

Review Article

Recent Advances & Historical Management in Dentoalveolar fracture- A Review

Jayendra Purohit¹, G. Jeevan kumar², Abhijit Datta³, Soumyasnata Maiti⁴, Annirudh Hinge⁵, Shivangini Kapoor⁶, Rahul Vinay Chandra Tiwari⁷

¹Reader, Department Of Oral And Maxillofacial Surgery, College Of Dental Sciences, Amargadh, Shior, Bhavnagar, Gujarat;

²Consultant Oral and Maxillofacial surgeon, Tirupati, Andhra Pradesh;

³PG Student, Dept of OMFS, Divya Jyoti College of dental sciences and research, Modinagar;

⁴Pg Student, Dept of OMFS, KLE Belgaum, Karnataka;

⁵Dental Surgeon, Mahalaxmi Dental Clinic, Nerul, Navi Mumbai;

⁶Pg student, Dept of OMFS, Sudha Rastogi Dental College, Faridabad;

⁷FOGS, MDS, Consultant Oral & Maxillofacial Surgeon, CLOVE Dental & OMNI Hospitals, Visakhapatnam, Andhra Pradesh, India

ABSTRACT:

Dentoalveolar trauma represents a significant proportion of facial injuries. Dentoalveolar injuries are those injuries involving the teeth, the alveolar portion of the maxilla and mandible, and the adjacent soft tissues. Dentoalveolar injuries occur commonly in pediatric and adult populations and account for up to 5% of all traumatic injuries for which people seek medical treatment. These injuries present a significant challenge to dental practitioners and require proper diagnosis, treatment planning, and follow-up to ensure a favorable outcome. Patterns of such injuries include the avulsion of teeth, fractures of the teeth, fractures of the alveolar process, and lacerations of the soft tissue. Although it is impossible to guarantee permanent retention of a traumatized tooth, patient age, severity of injury, and timely treatment and follow up of the tooth using recommended procedures can maximize the chances for success. Surgeons need to be aware that dentoalveolar injuries may be a marker for other injuries. Prompt relocation and splinting of displaced teeth is associated with better outcomes.

Key words: Dentoalveolar, concussion, avulsion, splinting, tooth, trauma.

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Corresponding author: Dr. Jayendra Purohit, Reader, Department Of Oral And Maxillofacial Surgery, College Of Dental Sciences, Amargadh, Shior, Bhavnagar, Gujarat, India

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INTRODUCTION:

Usually encountered dental emergencies is dentoalveolar traumatic injuries. The prevalence of dentoalveolar fractures as posted by Andreason and Andreason (1994) is that more than three billion of the world population is dental trauma victims. Unfortunately, dentoalveolar fracture result in fractured, displaced, or lost anterior teeth and this could have significant functional, esthetic, speech, and psychological effects on children thus affecting their

quality of life (1). Many times these are complex injuries of multiple types of tissues that require careful examination, thoughtful diagnosis, and formulation of a treatment plan, at times, all within a matter of minutes [2]. Dentoalveolar injuries are frequently allied with facial fractures, with studies depicting around 20% of patients with facial fractures also have dentoalveolar injuries, including fractures involving non tooth-bearing facial bones [3, 4]. Fractures may occur in the alveolar segments either in

isolation or in combination with other portions of the maxilla or mandible. Teeth associated with alveolar fractures are characterized by mobility of the alveolar process. In the permanent dentition, the peak age of trauma incidence is between 8 and 10 years (5), and the most commonly affected teeth are the maxillary central incisors (6-9). A thorough examination is necessary to assess the full extent of all injuries. Essential information to be gathered for each patient should include the vital signs, review of all systems, medical and surgical history, medications, allergies, and accident or incident information. The successes of management of dentoalveolar injuries depends on proper diagnosis and prompt treatment within a limited time to achieve a favourable outcome, hence they should be treated as an emergency situation (10).

