

RADIOGRAPHIC ASSESSMENT OF QUALITY OF ROOT CANAL TREATMENT

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ABSTRACT

Root canal treatment quality has a direct bearing on healing in the periradicular area. There are various methods to assess the quality of root canal treatment. Radiographic assessment in conjunction with clinical assessment remains one of the most commonly employed methods to predict the prognosis of endodontically treated teeth. The objective of this study was to assess the quality of root canal treatments of patients, reporting to outdoor clinics of a dental college. It was a cross sectional study carried out over a period of six months. A total of 248 patients, with at least one endodontically treated tooth, reporting to the outdoor clinics of Lahore Medical and Dental College were included in the study. Quality of root canal treatment was assessed radio graphically. A predetermined criterion, based on length and lateral seal of the root filling already used in earlier studies, was employed. The technical quality of root canal treatment was assessed to be adequate in 52.4% of the observed cases which is in contrast to the high percentages of reported success rates for this modality.

Key words: Technical quality, Root canal filling, Root canal treatment

INTRODUCTION

Root canal treatment is a highly prevalent treatment modality in today's dentistry. A high success rate (90-95%) has been associated with root canal treatments that are treated under controlled clinical conditions. However, cross sectional studies have demonstrated that a large proportion of endodontically treated teeth are associated with apical periodontitis, representing clinical failure. This association has been largely attributed to a poor quality of root canal filling as well as a less than satisfactory coronal restoration.¹

Various criteria have been devised to assess the quality of root canal treatment. Majority of these criteria base themselves on the clinical examination, radiographic examination or a combination of both. The European Society of Endodontology in 1994 issued quality guidelines for endodontic treatment. This document is a step by step description of every phase of endodontic treatment. According to this document a high quality root canal treatment is one in which clinical symptoms originating from an endodontically-induced apical periodontitis should neither persist nor

develop after RCT and the contours of the periodontal ligament (PDL) space around the root should radiographically be normal.² Similar guidelines have been published by the American Association of Endodontics (AAE).³

Several studies have revealed that majority of dentists even in the developed countries do not comply with the formulated guidelines on the quality of root canal treatments.^{4,5,6} Few studies have investigated the attitude of general dental practitioners towards various aspects of endodontic treatment in developing countries.⁷⁻⁹

In Pakistan one study evaluated the technical quality of root canal treatment carried out by house surgeons. Technical quality of adequately filled teeth was found to be 45%.¹⁰ The present study aims to evaluate the technical quality of root canal treatment carried out by general practitioners in Pakistan.

METHODOLOGY

All patients reporting in the Outpatient Department at Lahore Medical and Dental College, Lahore,

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with at least one endodontically treated tooth, consecutively for a period of six months (February 2005-July 2005) were selected for this study. All the endodontically treated teeth of the subjects included in this study had a periapical view radiograph taken with XCP X-ray positioning instrument (RINN) to facilitate the X-ray exposures with a paralleling technique keeping a film focal distance of 4 inches. All radiographs were taken with periapical radiograph machine (Explore X 70 Toshiba, Japan). Radiographs were examined using an X ray viewer. The length of root filling was measured by a clear scale placed on periapical radiograph. The quality of root canal treatment was determined using the parameters described in an earlier study.¹¹

According to these parameters, the lateral seal of root canal was judged as adequate if the score is 1 and inadequate if the score is 2,3 or 4. The length of root filling was regarded as adequate if the score was 1 or 4 and inadequate if the score was 2, 3 or 5. When both length and lateral seal of root filling were adequate the quality of root canal treatment was judged to be good. If either or both of the length and lateral seal of root filling were inadequate, the quality of treatment was assessed as poor.

RESULTS

The data were entered into SPSS program version 10.0 and analyzed accordingly. Frequency distribution

PARAMETERS RECORDED ON ROOT FILLED TEETH

Lateral seal of the root filling (adequate if no voids present)	1 = Adequate in the coronal half of the filling + Adequate in the apical half of the root filling. 2 = Adequate in the coronal half of the filling + Inadequate in the apical half of the root filling. 3 = Inadequate in the coronal half of the filling + Adequate in the apical half of the root filling. 4 = Inadequate in the coronal half of the filling + Inadequate in the apical half of the root filling.
Length of root filling	1 = Root filling ending \leq 3mm from the radiographic apex. 2 = Root filling ending $>$ 3mm from the radiographic apex. 3 = Pulpotomy, material seen only in the pulp chamber 4 = Flush, root filling ending at the radiographic apex. 5 = Overfilling, material seen in the periapical area

