

## Frequency of Root Canal Treatment among Patients Attending a Teaching Dental Hospital in Dammam, Saudi Arabia

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### ABSTRACT

**Objective:** The purpose of the study was to evaluate the frequency and status of root canal-treated teeth in patients treated at the College of Dentistry, University of Dammam in the Eastern Province of Saudi Arabia.

**Materials and Methods:** A total of 3701 patients visited the clinics during the study period. Through the use of radiographs, 161 patients were initially selected who had endodontically treated teeth. However, after applying the inclusion criteria, the total number of eligible cases was reduced to 155. Patients were divided into three groups according to age (children 1–12 years, adults 13–65 years and geriatrics >65 years).

**Results:** On average, each patient had  $2.28 \pm 1.88$  root canal-treated teeth and  $24.02 \pm 5.03$  teeth without root canal treatment. The average number of endodontically treated teeth increased with an increase in age. The adult group showed the highest number of root-filled teeth 314 (93.4%). Of the 336 endodontically treated teeth, only 75 (22.3%) teeth exhibited periapical radiolucency. First molars (28.43–36.36%) and second premolars (20.1–27.27%) were the most frequently root-filled teeth in both jaws, followed by the first maxillary premolars (11.76%). Periapical lesions showed an almost similar pattern with the highest number of radiolucencies found in the first molars in both jaws (29.3–33.3%) followed by the second premolars in the mandible (30.6%) and first premolars in both jaws (20.8–25%).

**Conclusion:** The first molars and second premolars were the most frequently root-filled teeth in both jaws, followed by maxillary first premolars. Periapical lesions showed an almost similar pattern among teeth with a higher number of radiolucencies found in the first molars in both jaws, followed by the second premolars in the mandible and the first premolars in both jaws.

**Key words:** Endodontics, epidemiology, periapical disease, radiographic evaluation, root canal treatment, Saudi Arabia

ملخص البحث:

تهدف هذه الدراسة إلى تقييم تكرار وحالة جذور الأسنان لدى المرضى الذين تم علاجهم بكلية طب الأسنان جامعة الدمام بالمنطقة الشرقية من المملكة العربية السعودية. شملت الدراسة 3701 مريضاً زاروا عيادات الكلية في فترة الدراسة. وضحت نتائج الدراسة أن الأضراس الأولى (first molar) وأسنان الضاحك الثاني (second premolars) كانت هي أكثر الأسنان في معالجة الجذور بالفكين يتلوهما الضواحك الأولى العلوية (maxillary first premolars). أما نمط الآفات الذروية (periapical lesions) فكان مشابهاً لنمط الأسنان الأكثر توهجا إشعاعياً في الأضراس الأولى في كلا الفكين يتلوهما أسنان الضاحك الثاني في الفك.

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## INTRODUCTION

Dental caries leads to irreversible pulpitis and subsequent root canal treatment. Many countries in the world have a high prevalence of dental caries, and the same scenario has been observed across the countries of the Arab League.<sup>[1-5]</sup> Today, endodontic therapy has become an integral part of modern comprehensive dental treatment. Studies have reported a high success rate for endodontic treatment associated with improved techniques and materials.<sup>[6,7]</sup> However, a number of studies on European and North American populations have reported a high prevalence of periapical lesions in endodontically treated teeth, with inadequate root filling being the most frequent cause, followed by other factors such as the age of the patient and the type of tooth.<sup>[8-11]</sup>

Different scientific committees have their recommended guidelines regarding the quality of treatment, which most dentists follow. However, evidence from the studies suggests that the quality of treatment still needs to be improved.<sup>[12]</sup> Most of the studies addressing this topic have been performed in Europe and North America, while only a few studies have been conducted in Japan and Saudi Arabia.<sup>[8,11-13]</sup> Therefore, the aim of this study was to determine the prevalence of endodontically treated teeth and its association with periapical lesions in a population residing in Dammam in the Eastern Province of Saudi Arabia.

## MATERIALS AND METHODS

This retrospective study included patients who attended the outpatient clinics of the College of Dentistry in the Eastern Province of Saudi Arabia from September 2011 to August 2012. The study was approved and ethical clearance granted by the Scientific and Research Committee of the college (Letter No. EA 2013001). The inclusion criteria were based on the availability of both digital orthopantomograms (OPG) and full mouth digital periapical radiographs (FMX). Initially, a trained general dentist reviewed the radiographs and identified those patients who had undergone root canal treatment. Later, a qualified examiner (endodontist) further evaluated these radiographs to determine the periapical status associated with root canal-treated teeth using the periapical index (PAI) suggested by Orstavik *et al.*<sup>[14]</sup> The examiner repeated the evaluations for 10% of the samples at a different time to verify the consistency of the examiner. The patients were divided into three groups according to age (children 1–12 years, adults 13–65 years and geriatrics >65 years). The data were

analyzed using the SPSS 19 (Windows; SPSS Inc., Chicago, IL, USA). Descriptive statistics included mean, standard deviation and range of different age groups, while inferential statistics included chi-square, Student's *t*-test and ANOVA significant at  $P < 0.05$ .

## RESULTS

A total of 3701 patients visited the dental clinics during the selected time period. Only 155 patients who had root canal-treated teeth met the inclusion criteria and were used for further analysis. Approximately, 92% of the included cases were adults, 6% were children and 2% were geriatric. From the study group, 52% were males and 48% were females. Significantly, more non-Saudi patients (74%) had root canal-treated teeth compared with Saudi (26%) patients ( $P < 0.05$ ).

