Panoramic Radiographic Examination of Patients Aged 65 Years and Above Attending To A Dentistry Faculty

Bir Diş Hekimliği Fakültesine Başvuran 65 Yaş ve Üstü Hastalarda Panoramik Radyografi Bulgularının Değerlendirilmesi

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ABSTRACT

INTRODUCTION: The aim of this study was to assess the frequency and location of significant radiographic findings in patients aged 65 years and above attending to a dentistry faculty.

METHODS: Panoramic radiographs from 1462 patients admitted within a one year period between the ages of 65-96 were included in the study (761 male, 701 female). The radiographs were evaluated for the following radiographic findings: impacted teeth, intrabony root remains, radiolucencies associated with teeth, radiopacities associated with localized sclerotic bone formation, soft tissue calcifications and ossifications, dental anomalies, bone pathologies and dental implants.

RESULTS: 239 of the 1462 patients had 307 intrabony root remains, 41.4% percent of these were maxillary molar teeth. 140 impacted teeth were found in 111 patients, 103 of which were third molars. 239 patients had unilateral or bilateral ossification of the stylohyoid ligament, and 168 patients had unilateral or bilateral calcifications related to the carotid artery.

DISCUSSION AND CONCLUSION: The results of this study suggest that the use of radiographic examination in addition to clinical examination is necessary especially in elderly patients because of the considerable percentage of positive findings. The knowledge of the prevalence of such positive findings aids dental practitioners for a proper treatment plan and helps in avoiding complications.

Keywords: *Geriatry, elderly patient, panoramic radiography*

ÖZ

GİRİŞ ve AMAÇ: Bu çalışmanın amacı, diş hekimliği fakültesine başvuran 65 yaş ve üstü hastalarda panoramik radyograflarda görülebilecek pozitif bulguların sıklığının ve lokasyonunun değerlendirilmesidir.

YÖNTEM ve GEREÇLER: Çalışmada, bir yıllık süreçte kliniğimize başvuran 65-96 yaşları arasında 1462 hastaya ait panoramik radyograf değerlendirildi. Radyografik incelemede; gömülü dişler, gömülü kalmış kemik içi kökler, dişlerle ilişkili radyolusensiler, lokalize sklerotik kemik formasyonu ile ilişkili radyopasiteler, yumuşak doku kalsifikasyonları ve ossifikasyonları, dental anomaliler, çene patolojileri ve yapılan dental implant uygulamaları değerlendirildi.

BULGULAR: Toplam 1462 hastanın 239'unda 307 adet gömülü kemik içi kök bulunmuştur ve bunların %41.4'ü maksiller molar dişlere aittir. 111 hastada ise 103 tanesi üçüncü molar diş olmak üzere toplam 140 gömülü diş tespit edilmiştir. 239 hastada unilateral/bilateral styloid ligament ossifikasyonu, 168 hastada ise unilateral/bilateral karotit arter kalsifikasyoınu gözlenmiştir.

TARTIŞMA ve SONUÇ: Radyografta izlenen pozitif bulgular nedeniyle özellikle yaşlı hastalarda klinik muayenenin yanı sıra radyolojik inceleme ile de değerlendirme yapılmalıdır. Pozitif bulgu oranının bilinmesi, diş hekimlerinin uygun tedavi planı yapmaları ve komplikasyonlardan kaçınmaları açısından yardımcıdır.

Anahtar Kelimeler: *Geriatri, yaşlı hasta, panoramik radyograf*

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INTRODUCTION

In recent years, because of the increasing elderly population, dentists have to treat more old patients. The dental treatment mostly applied to elderly patient is prosthetic treatment such as total prosthesis, removable partial dentures, fixed prosthesis and implant supported prosthesis depending on the increased number of missing teeth. Dental implants have become one of the most preferred treatment choices to rehabilitate fully and partially edentulous ridges. Generally, anomalies or pathologies in edentulous jaws do not show any clinical signs. Therefore, before denture therapy, radiologic examination of jaws is essential to detect positive radiographic findings. Radiographic examination also reveals anatomic structures such as mandibular canal, mental foramen and maxillary sinus that was important in patients scheduled for dental implant therapy.[1,2] Panoramic radiographs are often used to screen totally or partially edentulous patients. Panoramic imaging produces a single image of maxillary and mandibular dental arches and their supporting structures.[3,4] Panoramic images were preferred in examination of larger lesions of the jaws that intraoral radiographs were insufficient and provided many benefits to the clinician.

