

CASE REPORT

Management of Discolored Tooth with separated Instrument

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ABSTRACT

Tooth discoloration commonly occurs after trauma to tooth, which leads to pulpal injury. Trauma to the pulpal blood vessel leads to hemorrhage and releases iron from hemoglobin. The iron which is released from hemoglobin combines with hydrogen sulfide to form iron sulfide, which gives the tooth its characteristic dark appearance. Tooth discoloration can be treated by nonvital tooth bleaching, if the tooth structure is intact. A combination of hydrogen peroxide and sodium perborate reduces the discoloration of the tooth by a process of oxidation. During root canal preparation procedures, the common mishap that occurs is instrument separation inside the root canal. The fractured fragment in the root canal can hinder proper preparation of root canal space. Continuous pain or discomfort may result if it is not removed or bypassed. It is more conservative to bypass the fractured instrument, particularly in cases where access to the fragment is restricted (apical one-third of canal or beyond the canal curvature) and its removal may lead to excessive removal of dentin with associated sequelae.

Keywords: Bypassing, Instrument separation, Nonvital tooth bleaching, Sodium perborate.

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INTRODUCTION

Tooth discoloration commonly occurs after trauma to tooth, which leads to pulpal injury. Trauma to the pulpal blood vessel leads to hemorrhage and releases iron from hemoglobin. The iron which is released from hemoglobin combines with hydrogen sulfide to form iron sulfide, which gives the tooth its characteristic dark appearance. Tooth discoloration can be treated by nonvital tooth

bleaching, if the tooth structure is intact. A combination of hydrogen peroxide (H₂O₂) and sodium perborate reduces the discoloration of the tooth by a process of oxidation. Bleaching of nonvital teeth was first reported in 1850¹ and has been used ever since. In 1960, Nutting and Poe² sealed 35% H₂O₂ solution into the coronal pulp chamber and removed it 3 weeks later when the required result had been achieved; they called this the “walking bleach” technique. In 1961, Spasser,³ concerned about the potential caustic effects of H₂O₂, suggested a similar technique using sodium perborate mixed with water. In 1963, Nutting and Poe⁴ combined the two in an attempt to achieve a cumulative effect.

During root canal preparation procedures, the common mishap that occurs is instrument separation inside the root canal. The fractured fragment in the root canal can hinder proper preparation of root canal space. Continuous pain or discomfort may result if it is not removed or bypassed. There are various treatment options for managing separated instrument, depending upon the location of the instrument. Accordingly, the instrument is either removed or bypassed during obturation. When there is separated instrument at the apical third it becomes virtually impossible to remove the fragment. In such cases the instrument is either surgically removed or incorporated during compaction. It is more conservative to bypass the fractured instrument, particularly in cases where access to the fragment is restricted (apical one-third of canal or beyond the canal curvature) and its removal may lead to excessive removal of dentin with associated sequelae.⁵⁻⁷

CASE REPORT

A 29-year-old female reported to the Department of Conservative Dentistry and Endodontics with pain on her upper left front teeth with discoloration. She gave a history of root canal treatment 8 years back. One year after root canal treatment, she noticed discoloration of the tooth, which became more prominent of late. Patient felt pain and sensitivity 2 months back. She had no relevant medical history. Intraoral examination showed that patient had good oral hygiene, and hard tissue examination did not reveal any significant finding on other teeth. Tooth 21 showed yellowish discoloration of the crown without

