

Technical Quality of Root Fillings Performed by Dental Students in Babol Dental School

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Abstract

Introduction: There is substantial evidence that the technical quality of root canal filling has a significant effect on the outcome of root canal treatment. The aim of this study was to evaluate the technical quality of root canal fillings performed by dental students. **Methods:** The records of 325 teeth radiographs, treated by dental students in 2008-2009 in Babol Dental School, were selected and evaluated. For each tooth, three periapical radiographs (before treatment, during operation and at the end of treatment) were examined. Filling length, density and taper, and presence or absence of void was evaluated. Obturations that have proper length, density and taper, without any void are classified as acceptable root canal fillings. The SPSS statistical software and Chi-Square test were used for analysis. **Results:** Of the 325 radiographs, 72% had good length and 75% had acceptable taper. There were 14.2% low densities, whereas, only 3.32% of teeth have no void. At least 17.8% of teeth had underfilling and 10.2% overfilling. Finally, only 17.5% of teeth showed acceptable filling length, taper and density without any void. There was no significant difference between the 4th and 5th year students and oral hygienist (who studied oral hygiene and now continuing it to dentistry) in root canal filling quality ($P > 0.05$). **Conclusion:** Technical quality of root fillings performed by dental students was found to be less than 20%. It should be revised in the endodontic curriculum requirement to improve their performance.

Key words: Dental students, periapical radiographs, quality, root canal treatment.

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Introduction

Root canal obturation was the most critical stage of endodontic treatment and it was considered as one of the most important factors determining the prognosis of treatment. The main object of root canal filling is to prevent re-infection of root canal system and allowing the periapical tissue to heal (1).

Many factors can affect the technical quality of root canal filling such as distance between obturation material and root apex, density, voids and taper etc. These factors are often used to evaluate the radiographs of the treated teeth (2-7). In periapical radiography, a proper root canal treatment includes: conical form of the prepared root canal from coronal to apex, absence of any void within filling or filling and canal walls and presence of 0.5 to 2 mm distance between radiographic apex and root filling to prevent post treatment disease (8).

The length of root canal filling clearly affects the root canal treatment results. Healing rates of fillings which are 2 mm or more shorter than of the radiographic apex are 87-94% and 68-77.6%, respectively while overfilled canals showed 75-76% healing rate (4).

The relationship between filling density and treatment prognosis is not as clear as filling length and treatment prognosis.

Nowadays, a large number of patients have been treated in educational center and dental school. On the other hand, the prevalence of errors among the dental students can improve the educational programs and therefore, provide more appropriate level of medical service. Thus, efforts should be made to improve the quality of the obturation techniques. Accordingly, epidemiologic studies have been conducted in the different populations. Acceptable root canal filling by Turkish students was 33% (7); while in Taiwan, 70% of patients had inadequate root filling length or density (9). Also in Jordan, less than 50% (10), France only 30.1% (15), Saudi Arabia 23 % (4), Greece 55% (3), Glasgow 63% (6) and Sudan 24.2% (2) of fillings are ideal. Therefore, in this study, we evaluated the technical quality of root fillings performed by dental students at Dental School of Babol.

Materials and Methods

In this cross-sectional study, the radiographic records of all the patients treated by students in Endodontic Department of Babol Dental School in 2008-2009 were collected. Finally, 325 radiographs were selected by non-randomized method. Data collection was done using radiographs taken before treatment, during working length determination and after treatment (radiographs were taken by bisect method). Radiographs were observed independently by one endodontist and one oral & maxillofacial radiologist and in case of disagreement; consultation was done with another endodontist.

The questionnaires were prepared by one endodontist and one oral & maxillofacial radiologist. Its content validity was confirmed by other endodontists and radiologists (3 endodontists and 3 radiologists) and its reliability was tested by a pilot study on 30 samples by Cronbach 'alpha 0.81%.

The parameters used in the questionnaire for the assessment of the radiographic quality of the root filling included:

1. Presence or absence of low density of root canal filling
2. Presence or absence of voids within or between fillings and root canal wall.
3. Presence or absence of underfilling (more than 2 mm distance between the radiographic apex and filling material)
4. Presence or absence of overfilling (filling extrusion from the apex)
5. Presence or absence of suitable taper of root canal filling. (measured according to experience of observers)

Score was given to each of these parameters (0 = absence of radiographic criteria, 1= presence of

radiographic criteria). For multirouted teeth, each root canal was independently evaluated and scored. Then the total score was estimated (e.g. when the same parameters were observed for multirouted tooth, score one was given for the tooth). The scores of each parameter were summed to obtain the final score to evaluate the filling quality.

Radiographs with improper processing, did not include the 3 mm of apical surrounding tissue, with elongation or foreshortening, calcified or severe curvature canals and teeth treated by complementary students (who studied dentistry in other countries and had a course in dental school to complete their degree) not to be included in the study. Lateral and furcation perforations, broken instruments and similar cases were considered improper root canal filling.

All treatments were done by the 4th and 5th year dentistry students and dental hygienists (who studied oral hygiene and now continuing it to dentistry) under the situation of using rubber dam and with step back or passive step back techniques using stainless steel hand files. The canals were filled with gutta-percha and AH26 sealer and lateral compaction technique.

Data were analyzed using SPSS V.11 and Chi-Square test and a p value $\leq .05$ was considered as significant.

Results

This study was done on 325 periapical radiographs (306 patients) of root canal treatment done in Endodontic Department of Babol Dental School from 2008 to 2009. The most of radiographs were related to the first molar (36%) and then second premolar (17.8%), second molar (13.2%), central incisor(12%), first premolar(8.3%), lateral incisor(7.4%), canine(4.9%) and third molar(0.3%) respectively. One hundred sixty eight radiographs (51.7%) were related to upper jaw and 157 (48.3%) to lower jaw. The educational degree of students participants were dental hygienists (24%), 4th years students (35.4%) and 5th years students (40.6%).

