



# المرحلة الخامسة - جراحة الفم

الفصل الدراسي الأول

## Management of Dentoalveolar Fractures Part 2

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## *Objectives*

## اهداف المحاضرة

- *To know the causes and classification of dentoalveolar fractures.*
- *Management of the dentoalveolar fractures.*
- *How to manage soft tissue injures.*



### Periodontal injuries

- Injury to the periodontal tissue presents itself in many ways.
- Radiographically, this injury usually involves an evident dislocation or a movement of the tooth, and narrowing or loss of periodontal space may be seen.
- Primarily, we see the injury from the localized impact.
- secondary resorptive process. The likely result of displacement injuries is the development of some type and degree of resorption.

### Classification of Root Resorption

1. Root surface resorption.
1. Root canal resorption.



# Management of Dentoalveolar Fractures

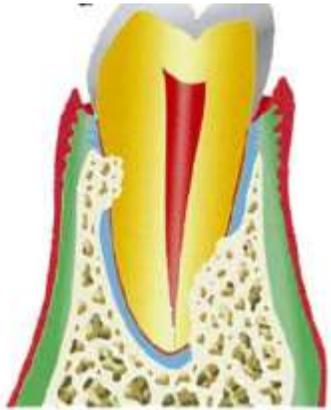


## 1. Root surface resorption (external root resorption) include:

A. Surface resorption: root displays superficial resorption lacunae, which are repaired with newly formed cementum. **Although not usually seen on radiographs**, these may appear as vague cavities on the lateral root surface. A normal lamina dura is usually present.

B. Replacement resorption: also known as ankylosis, presents as an indistinguishable merging of bone and root substance. The root substance is being ultimately replaced by bone, and **radiographically a loss of the periodontal space and progressive root resorption is seen.**

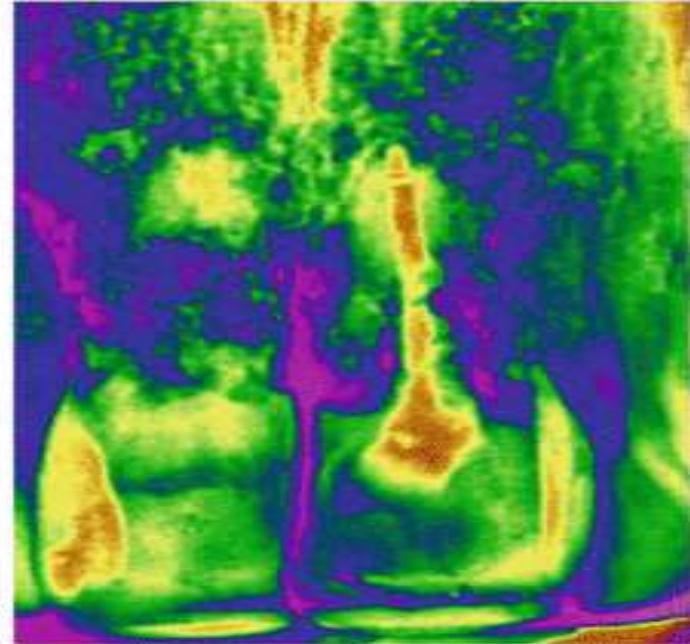
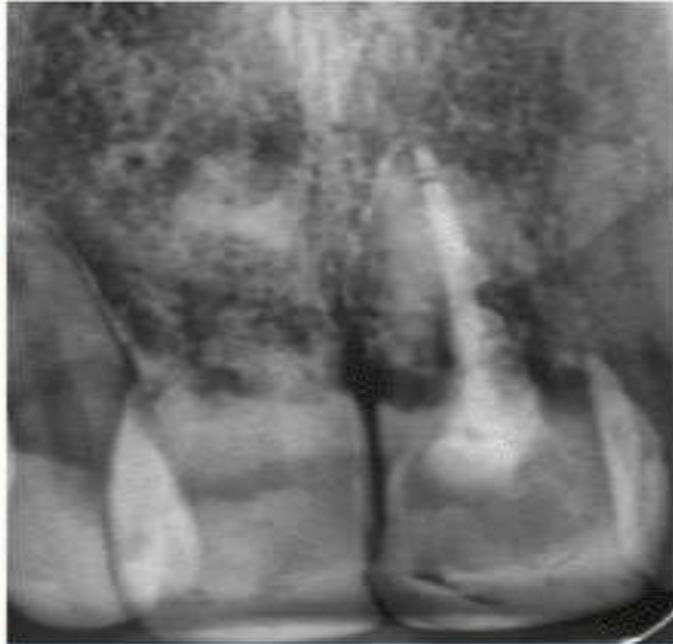
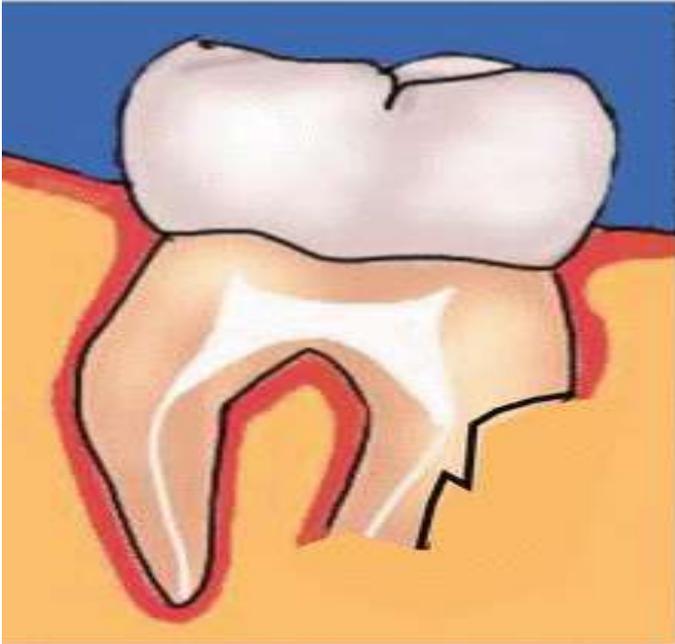
C. Inflammatory resorption: appears as well circumscribed areas of cementum and dentin resorption. The localized adjacent periodontal tissue is markedly inflamed. **The radiograph shows an appearance of root resorption with lines of adjacent bone radiolucency.**



