A Conservative Management of Iatrogenically damaged Distal Root of the Mandibular Second Molar

Abstract
Trauma to the adjacent hard and soft tissue is the most common iatrogenic injury during extraction of the mandibular third molar. As every functional component of the dental arch is of prime importance in contemporary dental practice, the major concern must be in conserving the tooth and its structure as much as possible. The present case discusses the application of this conservative approach for management of iatrogenically damaged distal root of the mandibular second molar during extraction of impacted third molar, in which excessive guttering of alveolar bone and fractured apical third of distal root of 37 was observed radiographically. A conservative and noninvasive approach was successfully achieved to restore the damaged root by the bioactive material. Sealing of the remaining root with mineral trioxide aggregate allowed regeneration of soft and hard tissue around it.

Keywords: Bioactivity, bone regeneration, conservative approach, iatrogenic injury, mineral trioxide aggregate, third molar extraction

Introduction
The term “iatrogenic” is derived from the Greek word “iatros” and “Gennan.” “Iatros” meaning healers or doctors and “Gennan” meaning “as a result.” Iatrogenic injuries may be defined as harm, hurt, damage, or impairment that results from the activities of a doctor.[1] Such injuries occur either by a fortuitous or erroneous treatment or may be the result of either act of commission or act of omission by the therapist.[2]

Extraction of impacted third molars is one of the most common oral surgical procedures which may be associated with several complications if not planned properly. Some of the reported frequently occurred complications following mandibular third molar surgery include sensory nerve damage, dry socket, infection, hemorrhage, pain, and trauma to adjacent tooth structure.[3‑6] Improper case evaluation and treatment planning, poor clinical and/or radiologic judgment, and using excessive and uncontrolled forces may damage the adjacent tooth during extraction of impacted third molars.[7] The trauma can be mild, causing mobility of tooth, moderate causing crown fracture of the adjacent tooth, and even severe causing root fracture of the adjacent tooth. If such trauma occurs, then treatment modality for it always remains guarded, depending on the extent and type of trauma. In the present case, management of damaged distal root of mandibular left second molar has been discussed. Various treatment options included extraction of 37, hemisection of 37 endodontic treatment followed by surgical exposure and repair of the fractured root of 37, endodontic treatment followed by intentional reimplantation of 37 after repairing the fracture site. In the present case, conservative management by the bioactive material of such damaged distal root of mandibular left second molar during extraction of mandibular third molar is reported.

Case Report
A 45-year-old male patient reported to the Department of Conservative and Endodontics with a chief complaint of pain and swelling in lower left back tooth region for the past 4 days. Medical history was not relevant. Dental history revealed a history of extraction in relation to lower left third molar 2 months ago. On intraoral examination, there was the presence of single localized swelling in relation to 36, 37 and presence of sinus tract with respect to 36. Sinus tract traced by gutta-percha

How to cite this article: Bansal R, Roy S, Chandra P, Gurtu A, Pandey R. A conservative management of iatrogenically damaged distal root of the mandibular second molar. Indian J Dent Res 2017;28:348-51.
cone revealed the involvement of furcation area with respect to 36. A periodontal pocket of 6 mm was observed at furcation area on the buccal surface of 36 and distal surface of 37. Cold test, heat test, and electric pulp test were negative in relation to 36, 37. Intraoral periapical radiograph depicted 2–3 mm of root remnant of 38, fracture of distal root of 37 at apical third; the fracture was oblique in nature with irregular margins. Radiolucency extending from the remaining distal root of 37 up to the furcation area of 37 was observed. This was suggestive of guttering of alveolar bone during extraction of 38 [Figures 1 and 2]. Mobility of 36, 37 was within normal limits. Prognosis of the tooth was explained to the patient, and a comprehensive treatment plan involving endodontic phase and prosthodontic phase with respect to 36, 37 was planned.

During endodontic phase, access to the pulp chamber of 36, 37 was gained after installation of a rubber dam. All the canals were prepared with V-Taper (SS White) and obturated with #30, 0.04 gutta-percha with respect to 36. An access cavity was prepared and mesiobuccal, mesiolingual, and distal canals were negotiated with respect to 37. The working length was established with No. 15 K-file and confirmed by the aid of an apex locator (Apex ID, Sybron Endo). The mesiobuccal and mesiolingual canal was prepared with V-Taper up to #30, 0.04 (SS White) and obturated with #30, 0.04 gutta-percha, using Fillapex (Angelus) as sealer. The distal canal was prepared by crown-down technique. Coronal flaring was done with #3, 2, 1. Gates Glidden drill was followed by apical preparation with hand files up to #30 K-files to the determined working length (16 mm). A spreader size was selected; the canal was dried and obturated with mineral trioxide aggregate (MTA, ProRoot) by “Lawarty technique.”[8] Postendodontic restoration of 36, 37 was completed with composite restoration. The patient was recalled for follow-up [Figures 3-7].