Previous studies showed that the incidence of positive radiographic sign especially in edentulous patients was ranging from 11.6-47.6% and submucosal/intrabony root remains in maxillary posterior region was the most common findings.[1-3,5] Therefore, in terms of preventing potential problems before prosthetic treatment, the importance of taking panoramic radiograph is emphasized in literature, although its routine use is controversial.[1-3,6,7] The aim of this study was to assess the frequency and location of significant radiographic findings in patients aged 65 years and above attending to a dentistry faculty.

MATERIAL and METHODS

The study was reviewed and approved by the Institutional Review Board of Ondokuz Mayis University. This retrospective study investigated 1462 patients aged 65 years and above who applied to Ondokuz Mayis University Department of Dentomaxillofacial Radiology within a one year period.

A retrospective analysis was carried out of using panoramic radiographs taken either due to patient complaints or prior to prosthetic treatment. Panoramic radiographs were obtained using a Veraviewepocs 2-D (J.Morita Mgf. Corp., Kyoto, Japan) digital panoramic x-ray unit. According to the manufacturer's instructions, the exposure parameters were 65 kVp, 5 mA, and an exposure time of 7.4 seconds. The panoramic radiographs that were transferred to the hospital information management system were assessed under dim light using Turcasoft software (Turcasoft Software Co., Samsun, Turkey) on 20-inch Dome GX2 MP medical monitors (NDS Surgical Imaging, LLC, San Jose, CA, USA) with 1200x1600 pixel resolution and 24-bit color support.

Panoramic radiographs were evaluated by a dentomaxillofacial radiologist for impacted teeth, intrabony root remains, radiolucencies associated with teeth, radiopacities associated with localized sclerotic bone formation, soft tissue calcifications and ossifications, dental anomalies and bone pathologies. The maxilla and mandible were divided into three areas; anterior (includes incisors and canines region), premolar and molar for evaluation of root fragments, radiolucencies and radiopacities. Patients treated with dental implant surgery and the number of applied implants was also noted. The localization of implants was recorded as in maxilla, in mandible, in both jaws and in the region of bilateral mandibular canine teeth. Soft tissue calcifications and ossifications were defined according to their typical geometry and location. Cysts, tumors, carsinomas, necrosis, foreign bodies, miniplates ..etc were recorded separately in the title of bone pathologies. (Figure 1-6)

Figure 1: Panoramic image of a 73-year-old male patient. No radiographic finding was observed.

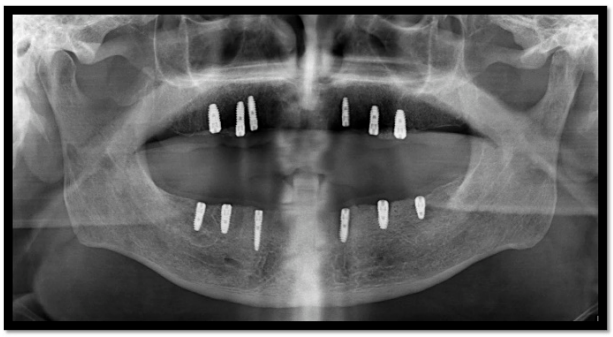

Figure 2: Twelve dental implants were observed in panoramic radiograph of a 74-year-old male patient.

Figure 3: Panoramic image of a 68-year-old female patient. Bilateral CSL, single CAC (left) and impacted right maxillary third molar were observed.

Figure 4: Panoramic image of a 71-year-old female patient. Bilateral CSL, bilateral CAC, impacted right maxillary third molar and intrabony root belonged to left maxillary molar tooth were observed.