TABLE 1: DISTRIBUTION OF PATIENTS WITH REFERENCE TO LATERAL SEAL OF THE ROOT FILLING (n=248)

Lateral seal of root filling	Frequency	Percent	95% Conf Limits	
Adequate	179	72.2%	66.2%	77.7%
Inadequate	69	27.8%	22.3%	33.8%
Total	248	100.0%		

TABLE 2: DISTRIBUTION OF PATIENTS WITH REFERENCE TO LENGTH OF ROOT FILLING (n=248)

Length of root filling	Frequency	Percent	95% Conf Limits	
Adequate	174	70.2%	64.0%	75.8%
Inadequate	74	29.8%	24.2%	36.0%
Total	248	100.0%		

TABLE 3: DISTRIBUTION OF PATIENTS WITH REFERENCE TO QUALITY OF TREATMENT (n=248)

Treatment quality	Frequency	Percent	95% Conf Limits	
Good	130	52.4%	46.0%	58.8%
Poor	118	47.6%	41.2%	54.0%
Total	248	100.0%		

and percentage were computed. Out of 248 root filled teeth, 72.2% of teeth were judged as having an adequate lateral seal of root canal filling (Table 1). 70.2% of the teeth were judged as having an adequate length of root filling (Table 2). Overall quality assessment revealed that 47.6% of examined teeth had a poor quality of root canal filling (Table 3).

DISCUSSION

An overall result of 47.6% inadequate root canal treatments in the present study is comparable to studies originating from different parts of the world. The percentage of inadequate root canal treatments was assessed as 50.6% in a Dutch population¹⁴, 56.7% in a Belgian population¹⁵, 51% in a Polish population¹⁶ and 58% in an American population¹⁷. A slightly lower percentage of inadequately treated teeth in present study could be explained on the basis of difference in criteria used to assess the adequacy of length of the root filling when compared with the above mentioned studies. In the present study, root fillings ending within 3 mm from the apex were considered to be adequate while most other studies set the value at 2 mm. This might have resulted in an underestimation of inadequacy of length of root filling which in turn might have affected the assessed percentage of inadequacy of technical quality of root filling.

Some of the studies originating from developing countries like Pakistan have shown even poorer quality of root canal treatment than the present study. Only 30.3% of the teeth were assessed as having an adequate root canal filling in a Taiwanese population⁹ compared to the 52.4% adequately filled root treated teeth in the present study. One of the reasons for this difference could be a large sample size (1183) associated with the above mentioned study compared to the present study (248). A large sample size coupled with the fact that the sample was randomly collected, could be the reasons

for a more accurate assessment of quality of root canal treatment in this Taiwanese population when compared to the present study.

The percentage of adequately treated teeth was found to be 45 % in the only other study¹⁰ assessing the quality of root canal treatment in Pakistan, compared to 52.4% in the present study. The reasons for this difference could be either slightly different parameter used for quality assessment in the present study and/or the operator experience and training. The above mentioned study comprised of cases treated by house surgeons. It has been shown that the quality of treatment can be affected not only by the experience of the operator but also the expertise of the instructor. One such study has demonstrated that the quality of root canal treatment of students instructed by endodontic faculty was better than the quality of treatment of students instructed by general dentistry faculty.¹⁸

Cross sectional studies have the limitation of being observational in nature. They provide information about a given data at one point in time. Such studies may lead to some bias and misinterpretation. For example, in the present study, an account of the experience of the clinicians that rendered root canal treatments was not possible. The experience of the treating clinician and specialist training in the field of endodontics might have a positive effect on the results when assessing the quality of root canal treatment. Root canal treatment has reported success rates varying from 85% to 95% when performed by specialists but reduces to 65% to 75% when performed by general dentists⁹. It is postulated that this may be because of a number of reasons including the difficulty of the technical procedures, lack of understanding of the principles and aims of treatment, poor remuneration for the time required and inadequate teaching at undergraduate level.¹³

CONCLUSION

Within the limitations of the present study, 52.4% of the patients had a good quality of root canal treatment while 47.6 % showed poor quality.

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