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A Study of Radiographic Changes in Endodontically Treated Teeth Restored with Intra-Radicular Posts

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Abstract

The purpose of the study was to evaluate, by examination of periapical radiographs, whether the application of intra-radicular posts in endodontically treated teeth can lead to the development of periapical lesions. A total of 103 panoramic radiographs from 103 patients (263 endodontically treated teeth) from Faculty of Dental Medicine, University of Varna, Bulgaria were investigated. From the 263 teeth evaluated, 58 (22%) had intra-radicular posts. While examining the radiographs a predetermined set of radiographic criteria was included: all teeth should be endodontically treated and have coronal restorations, the intra-radicular posts should be metal cast posts. The success rate for all endodontically treated teeth (n=58) was 70,7%. The following results show that using intra-radicular posts for restoration of endodontically treated teeth do not lead to periapical lesions in the practice where most of the patients were treated. It is most important to perform the coronal restorations carefully in order to avoid coronal microleakage

Keywords: intra-radicular posts, microleakage, periapical lesions

Introduction

The aim of endodontic therapy is to maintain tooth function, and in particular to remove the dental pulp and bacteria, to clean and shape the root canals and to obturate the canals to prevent infection or re-infection (1). The root canal filling materials, which are used nowadays, do not always provide an ideal canal sealing. That is why it is necessary to obtain a well-adapted coronal restoration to protect the apical region against recontamination with oral bacteria (2). A number of studies have reported several types of different restorations (3, 4, 5, 6). Since clinical and laboratory data indicate that teeth are not strengthened

by posts, their purpose is to retain a core that will provide appropriate support for the definitive crown or prosthesis. Eckerbom et al. examined the radiographs of 200 consecutive patients and radiographically re-examined the same patients 5 to 7 years later to determine the prevalence of apical periodontitis (7). Of the 636 endodontically treated teeth evaluated, 378 (59.4%) had posts and 258 (40.6%) did not have posts. At both examinations, apical periodontitis was significantly more common in teeth with posts than in endodontically treated teeth without posts. Turner reported a 12% absolute rate after a 5-year retrospective study on teeth having posts and cores (8). Weine et al. reported a 7% failure rate of 138 posts in service for ten or more years (9). Several studies reported a failure rate of 9% over certain time period (10, 11, 12). Goodacre et al. reported a tooth fracture and loss of retention as the two most common causes for fracture (13).

Multiple studies have determined the possible causes of the formation of periapical lesions associated with the roots of endodontically treated teeth that were restored with intra-radicular posts (6, 14, 15). Zuolo, et al. reported that canal recontamination is increased when the tooth requires post space preparation (16). Grieve et al. have suggested that the preparation of the root canal for the placement of an intra-radicular post may cause displacement of remaining filling material, when this material is insufficient or not well condensed (17). Abramovitz et al. (18) have reported that endodontically treated teeth in which part of the root filling material has been removed have a worse sealing ability than those where the root filling is intact. Another study by Boucher, et al. which evaluated the periapical region of endodontically treated teeth using radiographs, reported that teeth with intra-radicular posts were significantly more associated with periapical lesions than teeth without posts (19). Tronstad et al. (20) found the quality of the coronal restoration to be of significant influence on outcome only when combined with adequate endodontic treatment.

Study Design

The purpose of the study was to evaluate, by examination of periapical radiographs, whether the application of intra-radicular posts in endodontically treated teeth can lead to the development of periapical lesions.

Matherials and Methods

This study was undertaken among patients who attended Faculty of Dental Medicine, University of Varna, Bulgaria for an initial examination.

A total of 103 panoramic radiographs from 103 patients (263 endodontically treated teeth) were selected. While examining the radiographs a predetermined set of radiographic criteria was included: all teeth should be endodontically treated and have coronal restorations, the intra-radicular posts should be metal cast posts.

