COMPARISON OF ROOT CANAL TREATMENT QUALITY PERFORMED BY HOUSE SURGEONS AND POSTGRADUATE STUDENTS

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ABSTRACT

Endodontics is a challenging discipline, and includes technically demanding procedures in general dental practice. The objective of this study was to compare the quality of root canal treatment performed by house surgeons and postgraduate students. Comparative cross sectional study was carried out in the Department of Operative Dentistry, Lahore Medical and Dental College, Lahore (LMDC). The duration of study was from 13th March 2008 to 12th September 2008. One hundred (100) single rooted teeth of patients reported to the Department of Operative dentistry of LMDC. Patients were randomly allotted and divided in to two groups. Root canal treatment of group A patients was performed by postgraduate students and that of group B by house surgeons. Quality of root canal treatment of both groups was assessed radiographically. A predetermined criterion for assessing quality used in earlier studies was employed. All quality assessment variables for evaluation of root canal which were lateral root seal, adequate length, transportation of apex and instrument fracture showed statistically significant difference between the two groups. The quality of root canal treatment performed by postgraduates was much better than the house surgeons.

Key Words: Root canal treatment, Quality, Lateral seal, Apical Periodontitis, Endodontics.

INTRODUCTION

Root canal treatment deals with preservation and maintenance of periapical health through chemomechanical debridement and three dimensional obturation of root canal space to prevent intraradicular microorganism and their toxins from reaching the periapical tissue.\(^1\)\(^2\)

Most of the studies have evaluated the technical quality of root canal treatment by radiographic examination alone.\(^3\) In 2006 the European Society of Endodontontology issued quality guidelines for endodontic treatment. It contains step by step description of every phase of root canal treatment. According to it the root canal should be prepared as close to apical constriction as possible which varies between 0.5 and 2 mm from the radiographic apex. The filled and prepared canal should contain the original canal. On radiograph, no space should be visible beyond the end point of root canal filling. There should be no void or space between the root canal filling and the wall of the root canal. All the general dentists are expected to treat pulpal and periapical injuries and diseases efficiently that are common and within the skills acquired by the graduates of the dental school. The complicated cases beyond their experience and skills should be referred to colleague who has completed specialized training in Endodontontology and has more experience in treating such cases.\(^4\)

The number of root canal treatments rendered annually, are majorly performed by general dentists. The quality and standard of root canal treatments done by general dentists is below standard.\(^5\)

The purpose of this study was to radiographically assess the root canal treatment quality performed by house surgeons and postgraduate trainees and also to assess the effectiveness of specialized training in raising endodontic care standard. In a country like Pakistan, where proper public sector dental care is limited, it is important to investigate the effectiveness of root canal treatment as a treatment modality performed by operators of varying experience.

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METHODOLOGY

This study was carried out in Department of Operative Dentistry, LMDC, Lahore. The duration of study was six months, from 13th March 2008 to 12th September 2008. 100 root filled teeth were included, 50 were treated by house surgeons and 50 by postgraduate trainees. Sampling technique used was non probability; purposive sampling. Inclusion criteria consisted of patients with age 18 to 50 years, both genders, single rooted teeth and permanent teeth with mature apices and no invasive/ resorptive defects. Exclusion Criteria consisted of patients with physical and mental conditions that prevent jaw opening, medical conditions prohibiting exposures to radiations, fractured roots, calcified canals, and/or teeth requiring retreatment. The study design was comparative cross sectional. Risk benefit ratio was explained to the patient and informed consent was taken.

Patients were randomly allotted to Post Graduate and house surgeons using Statistical Package for Social Sciences (SPSS version 10) software and were divided into two equal groups A and B having 50 cases each. Group A patients were treated by Post Graduate students and Group B by house surgeons. Diagnosis of root treated teeth was based on patient history and radiographic examination. The patient information was recorded on specially designed proforma. Proforma was used to record demographic data, past dental history, personal history of the patient and complete charting of the patient’s dentition was done on an odontogram. All related information regarding the root filled tooth was recorded on the same Proforma.

Standard procedure of root canal treatment was performed. Working length was determined with the use of radiographs. All teeth were instrumented with the step back technique using stainless steel K-files of 0.02 taper (Mani Inc MDCI LTD, Japan) and the canals were irrigated with 2.5% sodium hypochloride. Root fillings were carried out with gutta-percha points (Sure-endo gatta percha points, Sure Dent Corporation, Korea) and sealer (Endofill, Dentsply Maillefer, Brazil). Lateral condensation of gutta percha points was done with NiTi finger spreader.

