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# Awareness and Knowledge of Root Canal Repair Materials in Endodontic Treatments among Dentists of Abbottabad, Khyber Pakhtunkhwa, Pakistan

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## Abstract

This study aimed to assess the knowledge and clinical experience of dentists towards root canal repair materials and to find the preferred material for endodontic treatments. It was a cross-sectional study based on a survey consisting of 200 questionnaires. The study was done in dental hospitals in Abbottabad from March 2022 to August 2022. This cross-sectional study was performed on 200 dentists belonging to different dental colleges in Abbottabad. A structured questionnaire consisting of 10 questions was designed and distributed among the participants through hard and soft copies. Statistical Package for Social Sciences (SPSS) version 22 was used for the analysis of results. Out of 200 questionnaires, 107 were recovered and responses were received. More than 60% of participants selected MTA as the material of choice for endodontic treatments, whereas 20–30% preferred calcium hydroxide, and a few used Bio dentine, Modified Metal Glass-Ionomer Cements (GIC), Super ethoxy benzoic acid (EBA), and Decalcified Freeze Dry Bone. The preferred treatment for the maximum number of participants was mineral trioxide aggregate (MTA). Most of the dentists showed good awareness of root canal repair materials.

**Keywords** Knowledge, Awareness, MTA, Root canal perforation, Repair

## 1. Introduction

The root canals need repairs when perforation occurs either iatrogenically during root canal treatments or as a result of resorption. The treatment prognosis might be significantly compromised if these perforations are left untreated (1). In perforation, there is an open channel that allows bacteria to enter either from periodontal tissues or the root canal and the elicits inflammatory reactions that result in fistulae formation (2). Moreover, if the perforations involve the furcation area, it will lead to the overgrowth of gingival epithelium, further complicating the endodontic treatment (2). For the repair of perforations, the main factor is the selection of the material to be used, which increases the chances of successful treatment. Among the various requirements, the most significant are biocompatibility and excellent sealing ability of repair materials to prevent exposure to contaminating medium and reduce inflammatory reactions (3,4). In the past, Amalgam, EBA, Cavit and Calcium phosphate were used as root canal repair materials (12). Nowadays, a wide variety of repair materials are available which provide a thorough seal between external dental surfaces and root canals (5-7).
These new materials include MTA, Biodentine Endo Sequence, Bio aggregate, and Decalcified Freeze-Dried Bone, (8-11). MTA discovered by Torbinjad, is a tricalcium silicate-based cement, and it has good marginal adaption and sealing ability (13,14). Biodentine is a recently developed calcium silicate-

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based bioactive cement that overcomes some of the deficiencies of MTA, which are long setting and difficult manipulation (8). Another recently developed root repair material is endosequence. It is a bioceramic material that has already been mixed and is ready to use. It is best for repairing perforations (9).

Bio-aggregate is a new root canal perforation repair material and is used for retrograde filling. It is composed of tricalcium silicate, tantalum pentoxide, dicalcium silicate, and calcium phosphate monobasic. The main difference between MTA and Bio-aggregate is the presence of tantalum pentoxide, which provides radiopacity instead of bismuth oxide in MTA (15). Recent studies recommend that Bio-aggregate can be considered a suitable alternative to MTA. It is available in both putty and injectable forms (16). The decalcified frozen dried bone is also sometimes used as root canal perforation repair material along with grafting surgical defects (17,18). Portland cement is also a root perforation repair material composed of tricalcium silicate, tetracalcium aluminoferrite, dicalcium silicate, tricalcium aluminate, and calcium sulfate combined with bismuth oxide powder (19,20)**.** Super EBA is a reinforced zinc oxide cement that consists of 68% ethoxy benzoic acid and 32% eugenol (21). The idea of the current article is to assess the knowledge and level of awareness of general dentists regarding the latest root canal repair materials.

## 2. Materials and Methods

This was a cross-sectional study conducted from March to August 2022. A survey questionnaire was carried out to assess the awareness and information of general dentists about root canal perforation repair materials. The questionnaire consisted of 10 questions. The first part of the questions was about the profile of participants, including the field of practice and primary setting, while the second part contained questions about knowledge and properties of materials. They were distributed among dentists working in various hospitals and dental clinics in Abbottabad, KPK. The questionnaire was shared both through hard copy forms and through online Google forms. The target population consisted of 200 dentists belonging to different dental colleges in Abbottabad, KPK, Pakistan. 107 out of 200 people responded. SPSS version 22 was used to interpret the results. The statistical analysis was done through frequency and bar charts.

