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Case Report

Multidisciplinary management of complex traumatic fractures in anterior teeth

Feng Gao*, Yan Zeng*, Jun Wen, Jun Shen

*Department of VIP Service Center, Stomatological Hospital, School of Stomatology, Southern Medical University, Guangzhou 510280, Guangdong, China. *Equal contributors.*

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Abstract: According to the fracture site, tooth fractures are generally classified as crown fractures, crown-root fractures, and root fractures. The co-occurrence of these three fracture types in adjacent teeth is rare. This report details a multidisciplinary approach to managing adjacent maxillary incisors with crown, crown-root, and root fractures. Treatment comprised endodontic therapy, modified crown-lengthening surgery combined with fragment reattachment, and fiber post-and-core restoration combined with surgical coronal repositioning. The 5-year follow-up documented periodontal inflammation, marginal bone loss, gingival recession, and black triangles, as well as the corresponding management. The value of this report lies in the integrated treatment sequence and the long-term observation of periodontal and esthetic complications.

Keywords: Dental trauma, crown-root fracture, esthetic complications, multidisciplinary approach, follow-up

Introduction

Fractures of anterior teeth pose significant challenges to esthetics, phonetics, and function. Treatment planning primarily depends on the fracture pattern and extent. Treatment options include direct restoration, fragment reattachment, surgical exposure, and repositioning [1-3]. Subgingival or subcrestal margins complicate treatment, as gaining restorative access may jeopardize periodontal tissues. Cervical root fractures are especially challenging when the mobile coronal fragment cannot be stabilized [3].

Published reports usually concern one injured tooth. We found only a few cases in which adjacent teeth had different fracture patterns [4, 5]. When several teeth are injured together, fewer teeth are available for splinting, and surgery may incur greater periodontal and esthetic costs. This report follows three adjacent maxillary incisors with crown, crown-root, and cervical root fractures for 5 years. It describes the order of treatment and the periodontal and esthetic problems encountered during follow-up.

Case report

A 25-year-old man presented with dental trauma sustained 10 hours earlier. He reported no headache, dizziness, nausea, or vomiting and had no systemic disease or drug allergies. His face was symmetrical, mouth opening was normal, and no temporomandibular joint abnormality was detected. An upper-lip abrasion was present (**Figure 1A**). Tooth 21 had a mesio-incisal fracture with pulp exposure and tenderness to palpation and percussion. Tooth 11 (maxillary right central incisor) had a crown-root fracture with a stable buccal segment and a palatal fracture line extending subgingivally; the pulp was exposed, and the tooth was tender to percussion. Tooth 12 (maxillary right lateral incisor) had grade 3 mobility of the coronal segment and percussion sensitivity. The mobile fragments of teeth 11 and 12 were removed. Initial radiographs showed no marked apical displacement. In tooth 11, the palatal fracture line was approximately 1 mm below the alveolar crest (**Figure 1C**). Tooth 12 had a cervical-third horizontal root fracture; the buccal line was supracrestal, and the palatal line was approximately

