Comparison of Various Sealers on Postoperative Pain in Single-Visit Endodontics: A Randomized Clinical Study

Shahnaz Nabi, Riyaz Farooq, Aamir Purra, Fayaz Ahmed

Department of Conservative Dentistry and Endodontics, Government Dental College and Hospital, Department of Conservative Dentistry and Endodontics, Government Dental College, Srinagar, Jammu and Kashmir, India

Aim: The aim of this study is to evaluate the effect of bioceramic-based sealers on postendodontic pain following single-visit endodontics.

Materials and Methods: Ninety patients requiring primary endodontic treatment were selected for the study. Patients were treated in single visit endodontically using three different bioceramic-based sealers: Group 1: obturation done using mineral trioxide aggregate plus sealer, Group 2: obturation done using EndoSequence BC sealer, and Group 3: iRoot SP sealer. Postendodontic pain was measured for 48 h postoperatively.

Results: No significant difference was found in postendodontic pain scores between the sealers groups. Conclusion: Postendodontic pain was reduced in all treatment groups. Any of the three bioceramic sealers can be used for single-visit endodontics without fear of postoperative pain.

Keywords: Bioceramic sealers, Heft–Parker Pain Scale, single-visit endodontics

INTRODUCTION

The evolution of newer techniques, instruments, materials, and better understanding of canal anatomy, has changed the face of endodontics completely. One concept that has emerged is the single-visit root canal therapy. Single-visit root canal treatment (RCT) has become a common practice and offers several advantages, including a reduced flare-up rate, decreased number of operative procedures, and no risk of interappointment leakage through temporary restorations.[1]

The major consideration regarding one-appointment endodontics has been the concern about postoperative pain.[2] Various studies have evaluated the postendodontic pain difference between single- and multiple-visit RCT, but most studies have ruled out any significant difference in postoperative pain.[3] Lately, bioceramic-based sealers have been used in endodontics. They offer the advantage of being biocompatible and form hydroxyapatite crystals that help in bonding with root dentin. Therefore, this study was undertaken to evaluate the effect of these sealers on postendodontic pain.

MATERIALS AND METHODS

Ninety patients reporting to the Department of Conservative Dentistry and Endodontics for undergoing endodontic treatment in teeth with asymptomatic apical periodontitis were recruited for the study. The following inclusion and exclusion criteria were applied for patient selection for the study.

Inclusion criteria
Permanent teeth with fully formed apex, teeth with vital pulp, teeth with no periapical radiolucency, and patients having preoperative pain were included in the study.

Exclusion criteria
Teeth with incompletely formed apex; teeth requiring secondary endodontic treatment; patients having complicating systemic disease such as diabetes, malignancy, pregnancy, central nervous system disorders, cardiovascular system disorders, respiratory disorders, asthma patients, psychiatric disorders, and immunocompromised patients; patients taking anti-inflammatory or antibiotics; patients giving a history of analgesic or antibiotic intake 1 week before treatment; patients <18 years of age; patients >60 years of age; teeth having calcified canals; teeth having multiple canals or

Access this article online
Quick Response Code:
Website: www.ijds.in
DOI: 10.4103/IJDS.IJDS_81_18

How to cite this article: Nabi S, Farooq R, Purra A, Ahmed F. Comparison of various sealers on postoperative pain in single-visit endodontics: A randomized clinical study. Indian J Dent Sci 2019;11:99-102.

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multirooted teeth; and teeth affected with periodontal disease; teeth tender on percussion; and teeth having procedural errors such as transportation, perforation, and missed canals. Before starting the procedure, informed consent was obtained, and a clinical examination was administered. The examination included cold pulp testing, heat testing, electric testing, percussion and palpation evaluation, periodontal probing, mobility assessment, and a periapical radiograph. All the past and present symptoms of the involved tooth were recorded; pulpal diagnosis was determined from the data collected in the examination and was recorded. Only those patients with a diagnosis of symptomatic irreversible pulpitis with no apical periodontitis were included in the study.