By evaluating the OPG, the total number of present teeth was found to be 4077, of which 1998 were in the maxilla and 2079 were in the mandible. Furthermore, 336 teeth were endodontically treated, with 204 (60.7%) teeth in the maxilla and 132 (39.3%) in the mandible. On average, each patient exhibited  $2.28 \pm 1.88$  root canal-treated teeth and  $24.02 \pm 5.03$  teeth without root canal treatment. An average number of endodontically treated teeth increased with an increase in age [Table 1] and the highest mean number of root canal treatment was found in the geriatric patients. In addition, it was also found that the frequency of endodontic treatment was similar in males and females. There was a statistically significant difference in the prevalence of endodontic treatments among Saudi and non-Saudi patients ( $P < 0.05$ ). Of the 336 endodontically treated teeth, only 75 (22.3%) teeth exhibited periapical radiolucency.

First molars (28.43–36.36%) and second premolars (20.1–27.27%) were the most frequently root-filled teeth in both jaws, followed by maxillary first premolars (11.76%) [Table 2]. The pattern of the periapical lesion was almost similar to root canal treatment among the teeth [Table 2]. The highest number of periapical radiolucencies was found in the first molars (29.3–33.3%) in both jaws, followed by the second premolars in the mandible (30.6%) and first premolars in both jaws (20.8–25%).

## DISCUSSION

These radiographs show the current status of the periapical lesion; however, periapical periodontitis is an ongoing process that may increase or decrease after

**Table 1: Description of demographics of the study, number of root-filled teeth and apical radiolucency**

Age groups	Gender		Nationality		Mean present teeth	Root-filled teeth, <i>n</i> (%)	Apical radiolucency, <i>n</i> (%)*
	Male	Female	Saudis	Non-Saudis			
1–12	6	3	4	5	26.67 (3.0)	11 (3.3)	3 (27.3)
13–65	71	72	36	107	26.29 (4.59)	314 (93.4)	71 (22.6)
>65	3	0	0	3	26 (2.65)	11 (3.3)	1 (0.09)
Total	80	75	40	115	26.30 (4.47)	336	75 (22.3)

\*Percentages were calculated by number of root-filled teeth

**Table 2: Distribution of root-filled teeth in maxilla and mandible along with associated periapical radiolucencies**

Maxilla	Root-filled teeth, <i>n</i> (%)	Apical radiolucency, <i>n</i> (%)*	Mandible	Root-filled teeth, <i>n</i> (%)	Apical radiolucency, <i>n</i> (%)*
Central incisors	32 (15.69)	3 (9.4)	Central incisors	9 (6.82)	4 (44.4)
Lateral incisors	22 (10.78)	3 (13.6)	Lateral incisors	4 (3.03)	0 (0)
Canines	13 (6.37)	1 (7.7)	Canines	7 (5.3)	2 (28.6)
First premolar	24 (11.76)	5 (20.8)	First premolar	12 (9.1)	3 (25)
Second premolar	41 (20.1)	3 (7.3)	Second premolar	36 (27.27)	11 (30.6)
First molar	58 (28.43)	17 (29.3)	First molar	48 (36.36)	16 (33.3)
Second molar	13 (6.37)	3 (23.1)	Second molar	14 (10.61)	4 (28.6)
Third molar	1 (0.5)	0 (0)	Third molar	2 (1.5)	0 (0)
Subtotal	204	35 (17.2)	Subtotal	132	40 (30.3)

\*Percentages were calculated by number of root-filled teeth

root canal treatment.<sup>[8,15]</sup> Multiple studies have used only OPG for the evaluation of periapical lesions, while in the present study, FMX was also used as they provide better details of the periapical region.<sup>[8,10]</sup>

In this study, the periapical lesion was determined using PAI suggested by Orstavik *et al.* as it is shown to be reliable and reproducible and can be used to compare different epidemiological studies.<sup>[14]</sup> The results of the present study showed periapical lesions in 22.3% of the endodontically treated teeth, which is relatively less compared to other studies performed in Brazil (42.5%), Holland (39.2%) and Lithuania (39.4%).<sup>[16-18]</sup> Moreover, an increase in the prevalence of periapical lesions was noted with an increase in age [Table 1]. This finding is in agreement with other studies and can be related to increased exposure to caries, periodontal problems and restorative procedures leading to root canal treatment.<sup>[19]</sup> The gender of the patient and periapical lesions did not reveal any significant relationship, which is similar to other studies.<sup>[19]</sup>

Our study is in line with a study carried out on a Palestinian population, which revealed maxillary and mandibular first molars are the most frequently involved teeth with periapical radiolucencies and can be associated with the complexity of posterior teeth.<sup>[20]</sup> However, other studies performed on Brazilian and French populations showed

contrasting results with maxillary incisors being most frequently associated with periapical radiolucencies.<sup>[8,16]</sup>

One of the limitations of this study is the use of radiographs only to identify periapical lesions as studies have shown that lesions confined within the cancellous bone may not appear radiographically.<sup>[21]</sup> Another limitation of this and other such studies is the lack of information available related to the presence or absence of periapical lesions before the start of root canal treatment and the elapsed time since the completion of root canal treatment. Future studies should utilize cone beam computed tomography as it has been shown to detect lesions that are not visible radiographically.<sup>[22]</sup>

## CONCLUSION

The first molars and second premolars were the most frequently root-filled teeth in both jaws, followed by the maxillary first premolars. Periapical lesions showed an almost similar pattern among teeth with a higher number of radiolucencies found in the first molars in both jaws, followed by the second premolars in the mandible and first premolars in both jaws.

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## Conflicts of interest

There are no conflicts of interest.

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