# Management of Dentoalveolar Fractures



# Management of Dentoalveolar Fractures



Resorptive lesion	Causes	Clinical findings	Radiographic findings	Treatment
Ankylotic/ Replacement	Severe traumatic injuries (intrusive luxation or avulsion with extended dry times)	Ankylotic teeth lack physiological mobility of normal teeth Tooth may demonstrate high pitched metallic percussion sound Infra-occlusion may be evident	Resorption lacunae are filled with bone and the periodontal ligament space is missing	As there is no stimulation to remove there is no predictable treatment available at present Prevention by minimizing periodontal ligament damage immediately following an injury is the only treatment decoronation and submergence may be an option in the developing dentition to allow for growth to cease before considering dental implant replacement

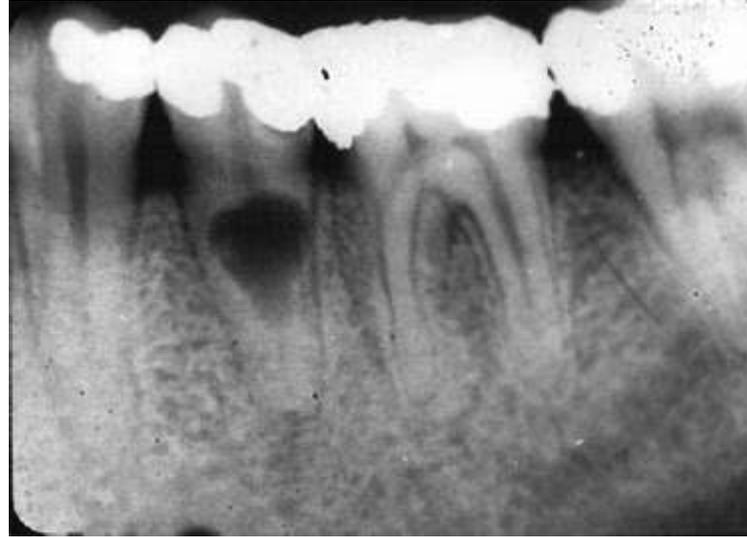


## 2- Root Canal Resorption (internal root resorption)

presents less often than root surface resorption. Studies found that it appears in both permanent and primary teeth. Root canal resorption is classified as two types:

