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Case Report

Interdisciplinary management of horizontal root fracture in middle third with osseous bone defect – A clinical report

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ABSTRACT

Dental trauma are the main cause of emergencies in dental practice. Amongst these, root fractures are relatively uncommon but comprises about 0.5 to 7% of all injuries affecting permanent dentition. Most commonly, root fracture occurs from a horizontal impact mostly in oblique direction. The incidence is more common at the mid-third of the root rather at the apical and cervical thirds. Such hideous injury must be restored to normal as early as possible to retain the dental health and appearance. This report records the case of horizontal root fracture of upper anterior tooth, treated with Mineral Trioxide Aggregate (MTA) and fractured root fragments were unified with the aid of a stainless steel reamer after an endodontic treatment. Alloplastic bone graft and GTR membrane were used for osseous bone defect. Mineral trioxide aggregate (MTA) has several impending & forthcomin clinical applications owing to its grander sealing property and biocompatibility. A 12 months follow-up revealed a well stabilized assembly of the root fragments and periodontal healing.

1. Introduction

A fracture of tooth resulting from injury to the oral cavity can be a tragic experience for the patient and may require a prompt treatment as well as skill and experience of the dentist. Root fractures are relatively uncommon but comprises about 0.5 to 7% of all injuries affecting permanent dentition.[1] They are most commonly seen in maxillary anterior teeth and are more frequent at the middle third of the root.[2] Root fractures can be at coronal, coronal-radicular or radicular position, also the continuity of the fracture may be a crack, incomplete fracture or complete.[3] They may be at different aspects, such as cervical, middle, apical third with an orientation of the fracture line being horizontal, vertical or oblique. The alterations in the morphology of the alveolar bone are defined as Intraosseous defects.[4] A diagnosis is established based on clinical and radiographic assessment. Mineral Trioxide Aggregate (MTA) has several impending clinical applications owing to its outstanding sealing assets and biocompatibility.[5] This report describes a case of complicated horizontal root fracture at the middle third of maxillary right central incisor. A multidisciplinary management of root fracture was done using MTA, bone graft & membrane after receiving endodontic treatment.

2. Case Report

A male patient 23years of age came with a history of pain and mobility in maxillary central incisors. Patient had a history trauma 2months back of maxillary anterior region. On clinical examination there was a draining sinus (Figure 1

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a), grade II mobility and periodontal pocket of 6mm mesial to tooth 11 (FDI System). On radiographic examination the tooth was fractured at mid-root level. There was marked separation of both the segments (Figure 1 b).

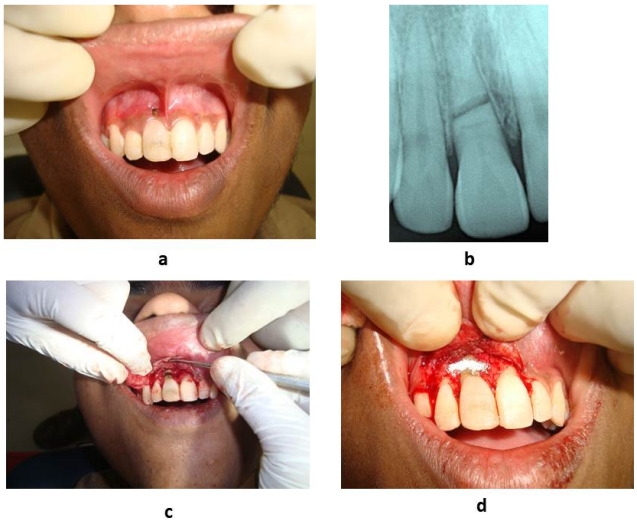

Figure 1: (**a**) Pre-operative view, (**b**) Pre-operative radiograph, (**c**) Fracture segments after flap reflection, (**d**) Bone Graft placed.