Figure 5: Panoramic image of a 72-year-old male patient. Impacted left maxillary canine and a stafne bone cavity on the left mandibular region were observed.

The information about patient's age, gender, dental condition (dentate, partially edentulous, or edentulous), radiographic findings and their localizations were recorded on the prepared forms.

Research findings were given as n, %, minimum-maximum and total. The distribution of radiographic findings by gender was statistically evaluated using the Chi-squared test and fisher's exact test. The statistical analyses were performed using IBM SPSS Statistics 22.0V for Windows PC (IBM Corp., Armonk, NY, USA). The P value <0.05 was considered statistically significant.

RESULTS

Of the total number of 1462 panoramic images, 761 (52.1%) belonged to male and 701 (47.9%) to female patients. The mean age of the patients was 70.7; minimum age was 65 and maximum age was 96.

Out of 1462 patients, 58.6% (n=857) were partially edentulous, 18.6% (n=272) were edentulous and 1.5% (n=22) were dentate in both arches.

One or more radiographic findings were detected in 799 (54%) patients (Figures 1-5). The frequency of radiographic findings according to the gender was summarized in Table 1. A total of 140 impacted teeth, 89 in male and 51 in female, were seen in 111 patients. Single impacted tooth was found in 87 patients. Twenty patients had two impacted teeth and three patients had three impacted teeth. Maximum number of impacted teeth was four which were found only in one patient. Most of the impacted teeth were third molars (n=103) located in mandible (n=41) and in maxilla (n=62) followed by maxillary canine (n=31).

Table 1. Frequency and percentage of radiographic findings according to the gender

Radiographic Findings	Male (n=761)		Female (n=701)		Total (n=1462)	
	n	%	n	%	n	%
Impacted teeth	69	9.1	42	6	111	7.6
Root remains	111	14.6	128	18.3	239	16.3
Radiolucency	91	12	62	8.8	153	10.5
Radiopacity	17	2.2	26	3.7	43	2.9
Dental anomaly	1	0.1	3	0.4	4	0.3
Bone pathology	21	2.8	9	1.3	30	2.1
Dental implant	117	15.4	83	11.9	200	13.7
Calcifications	201	26.4	250	35.7	451	30.9

A total of 307 intrabony root remains, 141 in male and 166 in female, were seen in 239 patients. Single intrabony root remains was found in 186 patients. Forty four patients had two, five patients had three and two patients had four root fragments. Maximum number of root fragments was five which were found in two patients. Most of the roots were belonged to maxillary molars and located in maxillary molar region (n=127) followed by mandibular molar region (n=94), maxillary premolar (n=45), mandibular premolar (n=24), maxillary anterior (n=12) and mandibular anterior region (n=5).

A total of 231 radiolucencies associated with teeth, 135 in male and 96 in female were seen in 153 patients. Most of the radiolucencies (34%) were located in mandibular molar region. Forty five radiopacities associated with localized sclerotic bone formation were detected in 43 patients and most of the radiopacities (73.3%) were located in mandibular molar region.

Statistically, there was no significant differences found between impacted teeth/intrabony root remains/ radiolucencies and gender (p>0.05).

A total of 30 bone pathologies were seen in 30 patients. Out of 30 pathologies, seven were diagnosed as residuel cyst, six as medication related osteonecrosis of the jaws, three as stafne bone cavity and two as

carcinoma. Three patients had mini plates placed due to mandibular fracture. One microdontia, one dens in dente and two mesiodens were detected as dental anomalies in 4 patients.

A total of 803 dental implants, 117 in male and 83 in female were seen in 200 patients. A minimum of 1 and a maximum of 16 implants were applied to the patients. Out of 200 patients, 62 had two implants located in the region of bilateral mandibular canine teeth. There was statistically significant difference between number of dental implants and gender (p=0.013). Men had more implants than women.

Among 1462 patients, 451 (30.9%) had at least one soft tissue calcification on the panoramic images. Most of them were single or bilateral calcified stylohyoid ligament (CSL) and carotid artery calcification (CAC). The prevalence of all type of calcifications showed statistically difference by gender (χ^2=60.21, p=0.007). The distribution of soft tissue calcifications according to gender was summarized in Table 2.

