The International Association of Dental Traumatology 2007 Guidelines for Fractured Teeth & Luxation Injuries

Treatment guidelines for fractures of teeth and alveolar bone

Clinical findings	Radiographic findings	Treatment
Uncomplicated crown fracture • Fracture involves enamel or dentin and enamel; the pulp is not exposed. • Sensibility testing may be negative initially indicating transient pulpal damage; monitor pulpal response until a definitive pulpal diagnosis can be made	• The 3 angulations described in radiographic examination to rule out displacement or fracture of the root • Radiograph of lip or cheek lacerations is recommended to search for tooth fragments or foreign material	• If tooth fragment is available, it can be bonded to the tooth. • Urgent care option is to cover the exposed dentin with a material such as glass ionomer or a permanent restoration using a bonding agent and composite resin • Definitive treatment for the fractured crown may be restoration with accepted dental restorative materials
Complicated crown fracture • Fracture involves enamel and dentin and the pulp is exposed. • Sensibility testing is usually not indicated initially since vitality of the pulp can be visualized. Follow-up control visits after initial treatment includes sensibility testing to monitor pulpal status	• The 3 angulations described in radiographic examination to rule out displacement or fracture of the root. Radiograph of lip or cheek lacerations is recommended to search for tooth fragments or foreign material. • The stage of root development can be determined from the radiographs	• In young patients with immature, still developing teeth, it is advantageous to preserve pulp vitality by pulp capping or partial pulpotomy. This treatment is also the choice in young patients with completely formed teeth. Calcium hydroxide and MTA (white) are suitable materials for such procedures. • In older patients, root canal treatment can be the treatment of choice, although pulp capping or partial pulpotomy may also be selected. • If too much time elapses between accident and treatment and the pulp becomes necrotic, root canal treatment is indicated to preserve the tooth. • In extensive crown fractures a decision must be made whether treatment other than extraction is feasible
Crown-root fracture • Fracture involves enamel, dentin and root structure; the pulp may or may not be exposed. Additional findings may include loose, but still attached, segments of the tooth • Sensibility testing is usually positive	• As in root fractures, more than one radiographic angle may be necessary to detect fracture lines in the root (see radiographic examination)	• Treatment recommendations are the same as for complicated crown fractures (see above).In addition, attempts at stabilizing loose segments of the tooth by bonding may be advantageous, at least as a temporary measure, until a definitive treatment plan can be formulated
Root fracture • The coronal segment may be mobile and may be displaced. • The tooth may be tender to percussion. • Sensibility testing may give negative results initially, indicating transient or permanent pulpal damage; monitoring the status of the pulp is recommended. Transient crown discoloration (red or grey) may occur	• The fracture involves the root of the tooth and is in a horizontal or diagonal plane. Fractures that are in the horizontal plane can usually be detected in the regular 90° angle film with the central beam through the tooth. This is usually the case with fractures in the cervical third of the root. If the plane of fracture is more diagonal, which is common with apical third fractures, an occlusal view is more likely to demonstrate the fracture including those located in the middle third	• Reposition, if displaced, the coronal segment of the tooth as soon as possible. Check position radiographically. Stabilize the tooth with a flexible splint for 4 weeks. If the root fracture is near the cervical area of the tooth, stabilization is beneficial for a longer period of time (up to 4 months). • It is advisable to monitor healing for at least1 year to determine pulpal status. If pulp necrosis develops, root canal treatment of the coronal tooth segment to the fracture line is indicated to preserve the tooth
Alveolar bone fracture • The fracture involves the alveolar bone and may extend to adjacent bone. Segment mobility and dislocation are common findings. An occlusal change due to misalignment of the fractured alveolar segment is often noted. • Sensibility testing may or may not be positive	• Fractures lines may be located at any level, from the marginal bone to the root apex. The panoramic technique is of great help in determining the course and position of fracture lines	• Reposition any displaced segment and then splint. Stabilize the segment for 4 weeks