Treatment was initiated by preparation of access opening. However, working length for apical segment could not be traced in 11, so a mucoperiosteum flap was raised and severe osseous destruction was observed on buccal aspect (Figure 1 c). Both the fractured segments were approximated and complete biomechanical preparation was done upto the size of number 80 file. Root canal was debrided and irrigated with 5.25% NaOCl. Apical segment was filled with MTA (Pro-Root MTA; Dentsply Tulsa, OK) and number 90 stainless steel reamer (one size larger than last file used for final canal preparation) was screwed upto the full length of the root simultaneously filling the complete canal with MTA. Access cavity was sealed with Glass Ionomer Cement. An alloplastic bone graft material (Periobone-G^{TM}, INDIA) and a resorbable GTR membrane (Perio col-GTR) was placed on buccal aspect over the fractured segment covering the root surface (Figure 1 a, d & b). Flap was sutured with 3-0 silk sutures (Figure 1 c). Occlusion was relieved and an immediate post-operative IOPA radiograph showed well approximated fractured segments. Post-operative antibiotics and analgesics were prescribed for 1 week. Patient was recalled after 7 days for suture removal. Patient was monitored postoperatively and was recalled at 1 month, 6 month and 12 month follow-up. At 6 month recall, the tooth was asymptomatic with uneventful healing. Clinical examination revealed complete healing of periodontal tissues and considerable reduction of periodontal pocket and mobility. Recall radiographs at 12months revealed distinct evidence of healing of fractured segments and tooth had become firm (Figure 1 d).

3. Discussion

A multidisciplinary approach is required for efficacious execution of root or crown-root fractures, that often involves a combination of endodontic, periodontal, orthodontic and prosthetic therapy. An emergency management may require repositioning or splinting in many cases. Also in case of horizontal fracture, it is advisable to take several radiographs at varied angles. The prognosis of a tooth with root fracture depends upon several factors like severity of initial mutilation to the periodontal tissues, the position of the fracture, the time lapse between injury and repair and also the biocompatibility of the material used to repair the fracture.[6] In the present case there was bone loss secondary to pulpal pathosis, which is believed to result from the spread of inflammatory irritants from pulp to periodontal ligament. As the tooth 11 was nonvital at vitality testing a root canal treatment is indicated. Here, we have used MTA to seal the fracture line similar to apexification procedure. A stainless steel reamer was used as intraradicular splint to stabilize both the fractured fragments. MTA has an excellent biological and physical property and was initially familiarized to seal pathways of communication from the external surface of the tooth in perforation repair and as a root-end filling material. Along with this, it has the ability to encourage regeneration of cementum, thus expediting the regeneration of the periodontal apparatus.[7] It also has antimicrobial properties and high pH (12.5) of MTA, which promote growth of the cementum and formation of bone, which in turn allow regeneration of the periodontal ligament around the site of injury. MTA might stimulate PDL fibroblasts to display the osteogenic phenotype and promote the production of osteonectin, osteopontin, and osteonidogen and increase alkaline phosphatase levels.[8] In conjunction with being sterile, radiopaque and non-shrinking, the material is not sensitive to moisture and blood contamination.

Another important factor was the degree of bone destruction and the defect surrounding the tooth. Wang and Boyapati suggested 4 factors, the so-called PASS principle, that are critical for predictable bone regeneration:[9] primary wound closure, angiogenesis as a blood supply and source of undifferentiated mesenchymal cells, space maintenance, and stability of the wound. GTR membrane was used over the bone graft for better results.[10] Poor operative technique in membrane placement or surgical soft tissue management and failure to adequately cover the membrane can cause gingival recession and consequently membrane exposure. With adopting apposite treatment stratagem of using biocompatible material like MTA for management of horizontal root fracture resulted in optimum healing and prolonged retention of the teeth, which would otherwise require extraction.

4. Conclusion

Management of traumatic injuries of teeth can be both demanding and challenging that requires interdisciplinary intervention as they are accompanied by emotional factors on the patient part. However, in the above cases, use of MTA, bone graft combined with GTR membrane, resulted in successful healing. The clinical and radiographic findings were quite impressive, resulting in a significant reduction in mobility and fracture healing.

5. Source of Funding

None.

6. Conflict of Interest

None.

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