On first recall after 15 days, the patient was asymptomatic. There was no sign and symptoms of pain or swelling. Sinus tract was healed. Hence, prosthodontic phase was planned further.

All metal crown preparation was done with respect to 36, 37 [Figure 7]. A metal crown with smaller occlusal table buccolingually with respect to 37 fabricated. The patient was recalled for follow-up to evaluate the prognosis of teeth. After 3 months, there was significant decrease in radiolucency at the furcation area of 36. Periodontal pocket decreased to 4 mm with respect to 37. There was increase in radiopacity around remaining distal root of 37 suggestive of bone formation [Figure 3]. After 6 months, periodontal pocket further decreased to 3 mm [Figure 4]. Eight months and 1-year follow-up revealed increased radiopacity up to cementoenamel junction of 37 suggestive of bone formation of 37 [Figures 5 and 6]. Throughout the follow-up period, the patient was asymptomatic. There were no signs and symptoms of pain, swelling, and mobility and function of teeth [Table 1].

Discussion

One of the most common oral surgical procedures in dentistry is extraction of impacted third molar that may sometime lead to complications if not planned properly. “Prevention is better than cure,” so preventive measures must be taken to avoid such iatrogenic complications. However, if such damage has occurred, adequate treatment must be planned and executed.
In the present case, many treatment options were possible for managing traumatized 37 like endodontic treatment followed by surgical exposure and repair of the fractured root. Since this treatment would be invasive and would involve excessive guttering of bone, this option was not opted. Second treatment option could be endodontic treatment followed by intentional reimplantation of 37 after repairing the fracture site, but this treatment option would also be invasive and patient was not willing for extraction because of previous traumatic experience. Further, as the tooth was already fractured, complete extraction for intentional reimplantation of such tooth could be questionable. Conservative alternative would be hemisection of 37, including removal of distal root of 37 with the fractured fragment, but this treatment option would also be invasive and would compromise the normal tooth structure. Further hemisection procedure would have resulted in loss of distal part of the crown in relation to the fractured distal root.

Hence, a more conservative approach for management of distal root of 37 was planned, in which whole of the crown and remaining distal root was preserved. As the fracture of root was oblique so to achieve three-dimensional seal at the remaining apex of the root, MTA (ProRoot, Dentsply) was preferred as obturating material over gutta-percha. This material has unique property of bioactivity, biocompatibility, and biomineralization. Hence, MTA allowed the regeneration of the soft and hard tissue around the remaining distal root. It promotes the repair of the periodontium and the supporting tissues of the tooth.\[9\] As the lesion with relation to 36 was primary endodontic and secondary periodontal in origin, only endodontic treatment was planned and all the canals were obturated with gutta-percha.

In agreement to the “submerged root concept” by Bjorn, the decision for the remaining root fragment with respect to 38 was made to leave it as such and allow to resorb in due course of time.\[10\] After 1 year follow-up, radiographic evaluation revealed healing in furcation area
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with respect to 36, decrease in size of periodontal pocket with respect to 37, increased alveolar bone formation around distal root with increase in crest height with respect to 37.

**Conclusion**

By adopting preventive measures, it is possible to reduce the risk of iatrogenic damage. However, if any mishap happens, the operator must be prepared for its management. Management of such mishap may require invasive treatment options; however, with advancement in material sciences, this conservative approach can successfully help to salvage the tooth.

**Acknowledgement**

We want to acknowledge the trustees of Institute of Dental Sciences, Bareilly, for providing us facility to perform this case.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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**Table 1: Decrease in signs and symptoms over a period of 1 year**

| Symptoms | 36 | 3 months | 8 months | 1 year | 37 | 3 months | 8 months | 1 year |
|----------|----|----------|----------|--------|----|----------|----------|--------|
| Swelling | ✓  | X        | X        | X      | ✓  | X        | X        | X      |
| Sinus tract | ✓  | X        | X        | X      | X  | X        | X        | X      |
| Periodontal pocket (mm) | 6 | 4        | 2        | 2      | 6  | 4        | 3        | 2      |
| Level of alveolar bone | X | X        | X        |        | Around apical 3rd of distal root | ↑ Around middle 3rd of distal root | ↑ Around middle 3rd of distal root | ↑ Around CEJ of distal root |

Radiolucency in furcation area

CEJ=Cementoenamel junction, X=Absent, ✓=Present, ↑=Increase