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Araştırma/ Research Article

THE RELATIONSHIP OF THE CHRONIC RENAL FAILURE WITH CAROTID ARTERY CALCIFICATIONS, DENTAL PULP CALCIFICATIONS AND DENTAL PULP STONES

KRONİK BÖBREK YETMEZLİĞİ İLE KAROTİD ARTER KALSİFİKASYONLARI, DENTAL PULPA KALSİFİKASYONLARI VE DENTAL PULPA TAŞLARI ARASINDAKİ İLİŞKİ

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ABSTRACT

Aim: The aim of this study was to investigate the existence of carotid artery calcifications in dental panoramic radiographs and dental pulp calcifications together with dental pulp stones in periapical radiographs in patients with chronic renal failure undergoing haemodialysis and healthy individuals, and to identify the relationship between the two groups.

Material and method: A total of 115 cases (57 patients on haemodialysis for chronic renal failure and 58 healthy individuals without any systemic disease) were included in the study. Carotid artery calcifications in panoramic radiographs and dental pulp calcifications, and pulp stones in periapical radiographs were investigated.

Results: None of the individuals in the control group had calcifications of carotid artery. However, in 3 out of 57 (5.26 %) of patients in haemodialysis program, calcifications were detected. Dental pulp calcifications existed in 108 (10.24 %) teeth of 16 patients on haemodialysis and 19 (1.45 %) teeth of 7 individuals in the control group. Existence of dental pulp stones was recorded in 5 (0.38 %) teeth of 3 control cases and 1 (0.09 %) tooth of 1 patient on haemodialysis.

Conclusion: When patients with chronic renal failure undergoing haemodialysis were compared to healthy individuals by means of panoramic and periapical radiographs, there were no statistically significant differences for carotid artery calcifications and dental pulp stones. However, there was statistically significant difference when dental pulp calcifications were compared.

Key words: Haemodialysis, pulp calcifications, pulp stones, carotid artery calcifications

ÖZET

Amaç: Bu çalışmanın amacı diyalize giren kronik böbrek yetmezliği olan hastalar ile sağlıklı bireyleri, panoramik radyografilerde karotid arter kalsifikasyonu ve periapikal radyografilerdeki pulpa kalsifikasyonu ve pulpa taşı varlığı açısından karşılaştırarak incelemektir.

Materyal ve metot: Çalışmaya kronik böbrek yetmezliği olup diyalize giren 57 ve sağlıklı 58 birey olmak üzere toplam 115 kişi dahil edilmiş ve bu kişilerde panoramik radyografilerdeki karotid arter kalsifikasyonu ve periapikal radyografilerdeki pulpa kalsifikasyonları ve pulpa taşları araştırılmıştır.

Bulgular: Kontrol grubundaki bireylerin hiçbirinde karotid arter kalsifikasyonu belirlenmemesine rağmen diyalize giren 57 hastanın 3'ünde (5,26%) karotid arter kalsifikasyonu belirlenmiştir. Kontrol grubundaki bireylerden 7'sinin 19 (1,45%) dişinde; diyalize giren hastalardan 16'sının 108 (10,24%) dişinde dental pulpa kalsifikasyonu tespit edilmiştir. Ayrıca 3 kontrol hastasının 5 (0,38%) dişinde ve 1 diyaliz hastasının 1 (0,09%) dişinde dental pulpa taşı varlığı kaydedilmiştir.

Sonuç: Kronik böbrek yetmezliği olup diyalize giren kişiler ile sağlıklı kişiler panoramik ve periapikal radyografilerde karotid arter ve pulpa taşı varlığı karşılaştırıldığı zaman istatistiksel olarak anlamlı bir fark sergilememişken; pulpa kalsifikasyonlarında istatistiksel olarak anlamlı fark bulunmuştur.

Anahtar kelimeler: Diyaliz, pulpa kalsifikasyonları, pulpa taşları, karotid arter kalsifikasyonları

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INTRODUCTION

Kidneys have important physiologic functions such as fluid-electrolyte homeostasis, preservation of acid-base balance, elimination of toxic substances and many other drugs and production of active vitamin D.[1] In chronic renal failure, hypocalcaemia is the end result of phosphate retention and calcium loss through kidneys leading to secondary hyperparathyroidism and eventually skeletal abnormalities. These patients manifest with significant findings in mouth, teeth and jaw bones such as periodontal disorders, enlargement of the parotid glands, bad odour and taste in the mouth, dry mouth,[2,3] lichen planus, malign lesions, viral and fungal (candida) infections, pulp calcifications,[4] carotid artery calcifications, loss of lamina dura and Brown tumours.[5]