Background:

Treatment of dentoalveolar trauma has been documented as early as the era of Hippocrates, who described the use of dental splinting with bridal wires (11, 12). Even though many advances have transpired, the basic principles of fixation of loose teeth or bony segments to allow for hard and soft tissue healing are still paramount. The incidence and prevalence of injuries to the dentoalveolar complex are challenging to determine. The mechanism of dentoalveolar injury is either direct trauma to the teeth or secondary to a blow to the chin resulting in the mandibular dentition being forced into the maxillary dentition.

Direct injury most commonly affects the maxillary central incisors, which protrude beyond the other teeth (13). The presence of the developing secondary dentition, smaller less pneumatized maxillary sinuses, and less dense bone make the pediatric alveolar bone more pliable and resistant to fracture (14,15).

Initial assessment:

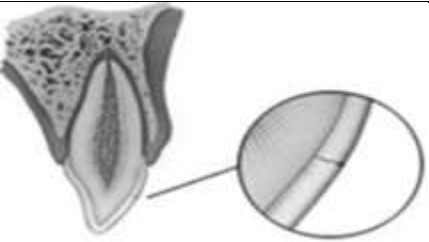
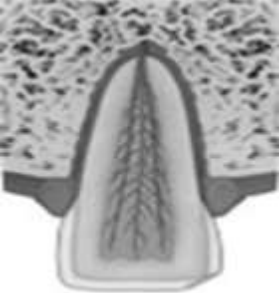

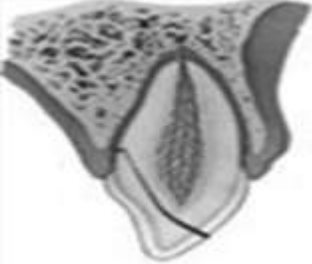
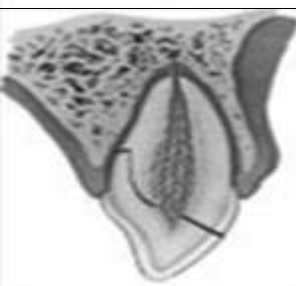
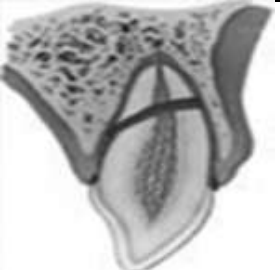
Meticulous and systematic diagnostic evaluation is critical to warranting timely and appropriate management of dentoalveolar injuries. The critical importance of a focused history and physical examination cannot be overstated. Foremost in the initial evaluation is the primary trauma survey with particular attention to airway, breathing, and circulation. Injuries to dentoalveolar structures can result in fragmented pieces that are potential aspiration risk, mandating the priority toward securing the airway. Once airway and breathing are safeguarded, any uncontrolled bleeding must be staunched to provide better visualization and assessment of the oral cavity. Because the prognosis of dentoalveolar injuries depends on the timeliness of evaluation and management, it is imperative for diagnosis to commence immediately. Trauma patient, who may be a new patient to the treating dentist, through systematic examination using a trauma checklist.

| Trauma Checklist | |
|-------------------------------------|---|
| — Consent for treatment (emergency) | — Clinical exam extraoral |
| — Emergent care CAB | — Facial bones |
| — Airway and vitals | — Nose |
| — Medical history | — Eyes |
| — Dental history | — Clinical exam intraoral teeth and soft tissue |
| — Previous injury? | — TMJ exam |
| — HPI | — Imaging |
| — When | — Conventional |
| — Where | — CBCT |
| — How | |



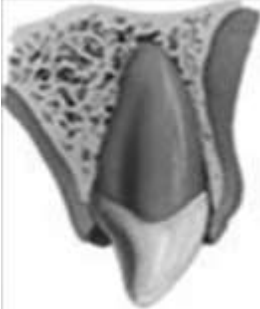


CLASSIFICATION OF DENTOALVEOLAR INJURIES

The most comprehensive classification is Andreasen’s modification of the WHO classification [16 - 18] (Tables 1).