## 3. Results

The bar chart is shown in Figures 1 and 2: Percentage distribution of responses to questions on knowledge level about root canal detection and the material most frequently used by the operator.

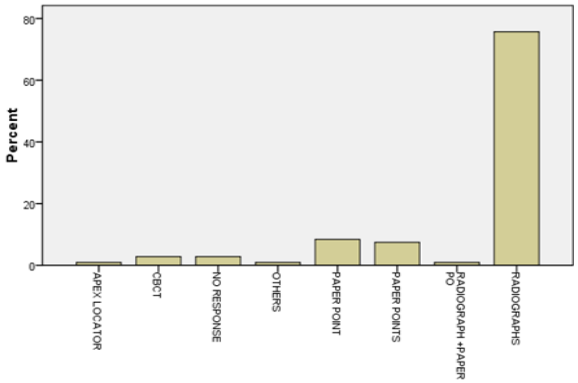


**Figure 1:** Percentage distribution of responses to questions on knowledge level about root canal detection.

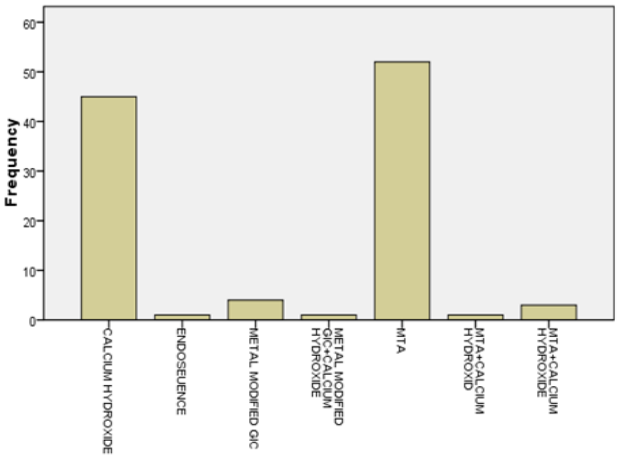


**Figure 2:** Percentage distribution of responses to questions on knowledge level about the material most frequently used by the operator.

In the pre-determined time, 107 filled responses were retrieved. In the above bar chart shown in figure 2, it can be interpreted that most dentists detect perforation through radiographs, less than 20% use paper points, and only a few utilize CBCT and apex locator. In bar chart 2, the frequency of the material which is favorably used by dentists for endodontic perforations is given. According to that data, more than 50% of dentists prefer MTA for repair and almost 50% use calcium hydroxide.

However, a small number use metal-modified GIC and endosequence for the repair of perforations.

Bar charts 3 and 4 show the percentage distribution of responses to questions about which material has the best compatibility and adaptation with the cavity wall in their clinical experiences.

In the bar charts in Figures 3 and 4, the experiences of dentists regarding the best compatibility and adaptation with cavity wall materials are shown. It can be inferred that MTA and calcium hydroxide are the most biocompatible materials and show maximum adaptation to the cavity wall of the tooth structure. For cavity wall adaptation, 20% of participants also selected Biodentine.

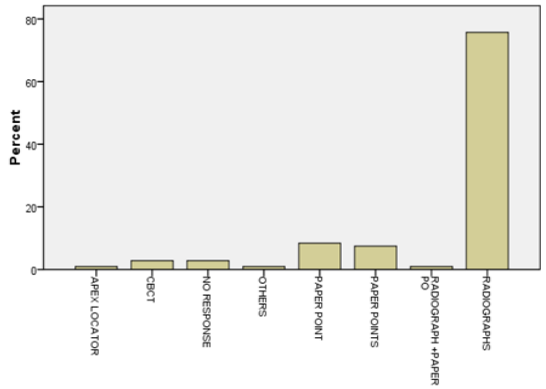


**Figure 3:** the experiences of dentists regarding the best compatibility.

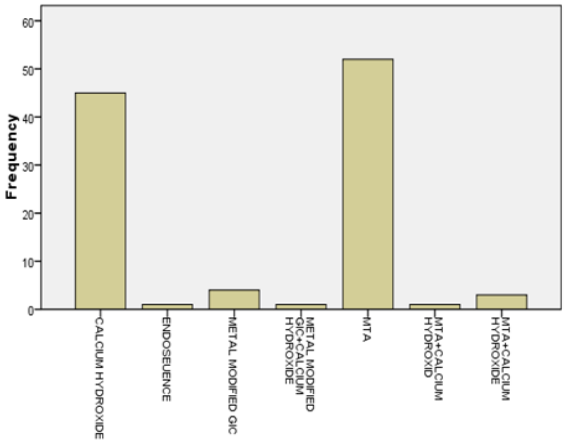


**Figure 4:** adaptation with cavity wall materials

Bar charts in Figure 5 and 6 show how people answered the questions about easy availability and manipulation with the use of root canal repair material