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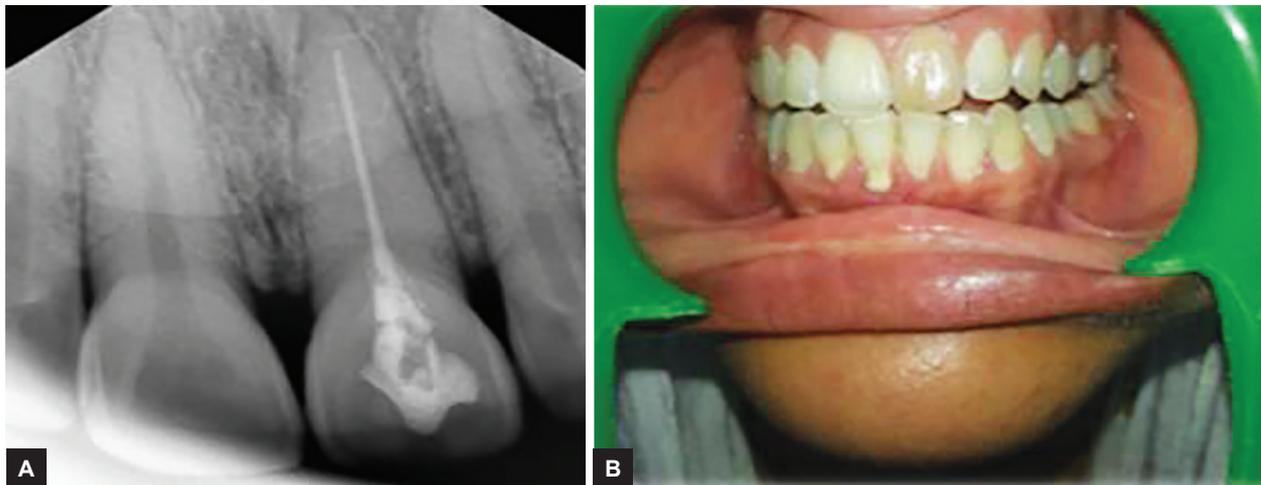
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any crack, wear facet, or fracture line (Fig. 1). The tooth had no mobility, but was tender on percussion. Intraoral periapical (IOPA) radiograph showed completed endodontic treatment in relation to 21 with periodontal ligament widening and the condition was diagnosed as acute exacerbation of chronic apical periodontitis (Fig. 1). It was decided to initiate retreatment of upper left central incisor and manage the discoloration by bleaching.

Root canal of 21 was reaccessed and gutta percha removal was done with the aid of RC Solve. A metallic obstruction was felt at the apical third. At the apical third of the root, IOPA revealed a separated instrument of about 3.5 mm length (Fig. 2). An attempt was made to remove the separated instrument with the help of H-files; however, the instrument could not be removed. Hence the instrument was bypassed by using a smaller size K-file (Fig. 3). Once the canal was negotiated up to the apex and working length was determined, the apical patency was established by using successively larger K-files up to

the working length. Obturation was done with selected master cone (Fig. 4).

After completion of the endodontic treatment, discoloration of tooth was managed by bleaching procedure. Tooth color was evaluated using shade guide. Tooth was isolated with rubber dam and about 1 mm of gutta percha was removed below the cemento-enamel junction and glass ionomer cement of 2 mm thickness was placed over the gutta percha. A mixture of sodium perborate and H_2O_2 was placed over the access cavity, which was then sealed with an intermediate restoration. The procedure of placing the bleaching mixture was repeated for three consecutive weeks until the desired shade of the tooth was achieved (Fig. 5). Finally, the cavity was restored with composite. After 8 months there were no significant periapical changes associated with the concerned tooth and clinically there was a slight darkening of the color of the tooth (Fig. 6). The patient was satisfied with the final outcome.



Figs 1A and B: Preoperative view



Fig. 2: Separated instrument



Fig. 3: Bypassing separated instrument

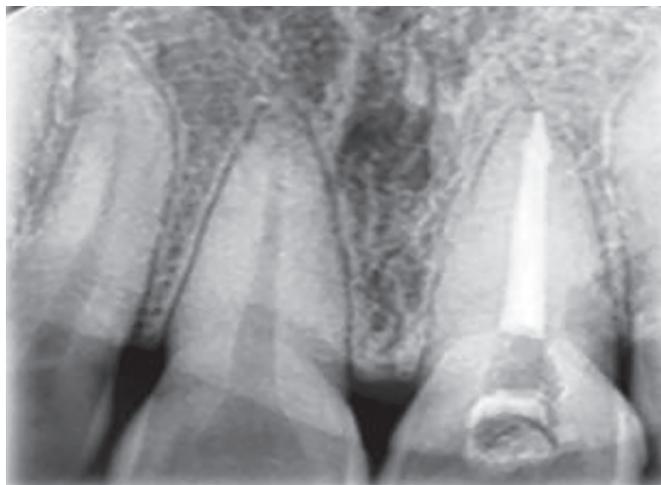
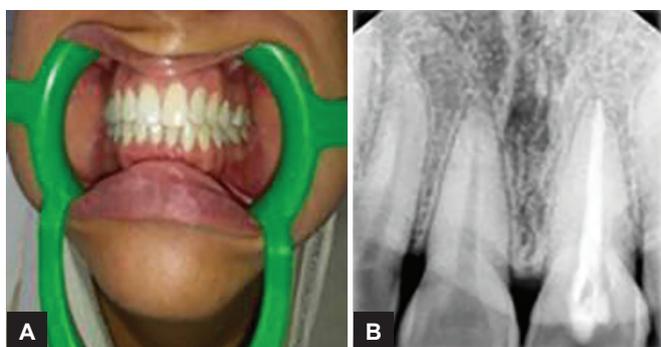