Pulp calcifications are calcified masses which can be detected in the pulps of healthy or diseased teeth. Although the exact causes of development of pulp calcifications are not completely identified, age, gender, systemic diseases, and long term irritations are claimed to be responsible.[6]

Pulp calcifications cannot be identified by clinical examination. They show themselves as radiopaque structures inside the pulp chamber and root channels. In clinical studies, radiography is the only non-invasive method to identify pulp calcifications. Some calcifications may not be big enough to be identifiable radiologically.[7]

Pulp stones may be found free or attached inside the pulp.[8] Their sizes may vary from small, microscopic particle up to a size that may completely fill the pulp tissue.[9] Their incidence in general population is in the range of 8 – 90 %.

Although many factors such as chronic irritations, orthodontic tooth movements, epithelial debris in pulp tissue,[10] and systemic conditions[11] were suggested, the etiology of formation of pulp stones is not well identified.

In our study, we aimed to investigate the existence of carotid artery calcifications in dental panoramic radiographs and dental pulp calcifications together with dental pulp stones in periapical radiographs in patients with chronic renal failure receiving haemodialysis and healthy individuals and to identify the relationship between the two groups.

PATIENTS AND METHODS

Our study included 115 individuals which consisted of 57 patients undergoing haemodialysis (average 41.63 ± 17.194) consulted to our clinic from nephrology department for dental examination and a control group of 58 healthy cases (average 36.34 ±12.708) admitted to our clinic for dental complaints. Following the approval by ethics committee, digital panoramic radiographic examination was performed on all cases. When pulp calcification or pulp stone was detected, digital periapical radiographs of the included regions were obtained. The radiograms that were not suitable for evaluation were excluded. Digital radiograms were evaluated by a specialist on maxillofacial radiology twice in 15 days in the dark room. No statistically significant difference was found. Among 2653 teeth, excluding 294 rotten, restored and unable to be evaluated ones, 2359 teeth were evaluated for pulp stones and pulp calcifications. Radiopaque masses inside the pulp chamber were regarded as pulp stones (figure 1) and recorded as stone formations. Partial or complete obstruction of pulp chamber and pulp canals was accepted as pulp calcification and recorded (figure 2). Calcified structures, adjacent to cervical vertebrae at, under or within the level of cervical 4th (C4) and cervical 3rd (C3) or at retromolar region, at the localization of angulus mandibula independent of hyoid bone, were regarded as carotid artery calcifications in panoramic radiograms (figure 3). Chi-squared test was used to identify the relationship between the two categorical variables.

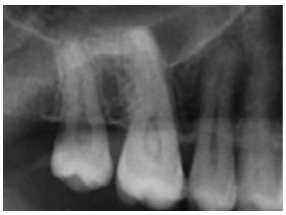
Figure 1. pulp Stones


Figure 2. pulp calcification

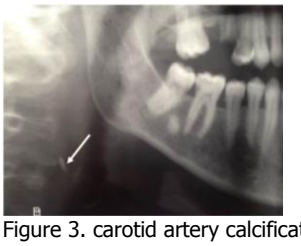
Figure 3. carotid artery calcifications

RESULTS

Patients

Panoramic and periapical radiographs of 2359 teeth in 115 cases (57 patients and 58 cases in control group) were evaluated in the study. Among 57 patients undergoing haemodialysis, 35 (61.40%) were females and 22 (38.60%) were males. Among 58 cases of the control group, 35 (60.34%) were females and 23 (39.66%) were males. Average ages of the patients and control group were 41.63 (17-77) and 36.34 (16-63) consecutively.

Carotid artery calcification

Among patients undergoing haemodialysis, 3 (5.26%) had carotid artery calcification whereas control group had none (table 1). This result was not statistically significant.

Pulp stone

Among patients undergoing haemodialysis, 1 (1.75%) had pulp stone, having it only in one tooth (0.09%) whereas in control group 3 (5.17) had pulp stone in 5 (1.45%) teeth (tables 1 and 2). This result was not statistically significant.

Pulp calcification

16 (28.07%) out of 57 patients undergoing haemodialysis had pulp calcification in 108 (10.24%) of their 1054 teeth, whereas 7 (12.06%) out of 58 cases in control group had pulp calcification in 19 (1.45%) of their 1305 teeth (tables 1 and 2). This was statistically significant (p<0,001).