A periapical radiograph (EXPLOR-X-70, speed E/F, Villa Italy) of root treated tooth was taken using parallaling technique on standard radiographic film (Agfa Dentus M2 Confort Single Film Size 2, 150 x 1 Heraeus Kulzer GmbH & Co. KG, South Bend, IN, USA), which were manually developed and fixed, and then mounted on black holders. All radiographs were examined by single examiner. Radiographs were interpreted in a darkened room using an illuminated viewer box with magnification (x2) whilst mounted in a cardboard slit to blockoff ambient light emanating from the viewer.

A transparent ruler was used to assess the distance between the end of the root canal filling material and the radiographic apex of the tooth.¹

The quality of root canal treatment was determined by a single examiner using the parameters, according to which if the lateral seal of the root canal had no voids, it was judged as adequate and the score was 1. If there were voids within the root canal filling it was considered inadequate and the score was 2. If length of the root filling was ≤2 mm from radiographic apex, it was regarded as adequate and the score was 1. If root filling was beyond radiographic apex (over obturation) or ending more than 2 mm short of radiographic apex (under obturation), it was considered inadequate and the score was 2. The root canal treatment was considered adequate when there was no transportation of apical foramen and no fractured instrument and the respective scores were 1. If transportation or fractured instrument were present, the filling was considered inadequate and the respective scores were 2. 10% of the data was re-examined by a second independent examiner to determine examiner reliability.⁶

All statistical analysis was done using statistical packages for social science (SPSS) for window software, version 10. Frequency and percentage were computed for categorical variables like age groups, gender, Lateral seal of the root filling, length of the root filling, transportation of apex, fractured instrument. Mean with standard deviation, 95% confidence interval and median were also computed for quantitative variable like age.

Independent sample t test was applied to compare mean age between groups. Chi-square test was used to compare proportion difference between groups for lateral seal of the root filling, length of the root filling, transportation of apex, fractured instrument. P ≤ 0.05 was considered level of significant.

RESULTS

Out of 100 patients, 48% were male and 52% were female. Average age of male was 27.04 ± 9.2 years (95% CI: 24.36 to 29.72) and female was 29.40 ± 9.9 years (95% CI: 26.65 to 32.16). Proportion of gender were not significant between the groups (Chi-Square = 0.160, p-value = 0.69).

Considering the first variable of adequate or inadequate lateral seal of root filling, 77% of root canals performed by post graduate students were adequate compared to only 22% adequate root fillings performed by house surgeons. Adequate lateral seal of root canal filling were significantly higher in those teeth which were treated by postgraduate trainee than house surgeon (Chi-Square = 20.17, p=0.0001).
Comparing adequate length of root filling majority of post graduate students 84% performed it adequately where as the opposite was true for house surgeon group where 66% inadequate root filled lengths were observed. Adequate length of root canal was significantly different between both groups (Chi-Square = 25.83, p=0.0001).

Transportation of apex and fractured instrument showed no significant difference between groups. The overall adequate quality of root canal fillings were 25% performed by both groups, of which 96% were performed by postgraduate and only 4% by house surgeons.
Comparison of root canal treatment

Epidemiological studies have consistently shown that the high prevalence of disease found in root-filled teeth is related to the poor technical quality of root fillings. These studies have found a very high percentage of inadequate root fillings, in the range of 49-87%.

However, many of these epidemiological studies were undertaken in general practice or hospital settings. The survival rate of teeth treated by specialists was shown to be significantly better than those treated by general practitioners. It has been demonstrated that highly skilled operators are less likely to perform procedural errors that may ultimately compromise the prognosis.

In this study root canal filling length along with lateral seal with no voids in filling, fractured instruments and apical transportations were evaluated. The quality of root filling was also assessed by its radiodensity and by the presence of voids. Radiodensity is one of the criteria used to estimate a potential defect of the root canal sealing. In a study preclinical exercises for students improved the working length performed by students emphasizing the need for training.

A recent study in Nigeria showed that old practices are common with continued education lacking the result of which is high rate of perforations. The results of patients treated by house surgeons and combined results of both groups are far inferior when compared with studies by Bierenkrant and Dugas et al.

