ORIGINAL ARTICLE

Correlation between Apical Periodontitis and Endodontic Treatment in a Sialkot Population

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ABSTRACT

Objective: To determine correlation between apical periodontitis and endodontic treatment in a Sialkot population based on radiographic examination.

Subjects and methods: This descriptive cross-sectional study was carried out in the Department of Operative Dentistry, Islam Medical & Dental College, Sialkot from October 2011-March 2012. The sample used for this study consisted of selected individuals referred from Oral Diagnosis and Radiology Department of Islam Dental Hospital to Endodontic Department. Periapical radiographs of 250 patients were evaluated. The periapical status of teeth was examined according to Orstavik's Periapical Index. The quality of root canal filling was rated as 'acceptable' or 'unacceptable' based on whether all canals were filled, depth of fill relative to radiographic apex and quality of condensation.

Results: Out of 2130 examined teeth, 180(8.45%) had endodontic treatment and 200(9.38%) had periapical lesions. Of 180 endodontically treated teeth, 75(41.66%) had periapical lesions. The prevalence of periapical lesions was found to be significantly high among unacceptable root filled teeth. The prevalence of apical periodontitis in the anterior teeth was 10.0%, compared with 8.79% in posterior teeth. More endodontically treated teeth were found in the posterior region than in the anterior region. A statistically significant difference was found for the frequency of endodontically-treated teeth associated with apical periodontitis in the 40-49 year age group.

Conclusions: The prevalence of apical periodontitis and the frequency of endodontically-treated teeth with apical periodontitis in this Sialkot population are found to be high and unacceptable root canal fillings were associated with an increased prevalence of apical periodontitis.

Keywords: Endodontic, Apical periodontitis. Endodontically treated teeth, Epidemiology

INTRODUCTION

Apical periodontitis (AP) is a multifactorial condition resulting from the interaction of many factors, predominantly bacteria[1]. It is characterized by a reaction of the periapical tissues to irritants diffusing at relatively low intensity and over an extended duration from an inflamed or necrotic pulp or a failed endodontic treatment[2]. Bacteria and their toxins can reach the pulp space via dental caries, trauma, or operative procedure[3-4] and can then advance into the periapical tissues, where they meet the various factors of the host defense systems[5].

The biological and therapeutic aim of endodontic treatment is either to prevent AP or to create optimal conditions for healing, based on the removal of infection and elimination of bacteria from the root canal system and prevention of re-infection. Endodontic treatment is widely recognized as a highly intricate task and epidemiological studies report that the frequency of teeth containing poor quality endodontic treatments is high[4-6]. Failure of a root filling is associated with inadequate endodontic treatment, through either technical error or insurmountable difficulty in the canal system of the tooth in question[7-8]. In several epidemiological studies, poor quality endodontic treatment was found to be associated with AP[9-11], which is commonly observed in root-filled teeth. The healing rate of patients experiencing AP after endodontic treatment in a general practice has been estimated to be as low as 50-75%[12]. Many authors have used clinical and radiologic criteria in assessing the quality of endodontic treatment and its correlation with apical lesions[13].

Apical radiography provides important information on the potential progression, regression and/or persistence of AP[14]. The literature contains a number of studies that present data regarding the prevalence of AP and endodontically treated teeth, and these vary with regard to study populations, radiographic methods and classifications of AP used[15-16]. However, No data are available on the prevalence of AP in either unfilled or root-filled teeth in the Sialkot population. The purpose of this study

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was therefore to use radiographic examination to determine the correlation between AP and endodontic treatment in an adult Sialkot population and to reveal any association between these anomalies.

MATERIALS AND METHODS

This descriptive cross-sectional study was carried out in the Department of Operative Dentistry, Islam Medical & Dental College, Sialkot from October 2011-March 2012. The study sample comprised 2130 teeth belonging to 250 patients. The patients whose teeth included were individuals who first presented to the Oral Diagnosis and Radiology Department of Islam Dental Hospital for a general dental check-up and then were referred to the Endodontics Department. One hundred fifty patients were males, whereas one hundreds were females. The ages of the participants ranged from 10 to 60 years. Before the investigation, the patients were asked to sign a consent form that confirmed their participation and approval. Later, clinical examination results and dental histories were recorded. Information regarding previous traumatic injuries was obtained from the clinical examination of the patients as well as dental anomalies. To provide standardization and avoid problems that may result from the use of different devices, all the radiographs were taken by the same X-ray device in the Oral Diagnosis and Radiology Department (Trophy, ETX model, Vincennes, France). The periapical radiographs were taken using Kodak film (Kodak, Rochester, NY; T-MAT G, NY) by the bisecting angle technique with an exposure time of 63 kVp, 8 mA, 0.25 to 0.32 seconds using Durr Dental developer and fixer. The evaluation of the periapical status of the patients was conducted by 2 separate examiners Kappa statistics was performed for the assessment of interobserver agreement by using 20 radiographs not included in the study. A kappa score of 0.92 was obtained, which indicated a high level of agreement between the observers. Chi-square test was used to determine the significance of differences by sex, age, dental arch (maxillary/mandibular) and region for the following parameters: number of teeth with AP; number of endodontically treated teeth; and the number of endodontically treated teeth with AP. P <0.05 was accepted as statistically significant.