Table 1. According to the number of patients: Carotid Artery Calcification, Dental Pulp Calcification, Dental Pulp Stones

	N Number of patients	Carotid Artery Calcification	Dental Pulp Calcification	Dental Pulp Stones
Patients on hemodialysis	57	3 (5.26%)	16 (28.07%)	1 (1.75%)
Control group	58	0 (0.00%)	7 (12.06%)	3 (5.17%)
Total	115	3 (2.60%)	23 (20%)	4 (3.47%)

Table 2. According to the number of teeth: Dental Pulp Calcification, Dental Pulp Stones

	N Number of teeth	Dental Pulp Calcification	Dental Pulp Stones
Patients on hemodialysis	1054	108 (10.24%)	1 (%0.09%)
Control group	1305	19 (1.45%)	5 (0.38%)
Total	2359	127 (4.96%)	6 (0.25%)

DISCUSSION

Atherosclerosis, the characteristic property of arterial diseases in patients with chronic renal failure is formed by calcification and thickening of medial layer of the arteries.[12] In these patients, vascular lesions are secondary metastatic calcifications caused by increased levels of calcification activators and decreased levels of calcification inhibitors. Carotid artery calcification in panoramic radiograph is accepted as a risk and an important sign for vascular diseases. Therefore, all patients showing carotid artery calcifications in panoramic radiography are advocated to be evaluated and treated for vascular disorders.[13] Carotid artery calcifications were first shown in panoramic radiography by Friedlander.[14] They stated the important role of this method in early diagnosis of carotid artery calcifications. Many other studies have also pointed out the high diagnostic value of panoramic radiography in defining atheromas.[15-17]

In a study conducted with electron beam computerized tomography (Electron-beam CT), the incidence of arterial calcifications was found out to be higher in patients undergoing haemodialysis when compared to healthy individuals.[18]

In a study performed on 112 patients on haemodialysis, no carotid artery calcification was detected on panoramic radiograms.[19] However, another study by Kansu et al.[20] revealed carotid artery calcifications in 6 out of 29 patients on haemodialysis and in 5 out of 31 patients who had their kidneys transplanted.

In a study on healthy individuals by Ohba et al.,[21] carotid artery calcifications were observed at a rate of 5% and in another study[22] on 1256 panoramic radiographs, the rate was 5.04%. Garay et al.[23] discovered soft tissue calcifications at the region of angulus mandibula by panoramic radiography in 2.69 % of healthy individuals. In our study, 3 (5.6%) of the

patients on haemodialysis had carotid artery calcifications whereas control group had none. Comparison of both groups showed no statistically significant difference. Our findings in patients on haemodialysis were correlated partially with the study of Kansu et al,[20] but not compatible with the studies performed by Patil et al.[19] and Garay et al.[23] The difference between studies may be due to differences between age groups.

Pulp calcifications may easily be evaluated by periapical and bitewing radiography. Since no statistically significant differences between the two techniques were found in a study,[24] periapical radiography was used in our study.

Narrowing of the pulp chambers in patients with chronic renal failure was shown. In a study, 74.99 % of the patients with chronic renal failure had pulp calcifications.[19] The study by Kansu et al.[20] revealed pulp calcifications in 22 (75.90 %) of 29 patients on haemodialysis. In our study, 16 (28.07%) out of 57 patients undergoing haemodialysis and 7 (12.06%) out of 58 cases in control group were found out to have pulp calcifications. When statistical test was done, there was statistically significant difference for pulp calcification ($p<0,001$). This finding is correlated to previous studies.

In a study with patients on dialysis for chronic renal failure, pulp stone formation was found in 5 cases out of 29;[20] another study of the same kind revealed 5 cases with pulp stones out of 112.[13]

In a study on healthy young adults by Chandler et al.,[25] pulp stones were diagnosed in 10% of 121 individuals and 4% of 445 teeth. Another study performed by Sisman et al.[26] in Turkish population revealed pulp stones in 15% of 6926 teeth. Nayak et al.[27] compared a group of cases having systemic diseases with a control group in their study and detected pulp stones in 4.76% of 882 teeth.

In our study, pulp stone was found in 1 tooth of 1 patient out of 57 patients on haemodialysis; our control group had pulp stones in 5 teeth of 3 individuals. Our results were partially correlated to other studies in patient groups undergoing dialysis but were not correlated to studies performed on healthy individuals. This difference may have originated from the criteria chosen for the evaluation of the teeth and also the number of investigated teeth.

CONCLUSION

In our comparative study by dental panoramic and periapical radiographs, performed in the patient group undergoing haemodialysis for chronic renal failure and healthy individuals, no statistically significant differences were observed when carotid artery calcification and pulp stones were taken into consideration. The difference between groups was statistically significant for dental pulp calcifications. For this reason, pulp calcifications should be taken into consideration in dental and radiologic examinations and also during treatment.

Conflict of interest

The authors declare no conflict of financial disclosure.

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