

**DENTAL TRAUMA: AN OVERVIEW**

**Mohammed Daifallah Almutairi<sup>1</sup>, Nadiah Abdulwasea Asrar<sup>2</sup>, Samirah Ebrahim alanbar<sup>3</sup>, Wejdan Ahmed Aljamaan<sup>4</sup>, Alharith Hani Sagga<sup>5</sup>, Saleh Abdulaziz Aldubayyan<sup>6</sup>, Fatimah suliman Alshehri<sup>7</sup>, Salha Mohammed Madkhali<sup>8</sup>, Abdullah alhammad<sup>9</sup>, Fahad Abdulaziz Ali Alhajri<sup>10</sup>, Majdah Salem Al hejali<sup>11</sup>**

1. Dental Assistant, West Riyadh Dental Clinics Complex, Saudi Arabia,  
[Mohammedda@moh.gov.sa](mailto:Mohammedda@moh.gov.sa)
2. General Dentist, West Riyadh dental complex, Saudi Arabia, [Nana.a2009@hotmail.com](mailto:Nana.a2009@hotmail.com)
3. Dental Assistant, West Riyadh dental complex, Saudi Arabia,  
[Samardental26@gmail.com](mailto:Samardental26@gmail.com)
4. Dental Assistant, West Riyadh Dental Complex, Saudi Arabia,  
[Waaljamaan@moh.gov.sa](mailto:Waaljamaan@moh.gov.sa)
5. General Dentist, West Riyadh Dental Complex, Saudi Arabia, [H-h-s2005@hotmail.com](mailto:H-h-s2005@hotmail.com)
6. Dental assistant, Dental Clinics Complex West of Riyadh, Saudi Arabia,  
[Saldubyyan@moh.gov.sa](mailto:Saldubyyan@moh.gov.sa)
7. Dental Assistant, West Riyadh Dental Complex, Saudi Arabia, [ffssalshehry@gmail.com](mailto:ffssalshehry@gmail.com)
8. General dentist, Riyadh west dental complex, Saudi Arabia,  
[Salhamadkhali24@gmail.com](mailto:Salhamadkhali24@gmail.com)
9. General Dentist, MOH, Saudi Arabia, [Asalhammad@moh.gov.sa](mailto:Asalhammad@moh.gov.sa)
10. Dental technician, Dental clinic in West of Riyadh, Saudi Arabia,  
[faaalhajri@moh.gov.sa](mailto:faaalhajri@moh.gov.sa)
11. Dental assistant, Dental Complex in Almansorah, Saudi Arabia,  
[sho0od2010@gmail.com](mailto:sho0od2010@gmail.com)

**Abstract**

Dental trauma is a significant public health concern that affects individuals of all ages, with children and adolescents being particularly vulnerable. Traumatic dental injuries (TDIs) can range from minor enamel fractures to severe luxation or avulsion injuries, leading to complex clinical challenges. This article provides a comprehensive overview of dental trauma, including its epidemiology, classification, pathophysiology, diagnosis, management, and long-term complications. The global prevalence of TDIs underscores the importance of timely diagnosis and evidence-based management to prevent adverse outcomes, such as pulp necrosis, root resorption, and tooth loss. Advances in diagnostic tools, such as pulp vitality testing and radiographic imaging, have improved the accuracy of injury assessment. Management strategies vary depending on the type and severity of trauma, with luxation and avulsion injuries requiring meticulous care to ensure the preservation of periodontal ligament viability and pulp health. Preventive measures, including the use of mouthguards and public education, play a critical role in reducing the incidence of dental trauma. Furthermore, the psychosocial impact of untreated or poorly managed dental injuries highlights the importance of early intervention and patient counseling. This review synthesizes current evidence and guidelines, providing a valuable resource for clinicians while emphasizing the need for ongoing research to optimize patient outcomes.

## Introduction

Dental trauma refers to injuries involving the teeth, oral structures, and surrounding tissues, often caused by accidents, falls, sports, or violence. These injuries can range from minor enamel fractures to complex conditions such as tooth luxation, avulsion, or fractures involving the alveolar bone. The management of dental trauma requires a multidisciplinary approach that considers the type of injury, the patient's age, and the condition of the affected dentition. This article explores the epidemiology, classification, diagnosis, and management of dental trauma, incorporating evidence-based guidelines and recent advances in the field.

## Epidemiology of Dental Trauma

Dental trauma is a global public health issue, with approximately one billion people affected worldwide (Petti et al., 2018). Among school-aged children, 25% experience dental trauma, with boys being more frequently affected than girls (Petti et al., 2018). The prevalence among adults is about 33%, with traffic accidents, occupational hazards, and violence being significant contributors (Zaleckiene et al., 2014).