- (1) **internal replacement resorption:** resorption shows metaplastic replacement of normal pulp tissue into cancellous bone, resulting in a widened pulp chamber. This is a characteristic process that is seen in root fractures.
- (2) **internal inflammatory resorption:** resorption often located at the cervical region of the pulp, presents **radiographically as an irregular or oval-shaped radiolucent enlargement within the pulp chamber.** Normal pulp tissue is altered and transformed into granulation tissue with giant cells that resorb the dentinal walls of the root canal, giving the chamber an enlarged appearance.

# Management of Dentoalveolar Fractures





### Classification of Periodontal injuries

1. **Concussion:** defined as an injury to the periodontium producing sensitivity to percussion without loosening or displacement of the tooth
2. **Subluxation:** the tooth is loosened but not displaced
3. **Luxation** (ie, lateral, intrusion, and extrusion) dislocation, or partial avulsion: the tooth is displaced without an accompanying comminution or fracture of the alveolar socket
4. **Injuries to the supporting bone**
  - A. Comminution of the alveolar housing, often occurring with an intrusive or lateral luxation
  - B. Fracture of a single wall of an alveolus
  - C. Fracture of the alveolar process, en bloc, in a patient having teeth but without the fracture line necessarily extending through a tooth socket
  - D. Fracture involving the main body of the mandible or maxilla
5. **Exarticulations (Avulsions)**
6. **Categories of injuries to the gingival or oral mucosa area include the following:**  
(Abrasion, Contusion & Laceration)



# Management of Dentoalveolar Fractures

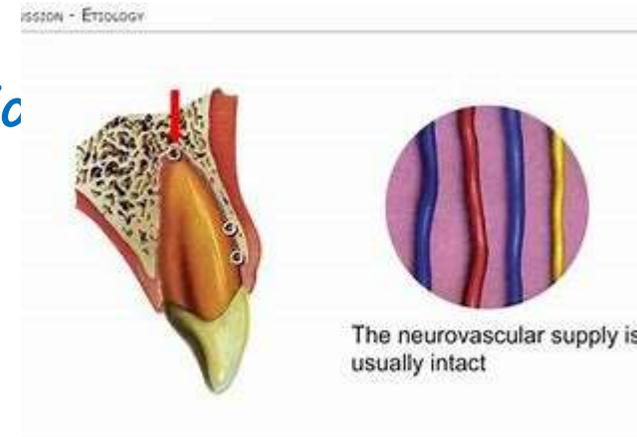


## 1- Concussion

- Often this injury is overlooked because no acute clinical or radiographic evidence of trauma is seen.
- defined as an injury to the periodontium producing sensitivity to percussion without loosening or displacement of the tooth
- No abnormal mobility, displacement, or bleeding is apparent; Only minimal injury to the tissues

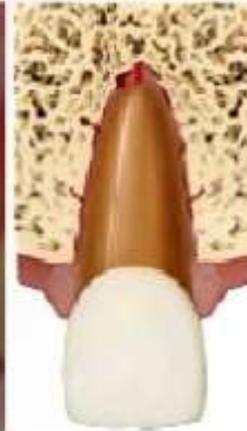
- The hallmark to diagnosis is a marked reactive in both the horizontal and vertical directions.

- Treatment includes taking the suspected tooth out of occlusion to avoid function, consider occlusal adjustments on the opposing dentition, thereby limiting further trauma to the involved tooth.





## Subluxation



- **Flexible splint for 2 wks**
- **Soft diet for 1wk**
- **CHX rinsing**
- **F/U: 4, 6~8 wks, and 1yr**
- **RCT after 2-3 months**



## 3- luxation

- principally involve the primary and permanent maxillary central incisors.
- The mandibular teeth are less at risk, unless a Class III malocclusion exists.
- Generally, displacement injuries are more prevalent in primary dentition owing to the increased elasticity and resilience of the bony supporting structures.
- Conversely, permanent teeth will have an increased risk of tooth fracture.
- The specific luxation classification depends on the force and direction of traumatic impact.
- Fifteen to 61% of luxation injuries occur in the permanent dentition and 62 to 73% in the primary dentition. Multiple teeth are usually involved in luxation injuries.



