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Correction of malocclusion by anterolateral osteotomy in a traumatized maxilla

CASE REPORT

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Abstract – Injuries to the face may cause long-term defects both aesthetic and functional consequences when the treatment is delayed, inadequate or absent. The varieties of osteotomy techniques are applied to improve posttraumatic malposition of the maxillofacial bones and occlusal function. In this article, a 21-year-old female involved in a traffic accident presented a severe deformity in maxilla and treated by anterolateral osteotomy is presented.

Maxillofacial injuries are quite significant. The injuries may not be severe and pose a risk of life in certain cases, but the long-term effect could be serious. Distortion of the face or tooth area and functional disorders such as speech and mastication difficulties, are often the result of these injuries (1–3). Fractures and injuries of the facial skeleton are a common component of multiple traumas resulting from motor vehicle and industrial accidents, as well as from sports and intentional injuries (4–6). Maxillofacial fractures are often accompanied by tooth avulsion and alveolar bone fractures which occur in older children and adults, particularly significant in the 10–19 year age group (5, 7) and anterior areas of the dental arch (1). The incidence of true dentoalveolar fracture is between 10.5% and 15.1% in retrospective studies (5, 8) Fractures of the anterior maxillary segment are common, compared with the mandible (1, 2). Although the fracture involves multiple tooth segments and the arch form of the palate is architecturally strong, the alveolar process of the maxilla very often occur in the labial portion of the alveolus while the palatal process acts as a palatal fulcrum for an anterior to posterior traumatic impact. The tooth or teeth crowns are displaced posterioinferiorly when the fracture of the labial plate occurs, which depends on the severity of injuries and direction of force (9).

Early reduction and fixation of fractured fragments is mandatory to allow rapid healing and return of normal function (2, 9). Hence, the goal is early re-establishment of preinjury anatomy to minimize morbidity in terms of form and function. Prompt and appropriate management is necessary to significantly improve prognosis for many dentoalveolar injuries. Treatment of alveolar process fractures is essentially free of controversy. As plating systems are rarely practical for these injuries, the associated controversies are avoided. The fixation of alveolar bone fracture must be more rigid by allowing the bone tissue healing (9). Many techniques can be used for the stabilization and the fixation of dentoalveolar injuries. Techniques to maintain reduction of these fractures include arch bars, figure of eight and loop wiring, orthodontic bands and acrylic, metallic cap or fiber splints (2, 10–12). Malunion and malocclusion are the most common major complications. It results from inadequate reduction and/or loss of reduction during the healing process (2).

Segmented osteotomy procedures are indicated for the surgical correction of dentoskeletal deformities of the maxilla and mandible. These osteotomies allow treating complex dentofacial deformities in the vertical, transverse, and sagittal dimensions with differential repositioning of all segments, either major or minor, simultaneously (13, 14). To correct the facial asymmetry, an anterior maxillary osteotomy can be performed. The major advantage of this procedure is avoidance of damage to the nasal structures because of the low osteotomy level (15). In this study, the correction of the delayed alveolar fracture of anterior maxilla treated by anterolateral osteotomy is present.

Case report

A 21-year-old woman presented to Yeditepe University, Faculty of Dentistry, oral and maxillofacial clinic for the evaluation of a malocclusion caused by trauma in the left maxillary area. History revealed that the patient had been involved in a traffic accident 20 days before and no treatment in anywhere because the patient refused the treatment. There were no known drug allergies and systemic diseases and on extra-oral examination, there was a slight asymmetry in her face.

Intraorally, the crowns of the left upper central and lateral teeth were broken, the dentoalveolar segment involved the left upper lateral, canine and first premolar were inclined towards to the palate approximately 5 mm and on occlusion she had slight openbite on right anterior maxilla and in traumatized area all teeth was in crossbite and no occlusal contact. The 2-mm space between the gingival margins of the upper and lower first premolar was noted (Fig. 1a–c). There was no lacerations or perforation both vestibule and palatinal mucosa but mild gingival inflammation were seen on the left upper premolar area. The segment was stabile; teeth were in their alveolar sockets without mobility. On panoramic radiograph, the fracture line was observed on the roots of related teeth (Fig. 2). Computed tomography showed the irregular fracture line between the left upper central tooth to the first premolar tooth and adequate bone height from the roots of the teeth to the anterior spina nasalis and nasal floor (Fig. 3).