Table 2. Distribution of soft tissue calcifications according to the gender (CLN:calcified lymph node, CTC:calcified tririceous cartilage)

Soft tissue calcifications	Male (n=761)		Female (n=701)		Total (n=1462)	
	n	%	n	%	n	%
Single CSL	22	2.9	14	2	36	2.5
Bilateral CSL	76	10	84	12	160	10.9
Single CAC	25	3.3	31	4.4	56	3.8
Bilateral CAC	21	2.7	51	7.3	72	4.9
Single CLN	17	2.2	11	1.6	28	1.9
Bilateral CLN	5	0.6	2	0.3	7	0.5
Single CTC	3	0.4	2	0.3	5	0.3
Bilateral CTC	0	0	8	1.2		0.6
Sialolith	0	0	1	0.1	1	0.1
Single tonsillolith	8	1.1	5	0.7	13	0.9
Bilateral tonsillolith	6	0.8	1	0.1	7	0.5
More than one type of calcification	18	2.4	40	5.7	58	4
Total	201	26.4	250	35.7	451	30.9

DISCUSSION

Panoramic radiographs are valuable diagnostic tool in prosthetic treatment planning and also they provide important information about anatomic landmarks for implant placement.[2] There are studies in the literature including radiographic features of edentulous jaws.[1-3,6] Because of considerable percentage of positive radiographic findings, radiographic screening of edentulous patients have been suggested.[1,3,6] The present study, panoramic radiographic examination of patients over 65 years old, partially/fully edentulous or dentate, revealed that 54% showed one or more positive radiographic findings, the most common being intrabony root remains which were found in 16.3% of the patients. Jindal et al[1], Kose et al[2], Masood et al[5] and Awad&Al-Dharrab[7] reported 32%,34%, 42.5% and 51.7% range of one or more radiographic findings in edentulous patients, respectively. Bohay et al[8] assessed 375 edentulous patients and reported 63.3% patients had positive radiographic findings that 8.3% received treatment before denture fabrication. Lyman&Boucher[9] and Ansari[10] had not suggested routine panoramic examination for edentulous patients because of the low rate of required treatment of detected radiographic findings. However, the use of osseointegrated implants has recently been increased as a fast, effective technique for partially/fully edentulous patients and radiographic assessment of the presurgical bone site before the placement of dental implants is essential.[11]

One of the most important prerequisite for success of osseointegrated dental implants is bone quality and quantity.[12,13] Therefore, significant amount of the radiographic findings in edentulous patients require treatment before implant placement.[2] Radiologist should analyze coincidental findings beside the interpretation of pathologic conditions related to the complaint of the patient.[14] In the present study, out of 1462 patients applied to our clinic within a year and aged 65 years and above, 200 had 803 dental implants. Implants can be successfully placed in older adults and ageing does not seem to compromise osteointegration.[15,16] Bertl et al[16] evaluated 444 patients ≥65 years old receiving 1517 implants and reported that elderly patients presented a similar early implant loss rate as younger patients. With the recent advancement in dental treatment modalities and deferment of edentulousness to older age, the use of dental implants in older patients has encouraged.

Retained root fragments and impacted teeth are the most frequent significant radiographic findings in edentulous patients.[1-3,10] (6,8,8 den 12,10). In the present study, intrabony root remains represented the most frequent pathology. The majority of these root remains were localized in the molar region of the maxilla similar to previous studies.[1-3,5] Thus, extraction of maxillary posterior teeth appears to be more difficult because of the morphology and number of roots and their posterior location.[2,3] Impacted teeth are important in preoperative planning for prostheses and dental implants.[2] There are

studies reporting a prevalence of impacted teeth as 3.1-3.7%.[2,3] Jindal et al[1] reported a 2.5% impacted teeth in 525 edentulous patients and most of them were located in the mandibular molar region. In our study, we found 140 impacted teeth in 111 patients, representing a frequency of 7.6%. This finding was higher compared to other studies. This result may be related to inclusion of all patients over 65 years old in the study, not just edentulous patients. The teeth most commonly found to be impacted were third molars and maxillary canines, consistent with past studies.[2,3]