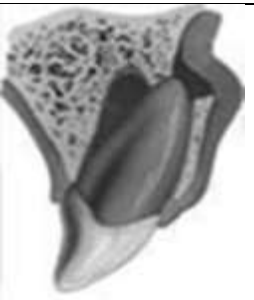
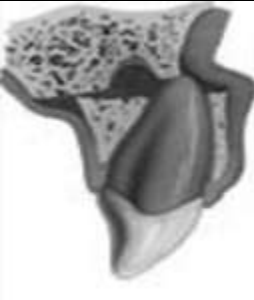

Table 1. Injury to tooth crown and root

| Andreasen's classification of dental trauma | | |
|--|---|--|
| Crown infraction | Incomplete fracture of the enamel |  |
| Uncomplicated crown fracture | Fracture of the dentin and or enamel but no pulp exposure |  |
| Complicated crown fracture | Fracture of the enamel and dentin with pulp exposure |  |
| Uncomplicated crown root fracture | Fracture involving the enamel, dentin and cementum but no pulp exposure |  |
| Complicated crown root fracture | Fracture involving the enamel, dentin and cementum with pulp exposure |  |
| Root fracture | Fracture involving the dentin, cementum, and pulp |  |

2. Injury to periodontium

| Andreasen's classification of dental trauma | | |
|--|---|---|
| Concussion | Injury without notable mobility or displacement. Significant tenderness to percussion |  |
| Subluxation | Injury that results in loosening of tooth without displacement |  |
| Intrusive luxation | Injury that results in movement of the tooth in the direction of the tooth roots |  |
| Extrusive luxation | Injury that results in partial avulsion of the tooth |  |
| Exarticulation (tooth avulsion) | Entire tooth is displaced from the socket |  |

3. Injury to bone

| Andreasen's classification of dental trauma | | |
|--|--|---|
| Comminution of alveolar socket | Crush injury to the bone surrounding the tooth |  |
| Fracture of an alveolar socket wall | Fracture of the only the facial or lingual wall of the socket |  |
| Fracture of the alveolar housing | Fracture of the bone that may or may not involve the socket |  |
| Fracture of the mandible or maxilla | Fracture that involves the bone of the maxilla or mandible. May include the alveolar housing or socket |  |

THE MANAGEMENT OF DENTAL AND DENTOALVEOLAR INJURIES

Concussion

No treatment is needed. Nursing of pulpal condition is recommended, because there is a minimal risk for pulp necrosis. A flexible splint can be used for the comfort of the patient for 7–10 days, or according to trauma diagnoses of adjacent teeth (19, 20).

Subluxation

It is a mild–moderate injury to the periodontal ligament without displacement but with some loosening of the tooth. The long-term prognosis should be good with vitality maintained. Bleeding around the gingival margin is indicative of this injury.

Extrusive luxation

Treatment decisions for primary teeth are based on the degree of displacement, root formation, and the ability of the child to cope with the emergency situation. For

minor extrusion (<3 mm) of an immature developing tooth, repositioning and stabilization for 1–2 weeks is indicated. Indications for extraction are severe injury or if the tooth is nearing exfoliation (11, 26, 35).

Extruded permanent teeth should be repositioned and splinted for up to 3 weeks. Monitoring the vitality of pulp is crucial to diagnose root resorption. In immature developing teeth, revascularization can be confirmed radiographically by evidence of continued root formation and pulp canal obliteration; such teeth usually return to positive response to sensibility testing.

In closed apex teeth, a lack of response to sensibility testing is an indication of pulpal necrosis, together with periapical rarification and sometimes crown discoloration, which requires endodontic treatment. A 2-week progression of treatment with CaOH before obturation with gutta-percha and sealer cement can help minimize the risk of inflammatory resorption (23,24,25).

Lateral luxation

It involves displacement of the tooth palatally or labially and is almost always associated with a dentoalveolar fracture. With this type of injury, there is a high risk of pulp necrosis. Again, it is advisable to review them and only start root canal treatment if there are two signs or symptoms of non-vitality (22).

Intrusive luxation

It involves displacement of a tooth further into the socket in an axial direction. Crushing of the neurovascular bundle occurs, resulting in the loss of vitality in teeth with closed apices. Severe damage usually also occurs to the bony alveolar socket. Immature permanent teeth that are allowed to reposition spontaneously demonstrate the lowest risk for healing complications (22, 26, 27).