Primary teeth are most commonly affected by luxation injuries, while permanent teeth are more prone to crown fractures due to their rigid structure (Zhang et al., 2014). Studies from urban areas such as Xi'an, China, report concussion injuries as the most common type of trauma, followed by subluxation, lateral luxation, and avulsion (Zhang et al., 2014). In Hong Kong, luxation injuries account for 50.1% of dental trauma cases among primary school children (Cho, 2015).

## Classification of Dental Trauma

Dr. Jens Ove Andreasen's classification system remains the gold standard for categorizing dental trauma. It divides injuries into four main types:

1. **Injuries to hard dental tissues and pulp:** Includes enamel fractures and crown-root fractures.
2. **Injuries to periodontal tissues:** Covers luxation injuries such as concussion, subluxation, extrusive luxation, intrusive luxation, and lateral luxation.
3. **Injuries to supporting bone:** Includes fractures of the alveolar process.
4. **Injuries to gingival or oral mucosa:** Encompasses lacerations, contusions, and abrasions (Andreasen & Ahrensburg, 2012).

Luxation injuries, which involve displacement of teeth, are particularly complex and demand meticulous management. Avulsion injuries, where the tooth is completely displaced from its socket, are among the most severe forms of trauma, requiring immediate intervention to optimize outcomes (Huang et al., 2024).

## Pathophysiology of Traumatic Dental Injuries

### Pulp Tissue Changes

Dental pulp injuries often occur when the blood supply to the tooth is disrupted. Prolonged ischemia leads to compromised oxygen delivery, eventually resulting in pulp necrosis, inflammation, or pulp canal obliteration (Lauridsen et al., 2012). Immature teeth, characterized by an open apex, have a better prognosis for pulp regeneration due to their enhanced vascular supply and healing potential compared to mature teeth (Huang et al., 2024).

### Periodontal Ligament (PDL) Changes

The periodontal ligament (PDL), which connects the tooth to the alveolar bone, is highly susceptible to trauma. Luxation injuries can stretch or tear the PDL fibers, while avulsion injuries can lead to its complete detachment. If the tooth is left dry for more than 60 minutes, PDL cells

can die, increasing the risk of external root resorption, ankylosis, or even tooth loss (De Brier et al., 2020).

### **Hard Tissue Changes**

Trauma can also lead to microcracks in the enamel and dentin, compromising the structural integrity of the tooth. Severe injuries, such as crown-root fractures, may expose the pulp, necessitating immediate intervention to prevent infections and further complications (Bourguignon et al., 2020).

### **Diagnosis of Dental Trauma**

Accurate diagnosis is critical for effective management. A comprehensive diagnostic process involves:

- **Clinical Examination:** Assessment of tooth mobility, discoloration, tenderness, and pulp exposure.
- **Pulp Vitality Testing:** Techniques such as electric pulp testing and laser Doppler flowmetry help evaluate the health of the pulp (Yang et al., 2023).
- **Radiographic Imaging:** Periapical and panoramic radiographs are essential for detecting fractures, root resorption, and other complications (Kühnisch et al., 2020).

In cases of luxation or avulsion, radiographs also help assess the condition of the adjacent alveolar bone and the position of the tooth root.

### **Management of Dental Trauma**

#### **Luxation Injuries**

Management of luxation injuries varies based on the type and severity:

- **Concussion and Subluxation:** These injuries usually require minimal intervention, such as observation, occlusal adjustments, and monitoring for pulp necrosis (Bourguignon et al., 2020).
- **Extrusive, Intrusive, and Lateral Luxation:** These require repositioning, splinting, and follow-up to monitor pulp and PDL health (Fouad et al., 2020).

#### **Avulsion Injuries**

For avulsed teeth, rapid replantation is crucial. If immediate replantation is not possible, the tooth should be stored in a suitable medium such as milk, saline, or Hank's Balanced Salt Solution to preserve PDL viability (De Brier et al., 2020). Replanted teeth should be splinted and monitored for signs of ankylosis or resorption.

### **Endodontic Considerations**

Teeth with closed apices are more likely to require root canal treatment following trauma, especially in cases of pulp necrosis. In contrast, teeth with open apices may benefit from regenerative endodontic procedures to encourage apexogenesis (Galler et al., 2016).

### **Long-Term Complications of Dental Trauma**

If dental trauma is not managed promptly or effectively, several long-term complications may arise, including:

1. **Pulp Necrosis:** A common outcome of severe luxation or avulsion injuries (Lauridsen et al., 2012).
2. **Root Resorption:** External or internal root resorption can occur due to delayed replantation or improper handling of avulsed teeth (Abbott, 2016).