# luxation

### 1- Intrusive Luxation

- Intrusive luxation may cause marked displacement of the tooth into the alveolar bone, with possible comminution or fracture of the alveolar socket.
- Percussion sensitivity is limited, and decreased mobility is noted because the tooth is essentially locked in. A high-pitched metallic sound is elicited on percussion (ankylosed tooth).
- The intrusive injury is more commonly seen in the maxilla because of its less dense anatomy and irregular premaxillary configuration. The superiorly placed hollow cavities and thin floors of the nasal and maxillary sinuses create a formula for relative ease of dislodgement of teeth to these sites when intrusive forces are encountered. Intrusive injuries are the most severe of the luxation injuries that involve the pediatric patient.
- The intruded primary tooth may be effecting the tooth bud of the permanent successors in a buccal-occlusal position. The incidence of pupal necrosis is relatively high (96%).
- Inflammatory resorption incidence may reach 52% as a result of the necrotic pulp





## Management of Dentoalveolar Fractures



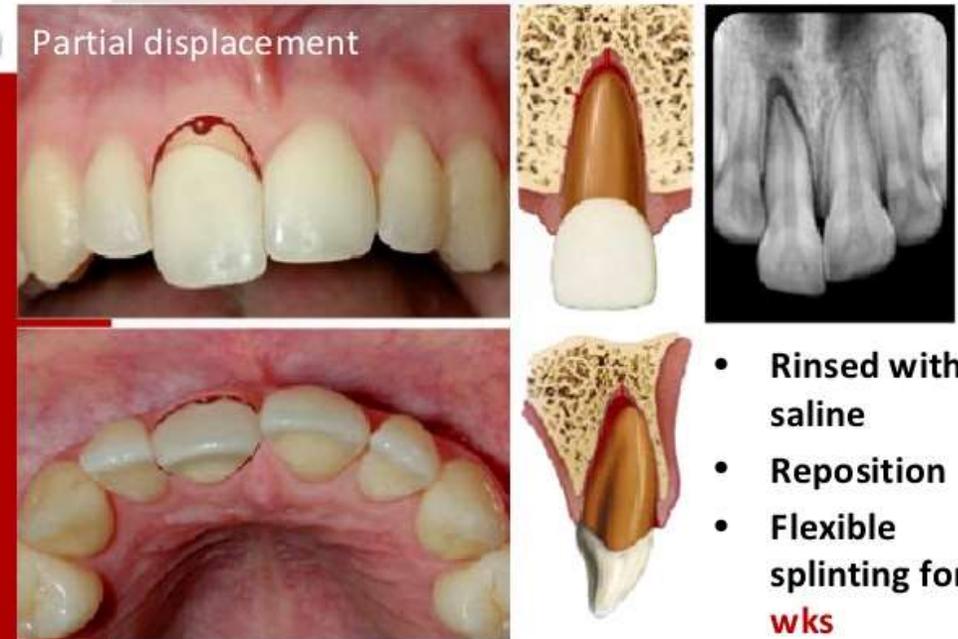
### Treating intrusive injuries : depends on root development.

- If incomplete root development exists, allow the intruded tooth to re-erupt. Continue this process for approximately 3 months.
- If re-eruption does not occur, to facilitate this process, place an orthodontic extruding appliance.
- If pulp necrosis occurs, seek **endodontic therapy**.
- In cases of complete root development with closed apices, re-position the tooth a traumatically, and stabilize with a nonrigid splint. Then, **initiate endodontic therapy in approximately 10 to 14 days after injury**.
- Use CaOH as a canal filler in this therapy to retard or inhibit the inflammatory or replacement resorption process.
- **Perform conventional root canal therapy with gutta-percha obturation when signs of resorption have ceased.**