Stathopoulos et al[17] evaluated the frequency of pathologies related to impacted third molars in 6182 patients with a mean age of 32 and reported a relatively low rate of 2.77%. Additionally, recent studies suggested to place implants encroaching upon the residuel roots and impacted teeth but the number of implants is limited in these studies and additional studies should be undertaken for this procedure.[18,19] Impacted teeth and root remains should be extracted if they serve as a potential source of infection. If not, the patient should be informed of these situations and follow up examination and radiographic evaluation should be done regularly.[1]

Idiopathic osteosclerosis is an asymptomatic and localized increase of bone radiopacity. It can arise at any age, at any location and usually requires no treatment.[14] Radiopacities associated with localized sclerotic bone formation, particularly in the mandibular molar region, are observed in 2.9% patients. Jindal et al[1] reported higher rate of radiopacities because they presented soft tissue calcifications, maxillary sinus cysts and foreign bodies as radiopacity.

In a systematic review, the periapical radiolucency was found approximately 5% of all teeth for patients of various ages.[20] In the present study, radiolucencies associated with teeth, particularly in the mandibular molar region, are observed in 10.5% patients. Most of studies presented cysts or osteoporotic areas as radiolucencies because only radiographs of edentulous patients were included in this studies.[1-3] In the present study, these findings were evaluated under the heading of bone pathologies. Jindal et al[1] reported 3 residuel cysts and 2 stafne bone cysts as bone radiolucencies. In this study, seven of bone pathologies diagnosed as residuel cysts, six as medication related osteonecrosis of the jaws, and 3 as stafne bone cavity.

Soft tissue opacities are common, present on about 4% of panoramic radiographs. In some cases soft tissue calcifications require no intervention but others may be important and the underlying cause needs treatment. Therefore the identify the calcification correctly is required.[4] In the present study, 30.9% patients were noted to have at least one soft tissue calcification detected on their panoramic radiographs. The incidence of soft tissue calcifications showed differences in previous studies.[21,22] This result could be caused by ethnical changes, imaging technique, sample size and characteristics.

Yalçın&Ararat[21] evaluated 1557 CBCT images belong to patients between the ages of 11 and 84 years and reported that the prevalence of soft tissue calcifications was higher in older age group. They also found a higher rate of calcification in males compared with that of females. The prevalence of calcifications increased with age and men showed higher rate of calcification than women.[23] In the present study, the incidence of all type of calcifications varied by gender.

Single or bilateral CSL is the most frequent soft tissue calcification seen in patients with a prevalence of 13.4%. Additionally, 8.75% of the patients was noted to have CAC detected on their panoramic radiographs. CSL and tonsilloliths were found to be the most prevalent calcifications in Missias et al[22] study. Kose et al[2] reported a frequency of 6% CAC in patients with a mean age of 59 and Ohba et al[24] reported a frequency of 5% in patients among 80 year olds. The prevalence of CAC in the present study is slightly higher than previously informed because the large number and the increase in age of the patients studied. Cohen et al[25] reported 86% of 71 patients who had CAC on routine panoramic radiographs, had preexisting vascular risk factors. Therefore, incidental findings on panoramic radiographs are powerful markers for future medical events. Panoramic radiographs can be used to detect soft tissue calcifications and they should be evaluated not only pathosis of the teeth and jaws but also for other incidental findings.[24]

It is necessary to identify and eliminate the pathological conditions before construction of dentures and application of dental implants in elderly patients. Information about the incidence of significant radiographic findings helps clinician to make an appropriate treatment plan and to avoid complications. The limitation of this study is no clinical examination was done together with the radiologic evaluation and not documented the rate of treatment requirement of detected radiographic findings. Additional studies should be undertaken to further elucidate the radiographic findings in older patients.

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