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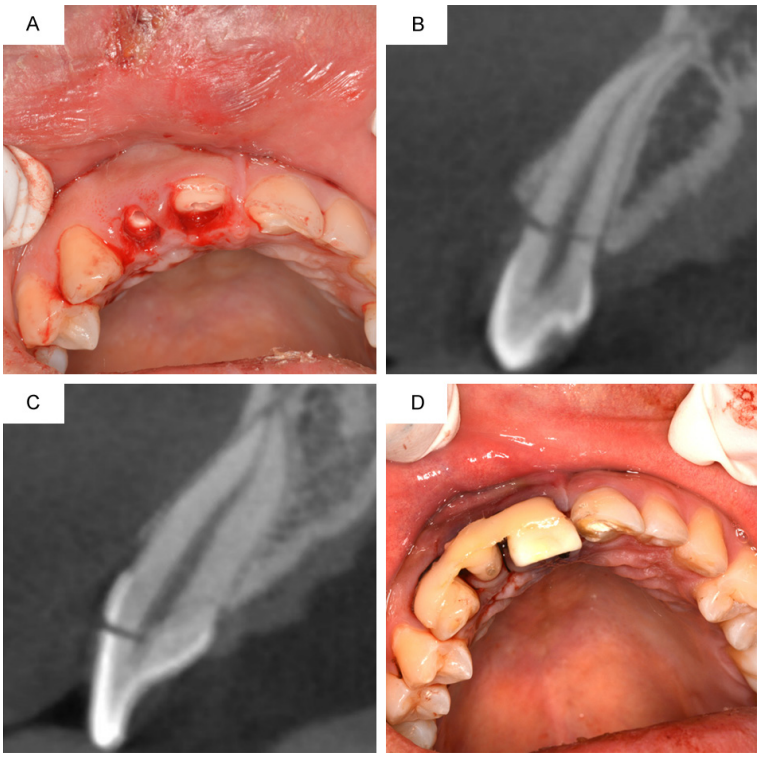

Figure 1. Initial presentation and treatment. (A) Clinical appearance after removal of the loose fragments. Initial radiographs of tooth 12 (B) and tooth 11 (C). (D) Immediate postoperative appearance after fragment reattachment of tooth 11 and surgical coronal repositioning of tooth 12 with provisional post-and-core restoration.

1 mm below the crest (**Figure 1B**). The diagnoses were complicated crown fracture of tooth 21, complicated crown-root fracture of tooth 11, and cervical-third horizontal root fracture of tooth 12.

The patient wished to retain all three teeth in the arch. The agreed plan was root canal treatment and composite restoration for tooth 21, root canal treatment and subgingival fragment reattachment for tooth 11, and root canal treatment followed by surgical coronal repositioning and a crown for tooth 12. The benefits and risks were explained, and written informed consent was obtained for the treatment and publication of clinical information and images.

After root canal treatment of teeth 12, 11, and 21, a post space was prepared in tooth 11. A periodontal flap and modified crown-lengthening procedure were performed under local anesthesia. Approximately 1 mm of palatal alveolar bone was removed to expose the fracture margin. The fragment was cleaned, residual pulp tissue was removed, and the chamber was enlarged for one LuxaPost fiber post (DMG, Hamburg, Germany). The post was cemented with RelyX Unicem (3M ESPE, USA). Because conventional rubber dam isolation was not feasible, an epinephrine-soaked cotton pellet was placed on the bone surface, and barrier resin was rapidly applied around the bonding interface to limit contamination. The thin palatal margin was trimmed, selectively etched, and reattached with Filtek Z350 flowable composite (3M ESPE, USA), after which the fracture and root surfaces were polished.

For tooth 12, a LuxaPost was cemented with RelyX Unicem, and a composite core was built up with Filtek Z350-XT. After flap elevation, the periodontal ligament was severed using a micro-surgical blade. The remaining tooth was repositioned coronally with dental forceps until the root margin was 3-4 mm above the alveolar crest. It was stabilized with a Quartz Splint fiber strip (RTD, France) and resin. The flap was sutured, and the occlusion was checked and adjusted after fixation (**Figure 1D**). The splint was removed after 4 weeks. Tooth 12 then had physiological mobility and received a definitive crown; occlusion was checked again after crown delivery. Tooth 21 was restored with resin using a lingual index (**Figure 2A**).

At 1 month, tooth 12 retained physiological mobility, a black triangle was visible between teeth 11 and 12, and no deep periodontal pockets were detected (**Figure 2B**). Tooth 11 showed a continuous periodontal ligament space without evident periapical radiolucency (**Figure 2D**), whereas tooth 12 showed a continuous periodontal ligament space and increased apical radiodensity (**Figure 2C**).