**Standard endodontic procedure**

Before treatment, the patient filled out his/her initial perception of pain on the Heft–Parker Pain Scale; local anesthetic (1:80,000 Arcaine, Aarge Pvt Ltd., India) was administered, and endodontic access was achieved under rubber dam isolation. Cleaning and shaping of the canal systems were achieved in the following manner; early negotiation and cleaning and shaping were completed with Flex-O-Files (Maillefer Switzerland) #8, #10, #15, #20. An initial working length reading was taken with the apex locator root ZX mini (J Morita Japan) and a confirmatory radiograph was taken. The working length was estimated to be 0.5-mm short of the radiographic apex. Canals were prepared using engine-driven rotary nickel-titanium ProTaper gold files (Dentsply Maillefer, Ballaigues, Switzerland) following the manufacturer’s instructions. RC prep (Premier Dental Products Co., Philadelphia, PA, USA) was used as a lubricant. Irrigation was performed with 5.25% sodium hypochlorite after each file change. Apical enlargement was accomplished with using finishing files which ranged from F1 to F5 depending on the initial diameter of the canal. Then, the patients were divided into three treatment groups for obturation.

Patients were randomly divided into three treatment groups depending on the sealer used:

- **Group 1**: Obturation done using MTA plus (Prevest India Ltd) sealer
- **Group 2**: Obturation done using EndoSequence BC (Bressler USA) sealer
- **Group 3**: iRoot SP (Innovative Bioceramix, Inc Canada) sealer.

All canals were then obturated using the warm vertical compaction technique. All cases were completed in one appointment (access, cleaning and shaping, and obturation). Patients were then given the Heft and Parker[4] Pain Rating Scale and were instructed to mark the individual pain level at 4, 8, 12, 24, and 48 h after root canal therapy.

**Statistical analysis**

Parametric data were analyzed with the help of means and standard deviations. Intergroup analysis was carried out using the analysis of variances with “least significant difference” post hoc test. For intragroup analysis, the Student’s t-test was used. The Chi-square test was applied for nonparametric data. P < 0.05 was considered statistically significant.

**Results**

Table 1 shows the gender distribution among the groups. A total of 90 patients were included in the study. Forty-six males and 44 female patients were participated in the study. No significant difference between the gender distributions was noted among the groups. Table 2 shows the mean age of patients among the groups. Age was ranged from 18 years to 65 years. No significant difference in the mean age of patients was noted among the groups. Table 3 shows the mean pain scores among groups at various time intervals. A significant difference among the mean pain score was noted among groups postoperatively as compared to preoperative pain scores. No significant difference was found between groups at various time intervals postoperatively (Table 4).

**Discussion**

It is well-known that pain perception is highly subjective and influenced by many factors, and the most effective method of pain evaluation is self-evaluation. Thus, results were based

### Table 1: Gender distribution among groups

| Groups     | Males, n (%) | Females, n (%) | P     |
|------------|--------------|----------------|-------|
| Group 1 (n=30) | 16 (53.3)    | 14 (46.7)      | 0.965*|
| Group 2 (n=30) | 17 (56.6)    | 13 (43.4)      |       |
| Group 3 (n=30) | 13 (43.4)    | 17 (56.6)      |       |

*Nonstatistically significant difference

### Table 2: Mean age of the patients among treatment groups

| Groups     | Mean age years | Range | P     |
|------------|----------------|-------|-------|
| Group 1 (n=30) | 34.4          | 18-60 | 0.975*|
| Group 2 (n=30) | 35.6          | 22-63 |       |
| Group 3 (n=30) | 36.1          | 22-62 |       |

*Nonsignificant statistical difference

### Table 3: Mean pain scores at various time intervals

| Groups     | Preoperative | 4 h   | 8 h   | 12 h  | 24 h  | 48 h  |
|------------|--------------|-------|-------|-------|-------|-------|
| Group 1    | 87.3         | 13.9  | 13.8  | 11.1  | 5.5   | 3.4   |
| Group 2    | 85.8         | 14.2  | 14.2  | 11.8  | 6.2   | 3.9   |
| Group 3    | 88.9         | 13.6  | 14.5  | 11.5  | 5.3   | 3.8   |