## Permanent teeth: Intrusion



## Extrusion



Partial displacement

- Rinsed with saline
- Reposition
- Flexible splinting for **2 wks**

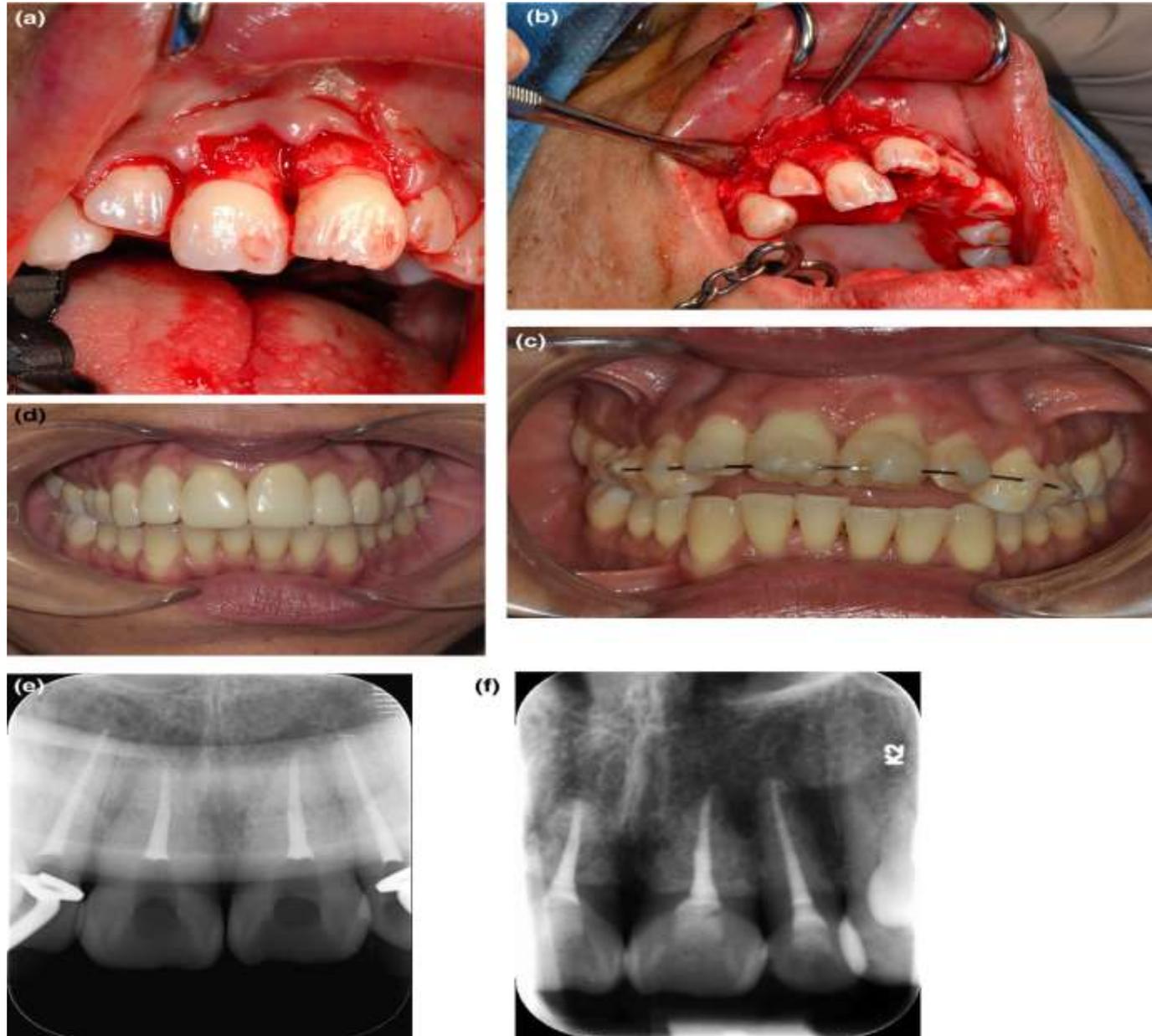


## luxation

### 2- Extrusive luxation

- Partial displacement of the tooth out of the socket in a coronal or incisal direction with lingual deviation of the crown.
- This results in the rupture of the neurovascular and periodontal ligament (PDL) tissues, respectively.
- There is gross mobility and bleeding at the gingival margin.
- Further, radiographically, the PDL space is widened.
- A dull sound is heard on percussion testing.
- Pulp necrosis occurs approximately 64% of the time, and a relatively low frequency of external resorption is seen at 7%.
- It is treated by
  1. Placing the extruded tooth back into the proper position in the socket.
  2. Check and re-check occlusion to ensure no rotation has occurred.
  3. Then, stabilize the tooth with a nonrigid splint for approximately 2 to 3 weeks.
  4. If signs of pulp necrosis occur, employ endodontic therapy.