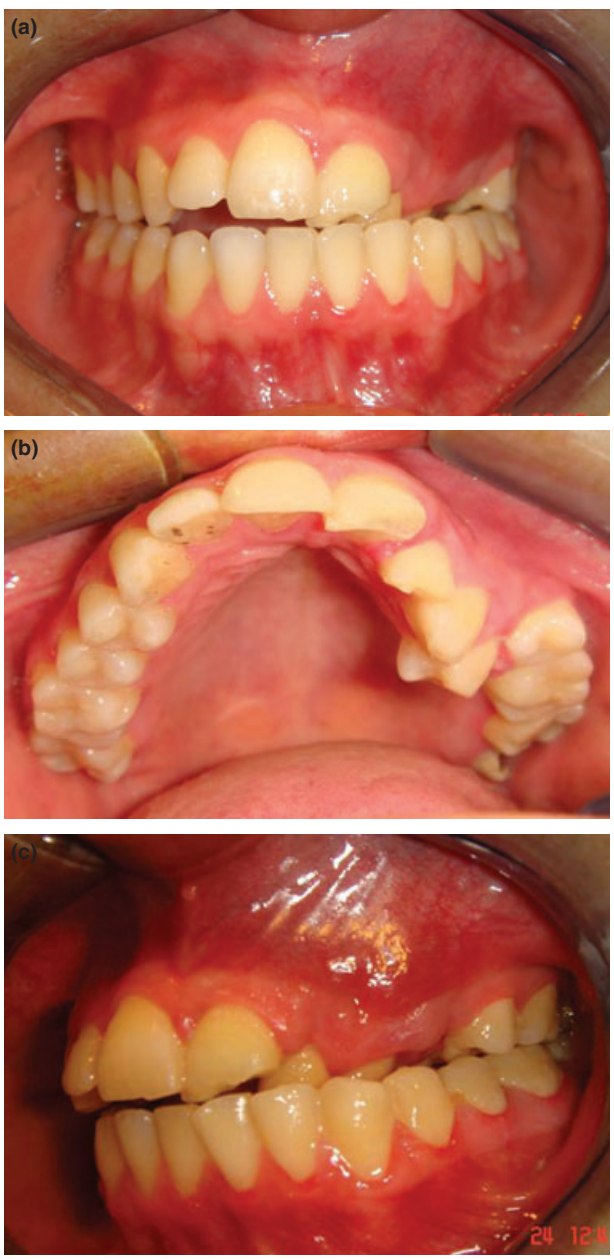

Fig. 1. (a–c) The dentoalveolar segment involved the left upper lateral, canine and first premolar were inclined towards to the palate and in traumatized area all teeth was in crossbite and no occlusal contact.

The alveolar fracture was classified as Class III and the reduction and immobilization of alveolar fracture was unsuccessful because of the time and resistance produced by the interaction of the small irregularities of the bony surfaces. In order to correct malocclusion, an anterolateral maxillar segmental osteotomy was planned to reduction and immobilization of the fractured segment. By computerized tomography evaluation, the osteotomy was planned to the 3-mm bone reduction of vertical anterior portion of the left maxilla for allowing the anterolateral rotation. Following model surgery, the preoperative surgical splint as key splint that would keep in place until the soft tissue have healed, was prepared.

A surgical procedure was made under deep conscious sedation. The incision was made from the right lateral to the left first molar teeth and was carried forward about 5 mm below attached gingival. Mucoperiosteal flap was reflected to expose the lateral cortex of maxilla with care being used around the nasal area. By means of osculating

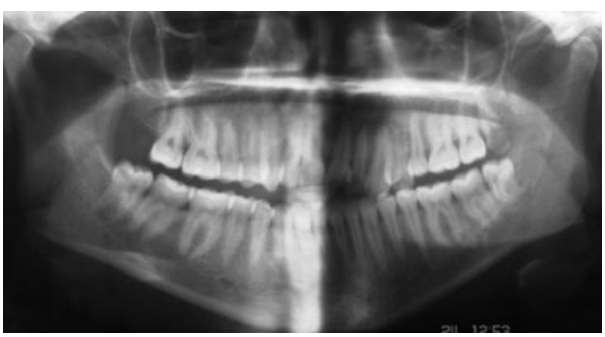

Fig. 2. The fracture line was observed on the roots of related teeth.

Fig. 3. The adequate bone height from the roots of the teeth to the anterior spina nasalis and nasal floor on computed tomography.

saw, the vertical osteotomies were made using parallel cuts between the central teeth and the left first and second premolar, and the first horizontal bone cut was made at 5 mm above the teeth apices. To remove 3-mm wedge shape bone in premolar area, the second horizontal bone cut was made under the first horizontal cut. Both vertical and horizontal cuts were extended to the palatal site by osteotom. The surgical splint was fixed to upper jaw and arch bar was applied to both jaw. After the mobilized dentoalveolar segment was fit into occlusal splint with elastics, the repositioned segment was fixed rigidly with L-type miniplate (Fig. 4). The surgical site was then irrigated thoroughly and closed with resorbable sutures.

After 6 weeks, the splint was removed and the dentoalveolar segment was in an anatomic position and the teeth were in normal occlusion displaying normal mobility in their sockets (Fig. 5a,b). Evaluation of the vitality of the related teeth was performed at frequent intervals. The endodontic treatments were performed the left lateral and canine teeth, which did not respond to vitality test after 2 months, and the broken crowns of the teeth were restorated (Fig. 6).