Avulsion injuries

Avulsion has been reported in 1-16% of dental injuries (11) Outcomes are largely dependent upon the storage medium of the avulsed tooth, the extraoral dry time, the stage of root formation and the time from the incident to re-implantation. Prompt treatment of this dental emergency is required for best outcomes. Replantation is the treatment of choice for permanent teeth, as soon as possible after the injury. Replantation of mature teeth that have an extraoral dry time >60 minutes is to promote alveolar bone growth. Bony encapsulation of the tooth is desirable, followed by ankylosis and resorption. The crown can be removed when the tooth shows evidence of submergence at 1 mm, the aim being to maintain the alveolar contour (28, 29).

When we manage this case, we must classify the cases into two categories (30, 31):

- A. Closed Apex
- B. Open Apex

Closed apex, extra oral dry time < 60 minutes, tooth stored in a special storage media, milk or saliva:

- Don't handle the root surface & don't curette the socket.
- Remove coagulum from socket with saline and examine the alveolar socket.
- Replant slowly with slight digital pressure.
- Stabilize with a semi-rigid splint for 7 to 10 days.
- Administer any systemic antibiotic (Penicillin 250mg 4x per day for 7 days or doxycycline 100mg 2x per day for 7 days), refer to the drugs reference to know the appropriate dose according to patient age and weight.
- Refer to physician to evaluate need for tetanus booster.
- After the 10th day we will do RCT, if RCT was delayed & signs of resorption revealed, a long term treatment with calcium hydroxide is given before a complete RCT.

Closed apex, extra oral day time > 60 minutes:

- Remove debris & necrotic periodontal ligament.
- Remove coagulum from the socket with saline and examine the alveolar socket.
- Immerse the tooth in 2.4% Sodium Fluoride -5.5 PH for 5 minutes.
- Replant slowly with a semi-rigid splint for 7 to 10 days.
- Administer systemic antibiotic as previously.
- Refer to physician for tetanus booster.
- RCT treatment is the same for <60 minutes.

Open apex, extra oral day time < 60 minutes, tooth reserved in a special storage media, milk or saliva:

- If contaminated, clean the root surface & apical foramen with a stream of saline.
- Remove coagulum from socket with saline and examine alveolar socket.
- Replant slowly with slight digital pressure.
- Stabilize with a semi-rigid splint for 7 to 10 days.
- Administer systemic antibiotic.
- Tetanus booster.
- We usually monitor this case and not do an endodontic treatment unless a pulpal inflammation was revealed, we will do an apexification.

Open apex, extra oral day time > 60 minutes:

- Replantation usually is not indicated.
- If we will replant it, try to do RCT outside the mouth or apexification inside the mouth.

Alveolar fracture

Alveolar fractures may be isolated or associated with basal bone fractures. The alveolus may be comminuted, resulting in differential movement of the involved teeth, or the teeth may be displaced en bloc with associated occlusal change. Treatment involves reduction and fixation of the alveolar fracture for 4 weeks, along with management of any associated basal fracture. Such fractures are typically managed

using closed techniques, but large alveolar fractures may be internally fixed, particularly if open reduction and internal fixation of an associated fracture is being undertaken.

Conclusion

Dentoalveolar injuries are one of the serious emergencies that require the expertise of an experienced dental practitioner for judicious diagnosis and management. These injuries include lacerations, contusions, and abrasions to the surrounding soft tissues, infractions and fractures to the teeth, and fractures of the alveolar process. Aetiology of such injuries can be motor vehicle accidents, assaults, falls, contact sports, and interpersonal violence. Dentoalveolar injuries also accompany life-threatening complications such as aspiration and bleeding. Focused history and physical examination should be further corroborated with pertinent radiographic findings to arrive at the correct diagnosis. Classification of the dentoalveolar trauma provides a common platform for implementing appropriate care plans according to the class of injury. Treatment is tailored specifically to the nature and severity of dentoalveolar injury and involves debridement, removal of nonviable teeth fragments, stabilization, realignment, and splint fixation. Finally, adequate follow-up is important for dental practitioners to improve functional and aesthetic outcomes and provide the best longitudinal care to patients.

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