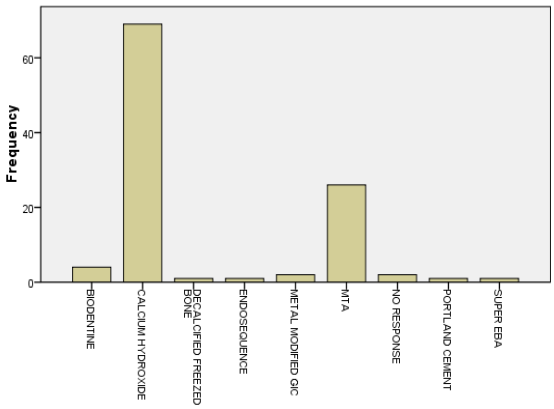


**Figure 5:** manipulation with the use of root canal repair material

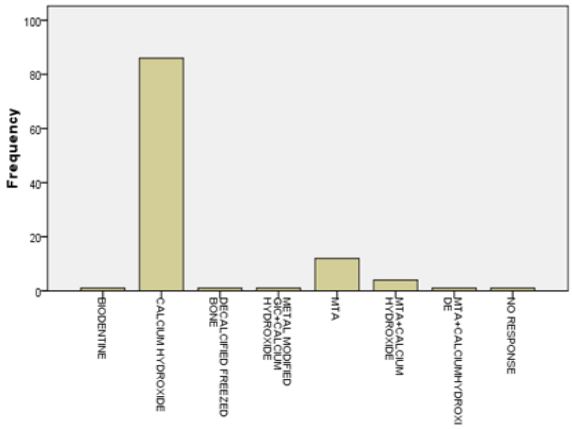


**Figure 6:** easy manipulation with the use of root canal repair material.

In case of easy availability and easy placement, the material selected by the maximum number of dentists was calcium hydroxide. As can be seen in bar charts 5 and 6, however, 15% selected MTA and response to the selection of remaining materials was negligible.

## 4. Discussion

Perforation repair is a tiresome process for dentists. For successful endodontic treatment, the dentist needs to have complete knowledge of root canal repair materials and their properties. This survey reveals the choice of materials used by dentists for the repair of perforations and their experiences with the clinical aspects of these materials. It is observed in this study that MTA is the material of choice for the majority of dentists, the reason being its capability to form mineralized tissue, which effectively closes the perforation in the root. The other reasons reported in previous studies for the most

frequent use of MTA are its biocompatibility and alkaline nature. Mohn et al. reported in their survey-based study that MTA was utilized more for perforations because of its opacifying property (22).

The current study is following the study of Surendar and Nivedhitha that MTA is more popular as compared to calcium hydroxide in repairing root canal perforation (23). Similarly, Keshava and Chitra also demonstrated that MTA is more frequently used material as it causes closure of perforation more quickly, whereas calcium hydroxide delays and weakens the tooth structure (24).

One of the previous studies done by William et al depicted that more than 96% of dentists used MTA while a few preferred Biodentine in Australia (25). According to the participants of our study, MTA showed the best compatibility and excellent adaptation with cavity walls as compared to other root perforation repair materials. However, about 80% of the responses of participants regarding the availability of materials were in favor of calcium hydroxide. They found that MTA and other materials are not easily available. Regarding manipulation and placement of material at the perforation site, the majority of participants in this survey selected Calcium hydroxide as the easiest material to place in the cavity, while few had a good experience with Biodentine and MTA. Overall, MTA appears to be more effective in closing perforations as compared to other root canal repair materials.

## 5. Conclusion

It is concluded from this study that most of the participants had good awareness and knowledge about root canal repair materials. MTA was the most widely used material for perforation repairs because of its excellent biocompatibility, whereas calcium hydroxide showed good adaptation to walls as well as ease of placement in the cavity. The problems with different materials were also reported, which seems to be more useful for manufacturers of these materials to remove or modify them in the future.

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**Conflicts of Interest** The authors declare no conflicts of interest.

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