The patient missed scheduled visits and returned after 2 years. He reported no pain,

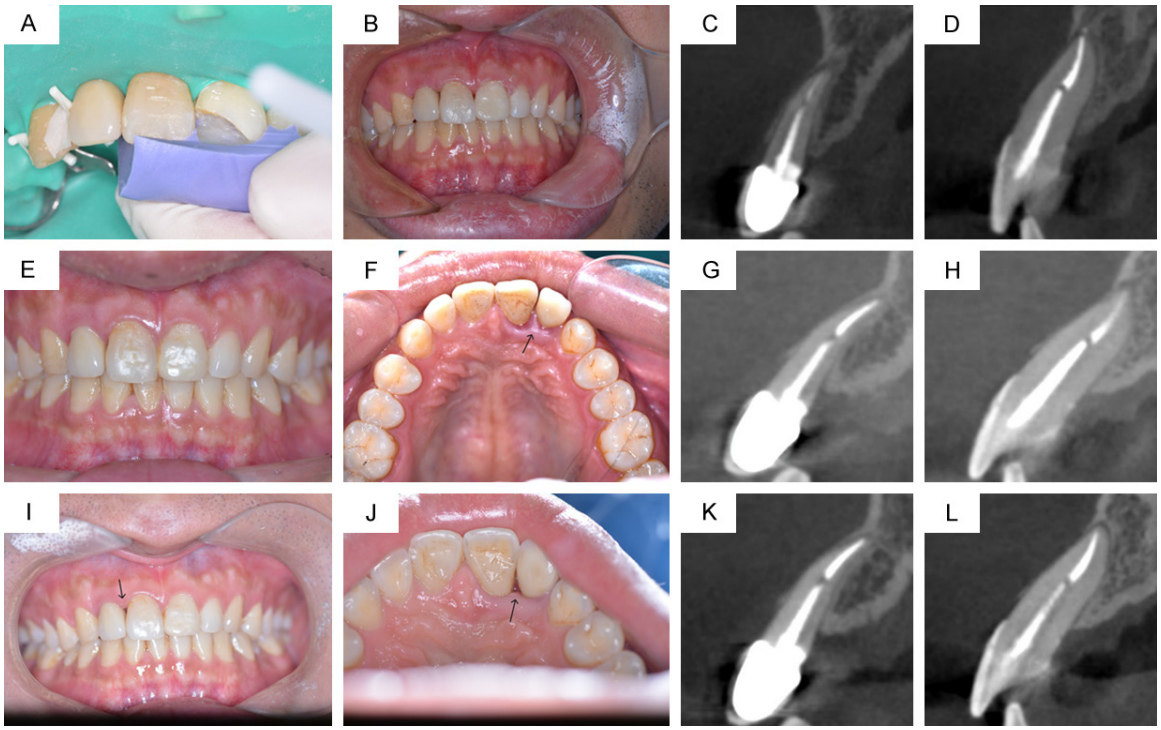

Figure 2. Follow-up findings. At 1 month: restorative procedure (A), clinical appearance (B), and radiographs of teeth 12 (C) and 11 (D). At 2 years: labial (E) and palatal (F) views showing palatal gingival inflammation, and radiographs of teeth 12 (G) and 11 (H) showing marginal bone loss. At 5 years: labial (I) and palatal (J) views showing resolution of inflammation with gingival recession and interdental black triangles, and radiographs of teeth 12 (K) and 11 (L) showing stable bone levels compared with the 2-year examination.

swelling, increased mobility, or treatment elsewhere during the interval. Oral hygiene was poor, with palatal gingival erythema, bleeding on probing, and probing depths of 5-6 mm around teeth 11 and 12 (**Figure 2E**, **2F**). Tooth 12 had physiological mobility. Both teeth retained a continuous periodontal ligament space, with horizontal marginal bone loss around tooth 11 (**Figure 2H**) and around tooth 12 (**Figure 2G**). Subgingival scaling and oral hygiene instruction were provided.