### Table 4: Intragroup comparison of mean pain scores at various time intervals

| Groups     | 4 h   | 8 h   | 12 h  | 24 h  | 24 h  |
|------------|-------|-------|-------|-------|-------|
| Group 1 versus Group 3 | 0.241 | 0.345 | 0.240 | 0.184 | 0.196 |
| Group 2 versus Group 3 | 0.344 | 0.234 | 0.160 | 0.184 | 0.177 |
| Group 1 versus Group 2 | 0.344 | 0.322 | 0.345 | 0.211 | 0.241 |
on the patient’s report of postobturation pain. An accurate classification of pain and its measurement is essential and makes the precise definition of different discomfort categories and detailed description of pain difficult. In this study, Heft–Parker Pain Rating Scale was used as it is more accurate and commonly used scale for measuring pain. It is well known that postendodontic pain is reduced significantly following endodontic therapy. In case of single-visit endodontics, many clinical studies have reported varying degrees of postendodontic pain, ranging from 25% to 40%. The results from the present study indicate that pain was significantly reduced in all the treatment groups postoperatively as compared to that of the preoperative pain [Figure 1]. There was no significant difference between mean pain scores after the endodontic treatment over the evaluated 48-h postoperatively among the three treatment groups. As regards to the age, only 25.7% of the elderly patients (n = 14) felt postoperative pain, a low percentage when compared to 40% of the youngest patients (n = 16). The highest pain intensity felt during the 48 h evaluation was more frequently classified as slight pain, both for the elderly (20.0%, n = 13) and youngest patients (26.7%, n = 1 4). Despite apparent differences, comparison between the age groups revealed no statistically significant differences for highest pain intensity felt during the postoperative 48-h evaluation period. When considering tooth location, postoperative pain was felt by 33.3% (n = 40) of patients in both categories. Although patients who received treatment in teeth localized in the mandible showed a higher percentage of moderate pain (13.3% vs. 6.67%), as compared to maxillary teeth similar to other studies. The incidence of postobturation pain was more during the first 24 h after obturation. However, at 48 h, postobturation pain decreased significantly which was found in agreement with the findings of other studies. In the 1st postobturation day and 2nd postobturation day, females reported more pain than males. These results support the findings of previous workers. Female patients experienced more pain than male patients; a possible explanation is that biological differences between genders may explain increased pain prevalence in females. In the present study, warm vertical compaction was used as obturation technique. It is said that lateral condensation and warm vertical compaction have more probability of apical extrusion of the gutta-percha. In this study, the root canals were prepared with Ni-Ti rotary files. Arias et al. in their prospective in vivo study suggested that a higher incidence of postoperative pain should be expected after manual root canal preparation. The instrumentation that uses rotation seems to reduce significantly the amount of debris extruded apically when compared with the manual system and bacteria which may worsen the inflammatory response and result in periradicular inflammation, a lower incidence of postoperative pain should be expected.

In this study, pain significantly decreased postoperatively after endodontic treatment in all the three groups. Among the groups, the use of different sealers did not make any significant difference in the development of postoperative pain over the next 48 h, suggesting that use of appropriate technique and limiting the preparation to within the apex has a greater role than the type of sealer used for obturation. Bioceramic-based sealers have been shown to cause less postoperative pain than other type of sealers. In case of bioceramics, due to its wettability and viscosity, the bioceramic could spread into any root canal irregularity and noninstrumented space. This sealer exhibits the formation of calcium hydroxide on hydration and thus would potentially promote bioactivity and adhesion to the canal wall through mineral tags. The least mean pain scores at 48 h were seen with Group 3, whereas at 48 h, the least mean pain scores were seen with Group 1.

**Conclusion**

Within the limitations of the present study, it is concluded that postoperative pain is significantly reduced following single-visit endodontics. Use of bioceramic sealers does not have a significant effect in decreasing postoperative pain. No significant difference was found between the sealer groups in terms of postendodontic pain. New studies can be done using different obturating techniques and other types of sealers to evaluate their effect on postendodontic pain.

**Financial support and sponsorship** Nil.

**Conflicts of interest**

There are no conflicts of interest.

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![Graphical representation of the mean pain scores among the treatment groups](image-url)
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