Assessment of apical periodontitis: Teeth were categorized as endodontically treated if they had been obturated with a radio-opaque material in the pulp chamber and/or in one or more of the root canals. Radiographs were assessed for the presence and severity of AP using the method of Orstavik et al (1986)[17]. Briefly, apical periodontitis was judged present in teeth in which the apical part of the periodontal space was less than twice the remaining lateral ligamental space and in which a radiolucency of more than twice the width of the lateral periodontal ligament space was associated with the apical portion of the root. Apical status was assessed using the PAI score[17], according to which 5 scores were attributed to the apical area of the radiographic images, as follows: 1) normal periapical structures; 2) small changes in bone structure; 3) changes in the bone structure with little mineral loss; 4) periodontitis with well-defined radiolucent area; 5) severe periodontitis with exacerbating features. For multirooted teeth, the root with the highest PAI score was recorded. For teeth scored 3, 4 and 5, i.e., those with chronic apical periodontitis, the abbreviation "AP" was used. For teeth with AP associated with endodontic treatment, the abbreviation "AP/ET" was used.

The criteria used for evaluation of the quality of the root fillings were: 1. Acceptable: all canals obturated, no voids present, root canal fillings terminate 0.5-2 mm short of the radio-graphic apex. 2. Unacceptable: root canal fillings end >2 mm short of the radiographic apex or are grossly over-filled (i.e. extrusion of filling material through apex), root canal fillings with voids, inadequate density, improper taper, unfilled canals, poor condensation.

RESULTS

The inter-examiner agreement was determined by the Cohen's Kappa for the scores of all teeth (kappa =0.92). The average patient age was 34.5±11.2 years. The distribution of female and male subjects is given in Table 1, sub-divided by age group.

Table 1: Distribution of patients by age group and sex

Age group (yrs)	Female	Male	Total (%)
<20	10	23	33(12.4%)
20 – 29	28	39	67(24.9%)
30 – 39	32	41	73(34.2%)
40 – 49	15	22	35(14.0%)
50 – 59	9	15	24(8.8%)
>60	6	10	16(5.7%)
Total	100	150	250(100%)

There was significant difference between males and females in the total number of teeth present. The overall prevalence of AP in the examined teeth was 9.36% (Table 2). Of 2131 examined teeth, 180 were endodontically treated (8.45%). The prevalence of endodontic treatment was significantly higher in females (9.75%), than in males (7.63%) [P<0.05]. There were also statistically significant differences between males and females for the number of teeth with AP or ET/AP (P≤0.05). There was a statistically significant difference among the age groups in the frequency of endodontically treated teeth with AP (P<0.01). The 20-29 and 40-49 years age groups had a significantly higher prevalence of endodontically treated teeth as shown in Table 1. In addition, the frequency of endodontically treated teeth with AP in the 40-49 year age group was also significantly different (P<0.001) than in the study population average. The prevalence of AP in the anterior region

was 10.0%, compared with 8.79% in posterior teeth (Table 4).

Table 2: Distribution of total number of teeth, teeth with P, ET, AP/ET by sex

Gender	No. of teeth	Teeth with AP (%)	Teeth with ET (%)*	Teeth with AP/ET(%)
Male	1310	125(9.45%)	100(7.63%)	45(44.9%)
Female	820	75(9.14%)	80(9.75%)	30(37.5%)
Total	2130	200(9.36%)	180(8.45%)	75(41.66%)

*Statistically significant difference between male/ female: P <0.05

Table 3: Distribution of total number of teeth, teeth with AP, ET and AP/ET regarding the jaw

Jaw	No. of teeth	Teeth with AP	Teeth with ET*	Teeth with AP/ET
Maxilla	1100	120 10.9%)	110(9.9%)	50(45.4%)
Mandible	1030	80(7.76%)	70(6.79%)	25(35.7%)
Total	2130	200(9.36%)	180(8.45%)	75(41.6%)

*P < 0.001

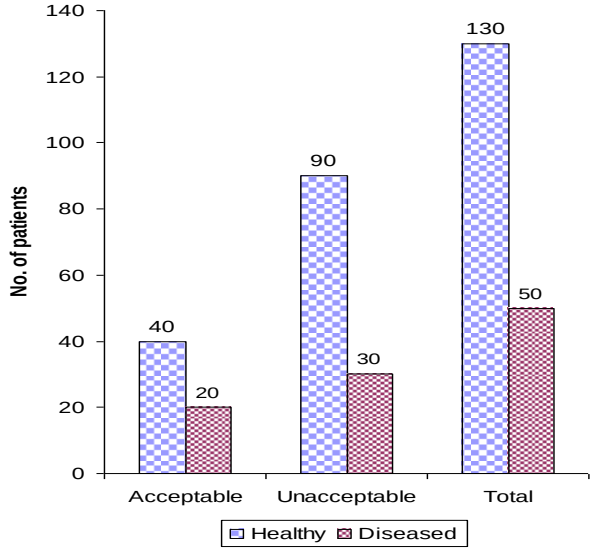
AP, Apical periodontitis; ET, Endodontically treated teeth; AP/ET, Apical periodontitis in endodontically treated teeth