# Management of Dentoalveolar Fractures





## luxation

### 3- Lateral luxations

- May result from traumatic forces that displace the tooth, or teeth, in many directions; however, the lingual direction appears to be the most prevalent.
- These luxation often involve the bony alveolar socket.
- The radiographic appearance is similar to the extruded tooth on occlusal views, with the PDL space widening in the apical direction.
- Localized soft tissue compromise is often apparent. When bony defects exist beneath the gingiva, it is common to see complex lacerations and step defects.
- The key to treatment is to:
  1. Reestablish preinjury occlusion.
  2. Manipulate the tooth or teeth back into the socket.
  3. Apply a nonrigid splint that is extended to and is supported by the uninjured adjacent teeth. Leave the splint in place for 2 to 8 weeks, depending on bony healing.
  4. Any signs of pulp necrosis should be met with immediate endodontic therapy.

## ETIOLOGY



Severance of neurovascular pulp supply



Severance of periodontal ligament



Compression of periodontal ligament



### Lateral luxation - Etiology

- Severance of neurovascular pulp supply
- Entrapment of apex
- Fracture of labial bone plate
- Severance of periodontal ligament
- Compression of periodontal ligament



### 4- Injuries to the supporting bone

#### Treatment of Fractures of the Alveolar Process

- Owing to the exposed anatomy, alveolar fractures usually occur at the incisor and premolar regions.
- Leave the splint in place for approximately 4 weeks.
- Successful treatment of alveolar fractures is associated with the pupal healing after the injury. When the fracture level is apical to the root tips, the vascular supply to the pulp is less at risk; however, if the line of the fracture and root apices are in contact, the teeth in the alveolar segment are at a higher risk for internal or external resorption.
- Injuries to maxillary or mandibular fractures, early maxillomandibular fixation is accomplished with a technique that will allow
- for dual treatment of the dental and/or alveolar injury and the jaw injury (eg, arch bars and maxillomandibular fixation). Perform the more invasive open reduction if indicated.



## Injuries to the supporting bone

Treatment involves early reduction and stabilization of the involved segments. Depending on the fracture's severity, use either an open or closed technique.

### Splint Requirements

1. Be able to be applied directly in the mouth without delay owing to laboratory procedures
2. Stabilize the injured tooth in a normal position
3. Provide adequate fixation throughout the entire period of immobilization
4. Neither damage the gingiva nor predispose to caries and should allow for a basic oral hygiene regimen
5. Not interfere with occlusion or articulation
6. Not interfere with any required endodontic therapy
7. Preferably fulfill esthetic demands
8. Allow a certain mobility (nonrigid) to aid periodontal ligament healing in cases of fixation after luxation injuries and replacement of avulsed teeth; however, after root fracture, the splint should be rigid to permit optimal formation of a dentin callus to unite the root fragments
9. Be easily removed without re-injury to tooth

# Management of Dentoalveolar Fractures





### Injuries to the supporting bone

#### Sequence of Acid-Etch Splinting Technique\*

1. Perform alveolar bony reduction and/or replantation
2. Perform localized cleansing and debridement
3. Isolate and dry area
4. Custom fabricate wire (~26 Ga), Extend wire to at least 1 or 2 teeth on either side of the involved tooth or teeth
5. Etch the incisal half of the labial surface of the involved and adjacent teeth with gelled phosphoric acid for 30–60 s
6. Remove etchant with water stream for ~20 s
7. Air dry etched surface; surface should appear chalky white
8. Passively place prefabricated wire to involved teeth
9. Stabilize splint with fast-setting autocure or light-cure composite resin
10. After resin is set, smooth rough edges with a fine acrylic or diamond finishing bur (Check occlusion)
11. Perform soft tissue and gingival repair as needed
12. Remove splint in 7–10 d