The results showed that only 58 cases (17.8%) of root canal fillings were quite accurate with good quality (density, absence of void, absence of underfilling or overfilling and proper taper of root canal filling). In other cases, there was at least one error.

Presence of underfilling (P = 0.021) and suitable taper of root canal filling (P = 0.018) in 5th years students was significantly more than others, but presence of overfilling (P = 0.024) in dental hygienists was significantly more than others.

According to educational degrees, differences in overall quality of root canal filling was not statistically

significant between 4th years, 5th years and dental hygienist students .

Table 1 shows the frequency and quality of root canal filling on radiographs based on educational degrees and problems.

Distribution of overall quality of root canal filling according to educational degrees is shown in Table 2.

Discussion

Of the 325 radiographs examined in this study, only 58 cases (17.5%) of root fillings had high technical quality. This frequency was lower than 47% reported by Barriehis et al. (10), 33% reported by Er et al. (7), 32.5 % reported by Dadresanfar et al. (11), 30.1% reported by Moussa-Badranetal (1), 23% reported by Balto (4), 55% reported by Khabbaz (3), 24.2% reported by Elsayed et al. (2) and 60.4% reported by Adams (12).

On the contrary, it was higher than 13% reported by Hayes et al. (13).

Several studies have shown optimal root canal filling length in the range of 0–2 mm from radiographic apex. In this study, the percentage of appropriate filling length was 72% that it is similar to Er et al. study (69.6%) (7), Balto et al. (67%) (4) and Maussa – Badranetal (69%) (1). But, Cheuh (62%) (9), Eleftheriadis et al. (63%) (14) Lupi–Pegurier et al. (38.7%) (15), Boltacz– Rzepkanska and Pawlicka (48.9%) (16) And Elsayed et al. (for upper jaw 34.7% and for lower jaw 10.9%) reported lower range (2). Kclbauskas reported higher percentage (84.1%) (5).This difference may be due to the fact that many students take several dental radiographies during working length determination to achieve the ideal length.

Table 1. Frequency and quality of root canal filling on the radiographic assessment based on educational degree

Quality	Educational degree	Dental Hygienists	4 th years	5 th years	Total	P-Value
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	
Presence of low density filling		12(15.4)	16(13.9)	18(13.6)	46(14.2)	0.936
Presence of void in filling or between filling and canal wall		47(60.3)	79(68.7)	94(71.2)	220(67.7)	0.25
Presence of underfilling		10(12.8)	15(13)	33(25)	58(17.8)	0.021
Presence of overfilling		13(16.7)	5(4.3)	15(11.4)	33(10.2)	0.018
Absence of proper tapering in root canal filling		26(33.3)	32(27.8)	23(17.4)	81(24.9)	0.024

Table 2. Frequency and quality of root canal filling on the radiographic assessment based on educational degree

Overall Quality	Educational degree	Dental Hygienist	4 th year	5 th year	Total	P-Value
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	
Without problem		12(15.4)	23(20)	23(17.4)	58(17.8)	
With problem		66(84.6)	92(80)	109(82.6)	267(82.2)	0.704
Total		78(100)	115(100)	132(100)	325(100)	

Teeth without any voids in the filling and adequate density was 32.5% in this study that was similar to the Balto 's study (35%) (4) and lower than Mussa-Badran 's study (42.7%) (1) and Er's (53.2%) (7).

Studies that have evaluated the quality of the radiographic root filling are often based on length and density, but according to European Society of Endodontology (2006) prepared root canal should be evenly tapered from coronal to apical (8). Adequate taper of root fillings in this study was shown in 75.1% of cases which was higher than the rate reported by Ero et al. (68.3%) (7), Balto et al. (60%) (4) and Elsayed et al. ((maxilla (40%) and mandible (16.6%)) (2). The comparison of this study with the others showed that the acceptable root canal filling percentage was lower than the other studies which should be because of different criteria were used in the studies. In other studies, only 2 or 3 criteria were considered as acceptable quality, whereas, 5 criteria were included in current study. To improve the technical quality of root canal treatment, it is recommended to review the endodontic curriculum requirements, specialized clinical supervision and increase the time of training at the preclinical and clinical level.

In the present study, the overall quality of the root fillings done by the 4th years dental students (20%) was a little better than the 5th years students (17.4%) and the latter was better than the oral hygienists (15.4%) but these differences were not statistically significant. It may be because of the teeth treated by the 4th dental students which have only single or two canals and these students passed preclinical courses in their last term, while the 5th year dental students had treated molar teeth and passed their preclinical course long time ago. But Balto et al. in 2010 in Saudi Arabia (4) and Khabbaz in Greece (3) in the same year studies observed no significant relationship between the 4th and 5th years dentistry students in terms of root canal filling quality, length, density and taper. Of course, one of our limitations in this study was that the radiographs taken by bisect technique, because this technique was routinely used by students. Consequently, we suggest repeating this study with parallel technique for its repeatability and better reliability.

As regards, data in this article were collected in years 2008 -2009 and now we are about 2014, for using the result of this article in educational curriculum, it is better to carry out a new study and the its result to be compared and then the final decision to be made.

Conclusion

The result of this study showed that a small proportion of the root canal filling was quite accurate

and had good quality. In conclusion, we suggest this subject should be in priority in scholarship program in Babol University of Medical Sciences for improving the training of the students in the preclinical and clinical levels. Also, this research should be revised in the future to reflect new evidences.

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