The radiographs were examined on the basis of the following criteria: 1. *Age of the patients* -between 19 and 69 years of age. 2. *Presence or Absence of Periapical Lesion*: score 1 and 2 (according toPAI) = healthy, and score 3, 4 and 5 (according to PAI - Table 1) = diseased 3. *Presence or Absence of coronal restoration with a tooth crown 4. Presence or Absence of intra-radicular posts*

Table 1. Periapical index (PAI)

score	Description
1	Normal periapical structures
2	Small changes in bone structure
3	Changes in bone structure with some mineral loss
4	Periodontitis with well-defined radiolucent area
5	Severe periodontitis with exacerbating features

Results

From the 263 teeth evaluated, 58 (22%) had intra-radicular posts. In the 19 to 29 years old group (1) the total amount of roots with intra-radicular posts was 20 teeth (19,4%). In the 30 to39 years old group (2) the total amount of roots with intra-radicular posts was 23 teeth (22,3%). In the 40 to 49 years old group (3) the total amount of roots with intra-radicular posts was 20 teeth (19,4%). In the 50 to 59 years old group (4) the total amount of roots with intra-radicular posts was 19 teeth (18,4%). In the 60 to 69 years old group (5) the total amount of roots with intra-radicular posts was 21 teeth (20,4%) (Table 2).

Furthermore, it is determined that in all of the five groups the percentage of the restored teeth with intra-radicular posts is almost the same, with 1to 3,9 % difference between them.

Table 2. Distribution of intra-radicular posts according to the age of the patients (1- 19-29 y.; 2- 30-39 y.; 3-40-49 y.; 4- 50-59 y.; 5 - 60-69 y.)

Age	1	2	3	4	5
Number of intra-radicular posts	20	23	20	19	21
Percentage of intra-radicular posts	19,4%	22,3%	19,4%	18,4%	20,4%

Amongst the total number of 58 teeth with intra-radicular posts, 17 teeth (29,3 %) had radiological signs of a periapical lesion (PAI>2) (Table 3).

Table 3. Periradicular status in teeth with intra-radicular posts

Treatment	Healthy (%) PAI 1-2	Diseased (%) PAI 3-5	Total number of teeth
	70,7	29,3	
Total	41	17	58

Table 4 shows the distribution of the types of teeth examined. Maxillary frontal teeth were the types of teeth most frequently restored with posts. 25,9 % of the posts were inserted in the maxillary frontal teeth, 24,1 % - in the maxillary premolars, 22,4% - in the mandibular molars, 15,5 % in the upper molars, 10,3 % - in the mandibular premolars while only 1,7 % were inserted in the mandibular frontal teeth.

Table 4. The distribution of the types of teeth with intra-radicular posts restorations

Teeth	Total	%
Maxillary frontal teeth	15	25,9
Maxillary premolars	14	24,1
Maxillary molars	9	15,5
Mandibular frontal teeth	1	1,7
Mandibular premolars	6	10,3
Mandibular molars	13	22,4

From the total amount of 58 teeth with intra-radicular posts, 50 were restored with a tooth crown (Table 5).

Table 5. Teeth restored both with intra-radicular posts and crowns

	Teeth with crowns	Teeth without crowns	Total number of teeth
Number	50	8	58
%	86,2	13,8	

Discussion

This study was not based on a recall performed on the same patients, so there is no possibility to compare pre- and post-panoramic X-rays. Some of the patients might have visited the Department because of dental problems that is why some of the results might not be representative.

A number of surveys reported about failure rates between 7-12% (8, 9, 10, 11, 12, 22). In the present study apical periodontitis was found in 29, 3 % of the examined teeth. Moreover the percentage in the youngest group of age 19 to 29 years old (19, 4%) is the same as the one in the group of age range for 40 to 49 years old. Only 1% more (20, 4%) intra-radicular posts are inserted in the oldest group of age from 60 to 69 years old.

The results from this survey demonstrate that intra-radicular posts did not represent a significant risk because the sample was relatively small (n=58). Tronstad et al. (20) published a survey based on a more comprehensive tooth sample (n=1001) selected according to strict criteria and reached similar conclusions.

Many results based on reports in the current literature have shown that coronal microleakage is the main factor for the failure of endodontic treatment (23, 24, 25).

Fox et al. (26) concluded that to prevent re-infection of the root canal system, it may be preferable to restore the tooth immediately with a post and composite system rather than place a temporary post crown and subsequently a cast post and core. Moreover, restoration with or without intra-radicular posts should be carefully performed to avoid coronal microleakage at any stage of the restorative treatment.

Conclusion

The following results show that using intra-radicular posts for restoration of endodontically treated teeth does not lead to periapical lesions in the practice where most of the patients were treated. It is most important to perform the coronal restorations carefully in order to avoid coronal microleakage.

Maxillary frontal teeth were the types of teeth most frequently restored with posts followed by maxillary premolars and mandibular molars. Mandibular frontal teeth are most rarely restored with intra-radicular posts. It was determined that teeth restored both with intra-radicular posts and crowns are 86,2%.

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