# Management of Dentoalveolar Fractures





### 5- Exarticulations (Avulsions)

- Avulsion injuries are the worst of the dentoalveolar injuries.
- By definition, these injuries involve tooth, or teeth, that are completely dislodged from the socket for a period of time.
- Owing to the higher risk of aspiration, supporting structure damage, or actual physical loss of the tooth, these injuries require special attention.
- Avulsion injuries occur from 0.5 to about 16% in the permanent dentition and occur less in the primary dentition (7 to 13%), with children ages 7 to 9 years being most associated with this injury.
- These injuries usually involve a single tooth, with the maxillary central incisor most often at risk, which is due to the relative instability of the periodontal ligament during the progressive eruption of these teeth.



## Exarticulations (Avulsions)

*The treatment* of such injuries must be geared toward:

- Early reestablishment of periodontal ligament cellular physiology.
- The fate of the avulsed tooth depends on the cellular viability of the periodontal fibers that remain attached to the root surface prior to reimplantation.
- Although extraoral time is a factor, newer physiologically compatible solutions are available that can maintain and/or replenish periodontal ligament cell metabolites.
- Two such solutions are Hank's balanced salt solution and ViaSpan are physiologic with compatible pH and osmolality other preserve solutions are cows milk, normal saline and saliva.
- Hank's balanced salt solution and ViaSpan which can store avulsed teeth and replenish cellular metabolites for 24 hours and 1 week, respectively, milk as a storage medium becomes ineffective after approximately 6 hours



# Management of Dentoalveolar Fractures





# Management of Dentoalveolar Fractures



## Treatment Summary for Avulsed Teeth

### < 2 h; open apex

1. Replant immediately if possible
2. Transport in Hank's solution or milk
3. Present to nearest qualified facility (decrease time call first)
4. Check ABCs; ( airway, breathing, and circulation) evaluate for associated injuries (history and physical examination)
5. Store in Hank's Solution for about 30 min
6. Transfer to a 1 mg/20 mL doxycycline bath for about 5 min
7. Perform radiography (posteroanterior, occlusal, panoramic, chest)
8. Initiate local anaesthesia
9. Irrigate socket with saline solution
10. Perform tetanus prophylaxis as needed
11. Initiate antibiotic coverage
12. Replant tooth
13. Splint for 7-10 d
14. Perform apexification with CaOH in cases of pathology

### Closed apex

1. Store in Hank's solution for about 30 min
2. Replant
3. Splint for 7-10 d
4. Perform endodontic cleansing and shaping of canal at time of splint removal
5. Fill canal with CaOH (6-12 mo)
6. Perform final gutta-percha obturation (~6-12 mo)



# Management of Dentoalveolar Fractures



## Treatment Summary for Avulsed Teeth

### Treatment Summary for Teeth Avulsed > 2 Hours Open or closed apex.

1. Replant immediately, if possible
2. Transport in Hank's solution or milk
3. Present to nearest qualified facility (decrease time call first)
4. Check ABCs; evaluate for associated injuries (history and physical examination)
5. Bathe tooth in sodium hypochlorite for ~30 min vs manual debridement of the periodontal ligament
6. Perform extraoral RCT
7. Bathe tooth in citric acid (~3 min)
8. Bathe tooth in 1% stannous fluoride (~5 min)
9. Transfer to a 1 mg/20 mL doxycycline bath for ~5 min
10. Perform radiography (posteroanterior, occlusal, panoramic, chest)
11. Initiate local anaesthesia
12. Perform tetanus prophylaxis as needed
13. Initiate antibiotic coverage
14. Replant tooth
15. Splint for 7-10 days

## Stabilization periods for dentoalveolar injury

Dentoalveolar injury	Duration of immobilization
1) Mobile tooth	7 _ 10 days
2) Tooth displacement	2 _ 3 weeks
3) Root fracture	2 _ 4 months
4) Avulsion	7 _ 10 days
5) Alveolar fracture	4 _ 6 weeks



## 6- Injuries to the gingival or oral mucosa

Traumatic injury to the oral soft tissue mainly consists of

1. abrasion,
2. contusion,
3. laceration.