3. **Tooth Discoloration:** Teeth may take on a pink, gray, or yellowish hue, indicating pulp necrosis or calcification (Nolte et al., 2020).
4. **Ankylosis:** Frequently seen in avulsed teeth that have been replanted after prolonged dry storage (Huang et al., 2024).

### Psychosocial Impact of Dental Trauma

Dental trauma can have profound psychological and social effects, particularly in children and adolescents. Compromised aesthetics, functional impairments, and social stigma can lead to reduced self-esteem and emotional distress (Lee & Divaris, 2009). Early intervention and counseling are critical to addressing these challenges.

### Prevention of Dental Trauma

Prevention strategies play a vital role in reducing the incidence of dental trauma. These include:

- **Use of Mouthguards:** Particularly in contact sports, mouthguards significantly reduce the risk of dental injuries (Dursun et al., 2015).
- **Public Education:** Raising awareness about the importance of immediate care for dental trauma, such as proper handling of avulsed teeth, can improve outcomes (Bourguignon et al., 2020).
- **Regular Dental Check-Ups:** Dentists can identify and address potential risk factors, such as malocclusion or protruding teeth, through early orthodontic intervention (Zaleckiene et al., 2014).

### Conclusion

Dental trauma is a prevalent and multifaceted condition requiring timely and effective management to prevent long-term complications. Advances in diagnostic tools, regenerative treatments, and evidence-based guidelines have significantly improved the prognosis for patients with traumatic dental injuries. However, public awareness, preventive measures, and adherence to clinical protocols remain critical in mitigating the impact of dental trauma on individuals and communities. Future research should focus on developing innovative therapies and refining treatment protocols to enhance outcomes for patients across all age groups.

### References

- Abbott, P. V. (2016). Prevention and management of external inflammatory resorption following trauma to teeth. *Australian Dental Journal*, 61(1), 82–94.
- Andreasen, J. O., & Ahrensburg, S. S. (2012). History of the dental trauma guide. *Dental Traumatology*, 28(5), 336–344.
- Bourguignon, C., et al. (2020). International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. *Dental Traumatology*, 36(4), 314–330.
- De Brier, N., et al. (2020). Storage of an avulsed tooth prior to replantation: A systematic review and meta-analysis. *Dental Traumatology*, 36(5), 453–476.
- Dursun, E., et al. (2015). Prevalence of dental trauma and mouthguard awareness among weekend warrior soccer players. *Journal of Oral Science*, 57(3), 191–194.
- Fouad, A. F., et al. (2020). International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. *Dental Traumatology*, 36(4), 331–342.

- Galler, K. M., et al. (2016). European Society of Endodontology position statement: Revitalization procedures. *International Endodontic Journal*, 49(8), 717–723.
- Huang, R., Zhou, C., Zhan, L., Liu, Y., Liu, X., Du, Q., Wang, J., Zhao, W., Song, G., Wu, L. A., Jiang, B., Li, Y., Zhang, H., & Zou, J. (2024). Experts consensus on management of tooth luxation and avulsion. *International Journal of Oral Science*, 16(1), 57. <https://doi.org/10.1038/s41368-024-00321-z>
- Lauridsen, E., et al. (2012). Combination injuries 1: The risk of pulp necrosis in permanent teeth with concussion injuries and concomitant crown fractures. *Dental Traumatology*, 28(5), 364–370.
- Lee, J. Y., & Divaris, K. (2009). Hidden consequences of dental trauma: The social and psychological effects. *Pediatric Dentistry*, 31(2), 96–101.
- Levin, L., et al. (2020). International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: General introduction. *Dental Traumatology*, 36(4), 309–313.
- Nolte, F. M., Aydin, B., & Kuitert, R. B. (2020). Transient pink tooth discoloration during orthodontic treatment. *Nederlands Tijdschrift voor Tandheelkunde*, 127(12), 677–681.
- Patnana, A. K., et al. (2021). The prevalence of traumatic dental injuries in primary teeth: A systematic review and meta-analysis. *Dental Traumatology*, 37(6), 383–399.
- Petti, S., Glendor, U., & Andersson, L. (2018). World traumatic dental injury prevalence and incidence, a meta-analysis—One billion living people have had traumatic dental injuries. *Dental Traumatology*, 34(2), 71–86.
- Yang, K., et al. (2023). Laser Doppler flowmetry to detect pulp vitality: Clinical reference range and coincidence rate for pulpal blood flow in permanent maxillary incisors in Chinese children. *BMC Oral Health*, 23(1), 283.
- Zaleckiene, V., et al. (2014). Traumatic dental injuries: Etiology, prevalence, and possible outcomes. *Stomatologija*, 16(1), 7–14.
- Zhang, Y., et al. (2014). A retrospective study of pediatric traumatic dental injuries in Xi'an, China. *Dental Traumatology*, 30(3), 211–215.