should be referred to the dentists or relevant specialist for further thorough examinations and possible association with systemic diseases.

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