Table 4: Distribution of total number of teeth, teeth with AP, ET and AP/ET regarding the region

Region	No. of teeth	Teeth with AP	Teeth with ET	Teeth with AP/ET
Anterior	1050	105(10.0%)	6 (5.71%)	20(33.3%)
Posterior	1080	95 (8.79%)	12(11.1%)	55(45.8%)
Total	2130	200(9.36%)	18(8.45%)	75(41.6%)

AP=Apical periodontitis; ET=Endodontically treated teeth; AP/ET=Apical periodontitis in endodontically treated teeth

Fig.1: Quality of root filled teeth and the relation to the periapical status



DISCUSSION

More endodontically treated teeth were found in the posterior region than in the anterior region. Some studies have also demonstrated that the prevalence of AP increases with age.[18] Younger people tend to visit the dentist more often compared with the elderly, and thus have a lower incidence of caries and periodontal diseases. There was no significant association of gender with the frequency of either AP alone or AP in endodontically treated teeth, in agreement with the findings of previous studies[19]. When sub-divided by whether the teeth are mandibular or maxillary, our data regarding the frequency of AP and endodontically treated teeth are comparable with those of other studies[20]. Those studies found no difference between the maxilla and the mandible in the average percentage of teeth with AP[21], but in our survey the percentage of endodontically treated maxillary teeth was higher than endodontically treated mandibular teeth. However, the incidence of AP in maxillary teeth was found to be almost greater than in the mandible.

Regarding the anterior/posterior region, there was significant difference in the prevalence of AP, but endodontic treatment of posterior teeth was associated with significantly more AP than the same treatments in anterior teeth (Table 4), in agreement with previous studies[22]. Endodontic specialists with additional training and expertise could raise the general standard of root canal treatments but there are currently very few practicing dentists with these skills in Sialkot. Difference was statistically significant ($p<0.001$). However, the difference between the prevalence of AP in anterior and posterior regions was significant ($P\leq0.05$). The prevalence of AP was significantly different between maxillary teeth and mandibular teeth (Table 4). There were significantly more endodontically treated teeth in the maxilla than in the mandible ($P<0.001$). The difference in the prevalence of AP in endodontically treated maxillary and mandibular teeth was also statistically significant. There were significantly more endodontically treated teeth in the maxilla than in the mandible ($P<0.001$). The relationship between the quality of root filling and periapical status as represented in graph shows the percentage of acceptably-filled teeth with AP was 32.7%, whereas the percentage of teeth with unacceptable root filling and AP was 67.3%

The findings of this study demonstrate that AP is more prevalent in the surveyed Sialkot population (9.36%) than in other populations around the globe[23]. This result could arise for a number of reasons. First, the oral status of Sialkot adults is unsatisfactory, owing to insufficient oral hygiene leading to a large numbers of carious teeth, and/or inadequate quality of fixed dentures. Second, socioeconomic factors may have a role in oral hygiene and, third, the absence of programs for integrated prevention and control of dental caries could exacerbate these problems and lead to more advanced dental and periodontal problems.

In this study, the total percentage of endodontically treated teeth was 8.45%, which is low compared with the results of some other studies[24]. This could be a consequence of the survey population being unrepresentative of the whole country and/or to differences in the socio-economic factors and the provision of dental care services in these various other countries. The results of our study showed that the prevalence of AP in endodontically treated teeth is 41.6%. This prevalence was higher than that reported in other parts of world[25]. The high rate of AP in endodontically teeth may be the result of inadequate endodontic treatment provided by general dentists in Sialkot. We have also shown an age-related increase in the frequency of AP affected teeth (Table 2), with prevalence. The prevalence of AP was influenced by the quality of the root filling. Petersson et al. reported only on complete/incomplete obturation and whether there was any evidence of overfilling[26]. In our study, the criteria used for the evaluation of the quality of root filling were modified slightly from those described by Tavares et al[27]. AP was present in 41.6% of endodontically treated teeth. Only 32.7% of the root filled teeth fulfilled the criteria for an acceptable root canal filling, which is low compared with other studies[28]. Although the methods/parameters used to evaluate the quality of root canal filling were not the same as other studies, we have noticed that the poor quality of root canal filling observed in our study are the result of low standards and/or poor technique in root canal procedures. This situation arises because, in Sialkot, majority of endodontic treatment is performed by general dentists.

CONCLUSIONS

Continuing dental education efforts to train future and current dental practitioners, extended support for programs in caries control and prevention, and general improvement in the socio-economic status of the population would make a significant contribution to reducing the prevalence of AP associated with endodontic treatment in the population of Sialkot. Further studies of dental health involving larger samples that cover more regions of Punjab will help to identify public dental health problems, an essential step in improving the general health status of the citizens of this country.

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