Discussion

Factors to be considered in the definitive treatment of dentoalveolar injury include as age and cooperation of the patient, duration between the trauma and treatment, location or extent of the injury, injury to primary or permanent dentition, stages of root development, presence of fracture of supporting bone and periodontal health of remaining teeth (16). Treatment of fractures of the alveolar process involves reduction and immobilization of the involved segment using closed or open techniques, followed by adequate stabilization to allow for osseous healing for at least 4 weeks. Early re-establishment of the pre-injury skeletal anatomy is essential to minimize or avoid the ill effects of delayed or no treatment such as malunion, deranged occlusion and an impending dentofacial deformity. Closed reduction of dentoalveolar fractures may be accomplished with digital pressure on the alveolus and dental segments. Arch bar, a Risdon or Essig wire, brackets or composite resin that fixes a wire to the teeth are common methods in closed reduction (9, 11, 12, 16). Open reduction is also required when the alveolar segment is significantly displaced or the roots of the teeth or the bone in the segment interfere with proper repositioning of the segment (9, 10). Class

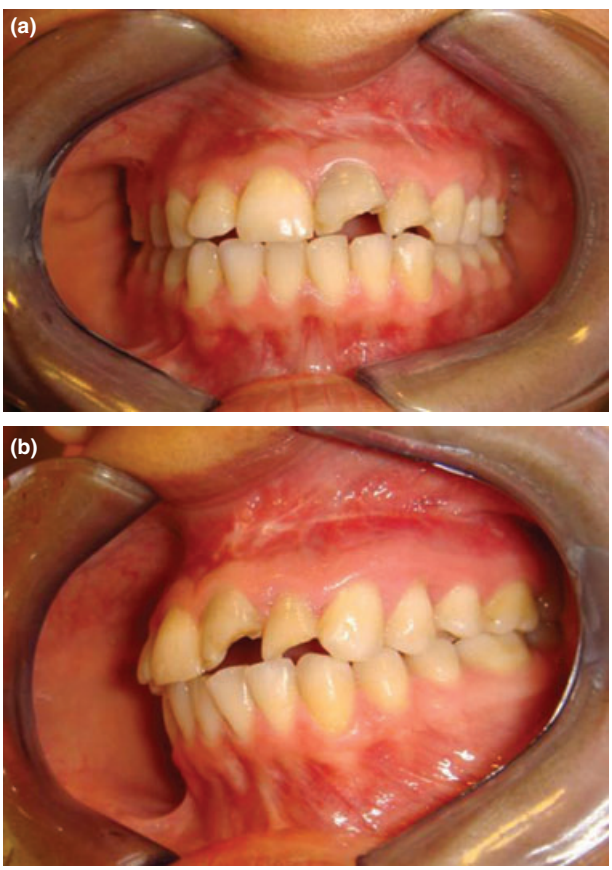

Fig. 5. (a, b) The occlusal view of the dentoalveolar segment in normal anatomic position displaying normal mobility in their sockets.

Fig. 4. The repositioned segment fixed rigidly with L-type miniplate.

Fig. 6. Final appearance of occlusion and broken crowns of the teeth were restored.

III fracture of the alveolar process are defined as the fracture involves dentulous segment with moderate to severe displacement. Reducing the displaced segment of the alveolar process can be difficult because of the resistance produced by the interaction of the small irregularities of the bony surfaces (1). In this situation, the bone removal may be necessary. In present case, we preferred to the anterolateral osteotomy because of the irregular fracture line on the roots of traumatized teeth, and adequate bone height between the roots of the teeth and the nasal floor. This approach eliminated to the risk for tooth damage.

Fixation of the fractured bones might be delayed and bone repositioning can become difficult. The occlusal situation might not be considered during repositioning and fixation of the bones. Occlusal reconstruction after maxillofacial fracture requires multidisciplinary treatment in most patients. In case of the tooth avulsion and excessive loss of bone, although surgical orthodontic treatment (secondary corrective surgery) are a preferable solution for this situation, most of them are treated without surgery because of not only the patient's unwillingness but also the difficulties in the surgical correction of healed bone (17–19). The prosthetic or implant treatment are considered in the area of the missing teeth and bone, by augmentating bone with bone grafts (19, 20). Segmental osteotomies are known to be predictable and safe procedure, with very few complications. With carefully planned surgery, it eliminates the non-union or malposition of segment and nerve injury but the periodontal problems and the devitalized or mobile tooth are still encountered (10, 21, 22). The animal studies have showed that the foci of necrosis in the pulpal tissues should not affect the long-term prognosis of teeth as long as root apices are not damaged intraoperatively and histological evaluation are revealed that when the osteotomy cuts were made at a safe distance (3–5 mm) from the apices of roots, neither important pulpal degeneration nor loss of teeth occurs (23).

The teeth in an alveolar fracture segment should be done to monitor their vitality and for evidence of root resorption and ankylosis. High percentage of teeth involved in alveolar process fractures undergoes pulpal necrosis and either internal or external root resorption (1, 2, 10). The necessity of the endodontic treatment of teeth in present case was caused by trauma.

In conclusion, the anterolateral osteotomy can be preferred as the one of the treatment modality of the delayed alveolar fracture without tooth damage in the occlusal rehabilitation of patient.

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