<table>
<thead>
<tr>
<th>Fractured Instrument</th>
<th>Post Graduate Trainee n=50</th>
<th>House Surgeon n=50</th>
<th>Total n=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate</td>
<td>50</td>
<td>49</td>
<td>99</td>
</tr>
<tr>
<td>(Row wise percentage)</td>
<td>(50.5%)</td>
<td>(49.5%)</td>
<td></td>
</tr>
<tr>
<td>(Column wise percentage)</td>
<td>[100%]</td>
<td>[98.0%]</td>
<td></td>
</tr>
<tr>
<td>Inadequate</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(Row wise percentage)</td>
<td>(0%)</td>
<td>(100%)</td>
<td></td>
</tr>
<tr>
<td>(Column wise percentage)</td>
<td>[0%]</td>
<td>[2%]</td>
<td></td>
</tr>
</tbody>
</table>

Fisher Exact test, p-value=0.99

Adequate: Absent

Inadequate: Present

<table>
<thead>
<tr>
<th>Adequate Outcomes</th>
<th>Post Graduate Trainee n=50</th>
<th>House Surgeon n=50</th>
<th>Total n=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any One Adequate</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(Row wise percentage)</td>
<td>(0%)</td>
<td>(100%)</td>
<td></td>
</tr>
<tr>
<td>(Column wise percentage)</td>
<td>[0%]</td>
<td>[2%]</td>
<td></td>
</tr>
<tr>
<td>Any Two Adequate</td>
<td>2</td>
<td>29</td>
<td>31</td>
</tr>
<tr>
<td>(Row wise percentage)</td>
<td>(6.5%)</td>
<td>(93.5%)</td>
<td></td>
</tr>
<tr>
<td>(Column wise percentage)</td>
<td>[4%]</td>
<td>[58%]</td>
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</tr>
<tr>
<td>Any Three Adequate</td>
<td>24</td>
<td>19</td>
<td>43</td>
</tr>
<tr>
<td>(Row wise percentage)</td>
<td>(55.8%)</td>
<td>(44.2%)</td>
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</tr>
<tr>
<td>(Column wise percentage)</td>
<td>[48%]</td>
<td>[38%]</td>
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</tr>
<tr>
<td>All Four Adequate</td>
<td>24</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>(Row wise percentage)</td>
<td>(96%)</td>
<td>(4%)</td>
<td></td>
</tr>
<tr>
<td>(Column wise percentage)</td>
<td>[48%]</td>
<td>[2%]</td>
<td></td>
</tr>
</tbody>
</table>

square= 28.21; df=1 p=0.0001 (for all adequate)

Adequate Outcome

Lateral Seal of the Root Filling
Length of Root Filling
Transportation of Apex
Fractured Instrument
Chueh et al.\textsuperscript{12} in their study observed adequate quality root canal filling was 34.8\%. These results are inferior when compared with current study. Ahmed et al. conducted study assessing the quality of root canal treatment conducted by house surgeons in Pakistan and found 58.9\% of roots were acceptably obturated within 0-2mm of the radiographic apex.\textsuperscript{13} A study was conducted in Senegal regarding the quality of root fillings. Only 17.7\% of the roots fulfilled the criteria for an acceptable root canal filling.\textsuperscript{14}

The results of this study can be explained as lack of exposure to preclinical teaching and clinical training at undergraduate level.\textsuperscript{15,16} Greater occurrence of adequate root canal fillings in other studies is attributed to the use of precise and advanced instruments in endodontics.\textsuperscript{1,17} There is a lack of all these factors at undergraduate level in most of dental schools in Pakistan.

The quality and standard of root canal treatments done by general dentists is below standard.\textsuperscript{18,19} The American Association of Endodontists (AAE) Board of Directors elected to use an evidence-based approach to its decision making and embrace lifelong learning as an essential element in the practice of the highest standards of endodontics.\textsuperscript{20} Similar steps should be taken in Pakistan.

**CONCLUSION**

This study revealed that the quality of root canal treatment performed by postgraduate students was much better than the quality of root canal treatment done by house surgeons. The adequacy of overall quality of root canal treatment including all the four outcome variables of postgraduate students was better than that of house surgeons. The individual outcome variable results also suggest the better outcome of the work done by postgraduate students. This study shows positive correlation between the operator experience and adequacy of quality of root canal treatment. The results also suggest the greater need to improve the curriculum and induction of preclinical and clinical endodontic programs at the undergraduate level.

**REFERENCES**