At every follow-up, the same examiner repeatedly performed periodontal probing with the same graduated probe and clinical protocol. At 5 years, palatal erythema and bleeding on probing had resolved, and probing depths had decreased to 2-3 mm; tooth 12 remained physiologically mobile. Gingival recession and interdental black triangles were evident, but the restorations remained functional (**Figure 2I**, **2J**). Compared with the 2-year images, tooth 11 showed no evident progression of marginal bone loss (**Figure 2L**), and the alveolar bone level around tooth 12 remained stable (**Figure 2K**).

Discussion

As a single case report, the findings here cannot be generalized to support routine treatment recommendations. While fragment reattachment preserves the original contour and offers rapid esthetic recovery, evidence supporting its use in subgingival crown-root fractures is limited [2, 7]. We selected this approach because the patient preferred a conservative, cost-effective treatment that could be completed without prolonged restorative procedures. We controlled the moisture with an epinephrine-soaked cotton pellet and barrier resin. Although the fragment remained attached, a single successful case does not validate this isolation technique.

The palatal fracture line of tooth 11 extended below the alveolar crest. Bonding at this level risks encroaching on the supracrestal attachment and leaving a poorly polishable interface. Limited bone removal exposed the margin, and trimming the thin edge of the fragment allowed the interface to be polished [6]. The fragment remained clinically stable and attached

throughout the 5-year follow-up. Tooth 11 also served as a splint abutment. Its intraradicular fiber post may have supported the reattached fragment during splinting, although this cannot be established from one case. At 2 years, plaque accumulation was evident. Finishing of the margin may also have damaged periodontal ligament fibers and favored healing with a long junctional epithelium. In contrast to the attachment of connective tissue to root cementum, junctional epithelial attachment is more susceptible to bacterial products [8]. The palatal inflammation resolved after subgingival scaling and improved oral hygiene, with more frequent reviews.

The cervical root fracture of tooth 12 presented a different choice. The patient declined orthodontic extrusion because it would prolong treatment, while crown lengthening could remove bone from the adjacent teeth. Surgical coronal repositioning was considered feasible because the root was long, had little taper, and retained adequate thickness [3, 9]. The later bone loss cannot be assigned to one cause. The cervical socket was widened during repositioning, the repositioned root did not match the original socket dimensions, and the interdental crest had already been exposed to trauma. Any of these factors may have contributed to the observed bone loss. Four weeks of splinting may also have affected periodontal healing. Occlusion was adjusted after fixation and after crown placement, so obvious occlusal trauma was unlikely, though it cannot be excluded. Root form alone is therefore insufficient when this procedure is considered; the adjacent injured teeth also need to be assessed.

Available treatments for black triangles include direct composite resin, veneers, orthodontic movement, and selected periodontal procedures [10]. We discussed the use of resin and veneers with the patient. The patient did not perceive the esthetic deficit as significant enough to warrant further intervention. In this case, the periodontal findings prioritized continued hygiene reinforcement and follow-up over additional esthetic procedures.

Conclusion

All three injured teeth remained functional after 5 years, however, the outcome was not without complications. The patient developed palatal inflammation, marginal bone loss, gingival recession, and interdental black triangles. Preserving teeth with subgingival fractures in adjacent sites may entail a trade-off with periodontal health and esthetics. The patient should be fully informed of this trade-off prior to treatment. Oral hygiene and follow-up also need continued attention after the initial restoration has succeeded. This experience concerns one patient and cannot establish the effectiveness of the procedures or support a general treatment recommendation.

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Written informed consent was obtained from the patient for treatment and publication of this case report and its accompanying clinical images.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Jun Shen, Department of VIP Service Center, Stomatological Hospital, School of Stomatology, Southern Medical University, 366 Southern Jiangnan Road, Guangzhou 510280, Guangdong, China. Tel: +86-20-84427024; E-mail: marsmare@126.com

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