Fig. 4: Obturation



Fig. 5: Postoperative after bleaching



Figs 6A and B: Eight-month follow-up

DISCUSSION

Management of a separated instrument within the canal in a clinical situation is quite challenging. The separated instrument, particularly a broken file, leads to metallic obstruction and prevents thorough cleaning and shaping procedures which compromise the outcome of root canal treatment. Where conditions are favorable, removal of the retained fragment can be a conservative procedure,⁸ but in cases where access to the fragment is difficult and/or visibility limited, removal may lead to iatrogenic errors, such as ledge formation, perforation, or excessive enlargement of the canal, resulting in a weakened root structure which predisposes to vertical fracture.^{5,9-14} Additional complications of removal involve fracture of a second instrument or extrusion of the fractured segment.¹⁰ If nonsurgical removal is not possible, surgical removal of the portion of the root containing the fractured fragment has also been advocated; however, this procedure relies on considerable surgical skill and may reduce the crown-root ratio.¹⁵ Because of these associated complications, bypassing may be the appropriate treatment option if the fractured fragment is located deep in the root canal or beyond the root canal curvature. In the present case since the separated file was located in the apical third

of the tooth, its removal was practically difficult. Hence bypassing the separated instrument was considered as a more conservative mode of management and it also conserves the root dentin.

The involved tooth also showed a yellowish discoloration. If the pulpal tissue is not completely removed during endodontic treatment, the remaining tissue can lead to discoloration. Combining irrigants which contain sodium hypochlorite (even at low concentrations) and chlorhexidine leads to brownish-red precipitates. Moreover, a thinning of the dental enamel during aging also darkens the tooth. Walking bleaching technique was first described by Spasser. The technique was modified by mixing sodium perborate with H_2O_2 and inserting this into the access cavity. Stewart¹⁶ reported the thermocatalytic bleaching method in which 30% H_2O_2 was heated with a hot instrument in the pulp chamber. However, it was found that 7% of teeth subjected to this thermocatalytic bleaching method displayed evidence of external cervical root resorption after periods of 1 to 8 years.¹⁷ In 1961, Spasser³ reported a new bleaching method in which sodium perborate ($NaBO_3 \cdot nH_2O$) was mixed with water to form a thick bleaching paste and sealed in the pulp chamber of discolored teeth for several days. Subsequently, Nutting and Poe⁴ modified the method by substituting 30% H_2O_2 for water. This was referred to as the "Walking Bleach" method and it was believed that the combination of these two oxidizing agents would be synergistic and more effective. To date, this Walking Bleach method has become the most widely used nonvital bleaching technique because of its simplicity, inexpensiveness, and reliable bleaching efficacy. Given the appropriate indication, the bleaching of nonvital teeth is a relatively low-risk intervention to improve the esthetics of endodontically treated teeth. Nonvital tooth bleaching was opted due to following

reasons. It is a conservative and effective treatment option compared with placing restorations as it preserves the tooth structure.

CONCLUSION

Instrument separation within the root canal during endodontic treatment may occur due to various factors. Thorough knowledge regarding root canal anatomy and various instruments used, following proven concepts and applying safe and modern techniques of root canal instrumentation may prevent such an incident. When an instrument separates in a root canal system, it may prevent cleaning and shaping procedures and also affects the treatment outcome. Bypassing the separated instrument is then the most conservative method of management in such a situation if the instrument cannot be retrieved. Most of the endodontically treated teeth present with a discoloration. In the present case, since there is no loss of tooth structure, bleaching may be considered the most economic option.

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