If these injuries are not addressed, they can place the underlying bony tissue at risk for devitalization. Frequently these injuries may alert the surgeon to underlying trauma. The ultimate goal of treatment is to reestablish vital soft tissue bony coverage.



Abrasion



contusion



laceration.



## Management of Dentoalveolar Fractures



### Injuries to the gingival or oral mucosa

Abrasion : Is a superficial wound wherein the epithelial or gingival tissue is rubbed, worn, or scratched.

### Treatment consists of

1. local cleansing with a mild disinfectant soap for the skin and saline rinsing and/or irrigation of the gingiva.
2. Antibiotic coverage is seldom necessary. Inspect the wound for possible foreign body (asphalt) accumulation, which could lead to unsightly accidental tattooing.
3. If present, carry out meticulous removal within 12 hours.





## Management of Dentoalveolar Fractures



### Injuries to the gingival or oral mucosa

#### Contusion :

A hemorrhage of subcutaneous tissue without laceration or break of overlying soft tissue, is similar to a bruising injury caused by blunt trauma.

#### Treating gingival contusion includes

1. local cleansing and observation.
2. This injury may be associated with an underlying hematoma or ecchymosis formation, which is generally self-limiting.
3. Antibiotic coverage is usually unnecessary.





## Management of Dentoalveolar Fractures



### Injuries to the gingival or oral mucosa

#### Laceration :

Are the most common form of facial injury. Gingival lacerations may involve an underlying bony defect.

#### Treatment involves

1. Early cleansing and reap proximation.
2. Remove devitalized tissue in a conservative manner, and suture in a manner that limits wound tension.
3. Consider antibiotic and tetanus prophylaxis.
4. More serious avulse gingival wounds warrant close inspection of remaining tissue and underlying bony integrity.
5. Exposure of any underlying bony defect may indicate localized keratinized sliding or advancement flaps.





# Management of Dentoalveolar Fractures

## Laceration





# Management of Dentoalveolar Fractures



Table 21-7 Treatment of Pediatric Injuries

Type of Injury	Treatment
Crown fractures	
Class I (enamel only)	Smooth rough edges
Class II (enamel and dentin)	1. CaOH or glass ionomer liner over dentin 2. Composite resin restoration
Class III (pulpal involvement)	
Vital pulp	1. Formocresol pulpotomy 2. Coronal coverage
Nonvital pulp	1. ZnOH-eugenol pulpectomy 2. Coronal coverage
Class IV (root fracture)	
Apical third	No treatment; follow-up
Cervical third	1. Remove tooth fragments 2. Allow apical third to resorb if compromise to permanent tooth bud is expected
Luxations	
Subluxation	Monitor/follow-up
Lateral luxations	Realign/remove prn
Extrusion	Realign/remove prn
Intrusion	1. Allow to re-erupt 4–6 wk 2. Remove if in contact with permanent successor 3. Remove if infection presents

prn = as needed.



## Cleansing of Wound

Mechanical cleansing of the wound is necessary to prevent debris from remaining. Cleansing can be performed with surgical soap and may necessitate the use of a brush. An anesthetic is usually necessary.

## Debridement of Wound

Debridement refers to the removal of contused and devitalized tissue from a wound and the removal of jagged pieces of surface tissue to enable linear closure. In the maxillofacial region, which enjoys a rich blood supply, the amount of debridement should be kept to a minimum. Only tissue that is obviously not vital is excised. For most of the intraoral lacerations a dentist encounters, no debridement is necessary, except for minor salivary gland tissue .

## Hemostasis in Wound

*Before closure, hemostasis must be achieved. Continued bleeding might jeopardize the repair by creating a hematoma within the tissues that can break the tissues open once they are sutured closed. If any bleeding vessels are identified, they should be clamped and tied with ligatures or cauterized with an electrocoagulation unit.*

## Closure of Wound

*Once the wound has been cleansed, debrided, and hemostasis achieved, the laceration is ready to be closed with sutures. However, not every laceration in the oral cavity must be closed with sutures. For example, a small laceration in the palatal mucosa caused by falling on an object extending from the mouth need not be closed.*

## Tongue Lacerations





## References

- Peterson CHAPTER 21- Management of Alveolar and Dental Fractures  
Richard D. Leathers, DDS  
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- Google images