Treatment guidelines for luxation injuries

Clinical findings	Radiographic findings	Treatment
Concussion • The tooth is tender to touch or tapping; it has not been displaced and does not have increased mobility. • Sensibility tests are likely to give positive results	• No radiographic abnormalities	• No treatment is needed. Monitor pulpal condition for at least 1 year
Subluxation • The tooth is tender to touch or tapping and has increased mobility; it has not been displaced. Bleeding from gingival crevice may be noted. • Sensibility testing may be negative initially indicating transient pulpal damage. Monitor pulpal response until a definitive pulpal diagnosis can be made	• Radiographic abnormalities are usually not found	• A flexible splint to stabilize the tooth for patient comfort can be used for up to 2 weeks
Extrusive luxation • The tooth appears elongated and is excessively mobile. • Sensibility tests will likely give negative results. In mature teeth, pulp revascularization some times occurs. In immature, not fully developed teeth, pulpal revascularization usually occurs	• Increased periodontal ligament space apically	• Reposition the tooth by gently re-inserting it into the tooth socket. Stabilize the tooth for 2 weeks using a flexible splint. Monitoring the pulpal condition is essential to diagnose root resorption. In immature developing teeth, revascularization can be confirmed radiographically by evidence of continued root formation and pulp canal obliteration and usually return to response to sensibility testing. In fully formed teeth, a continued lack of response to sensibility testing should be taken as evidence of pulp necrosis together with periapical rarification and sometimes crown discoloration
Lateral luxation • The tooth is displaced, usually in a palatal/lingual or labial direction. It will be immobile and percussion usually gives a high, metallic • (ankylotic) sound. Sensibility tests will likely give negative results. In immature, not fully developed teeth, pulpal revascularization usually occurs	• The widened periodontal ligament space is best seen on eccentric or occlusal exposures	• Reposition the tooth with forceps to disengage it from its bony lock and gently reposition it into its original location. Stabilize the tooth for 4 weeks using a flexible splint. Monitor the pulpal condition. If the pulp becomes necrotic, root canal treatment is indicated to prevent root resorption. In immature, developing teeth, revascularization can be confirmed radiographically by evidence of continued root formation and possibly by positive sensibility testing. In fully formed teeth, a continued lack of response to sensibility testing indicates pulp necrosis, along with periapical rarification and sometimes crown discoloration
Intrusive luxation • The tooth is displaced axially into the alveolar bone. It is immobile and percussion may give a high, metallic (ankylotic) sound. Sensibility tests will likely give negative results. • In immature, not fully developed teeth, pulpal revascularization may occur	• The periodontal ligament space may be absent from all or part of the root	• Teeth with incomplete root formation: Allow spontaneous repositioning to take place. If no movement is noted within 3 weeks, recommend rapid orthodontic repositioning. • Teeth with complete root formation: The tooth should be repositioned either orthodontically or surgically as soon as possible. The pulp will likely be necrotic and root canal treatment using a temporary filling with calcium hydroxide is recommended to retain the tooth

Courtesy of Catherine A. Hebert, DDS – Endodontic Center phone/(985) 626-0111 fax/(985) 626-0164 email: endocenter@aol.com website: www.endodonticcenter.com

Catherine A. Hebert, DDS
Endodontic Center

2007 IADT Guidelines

- Advanced Microscope and Digital Technology
- Comprehensive Fiber-Optic Enhanced Diagnostics
- Micro-Endodontic Care with a Focus on Relaxation

Follow-up procedures for fractured teeth and alveolar fractures

Time	4 weeks	6–8 weeks	4 months	6 months	1 year	5 years
Uncomplicated crown fracture		C(1)			C(1)	
Complicated crown fracture		C(1)			C(1)	
Crown-root fracture		C(1)			C(1)	
Root fracture	S + C(2)	C(2)	S(*) + C(2)	C(2)	C(2)	C(2)
Alveolar fracture	S + C(3)	C(3)	C(3)	C(3)	C(3)	C(3)

S, splint removal. S (*), splint removal in cervical third fractures. C, clinical and radiographic examination.

Follow-up procedures for luxated permanent teeth

Time	Up to 2 weeks	4 weeks	6–8 weeks	6 months	1 year	Yearly for 5 years
Concussion/subluxation		C(1)	C(1)		C(1)	N/A
Extrusive luxation	S+C (2)	C(3)	C(3)	C(3)	C(3)	C(3)
Lateral luxation	C(3)	S	C(3)	C(3)	C(3)	C(3)
Intrusive luxation	C(4)		C(4)	C(4)	C(4)	C(4)

S, splint removal. C, clinical and radiographic examination. NA, not applicable.

Favorable & unfavorable outcomes include some, but not necessarily all of the following

Favorable outcome	Unfavorable outcome
• Asymptomatic; positive response to pulp testing; continuing root development in immature teeth. Continue to next evaluation • Positive response to pulp testing (false negative possible up to 3 months). Signs of repair between fractured segments. Continue to next evaluation • Positive response to pulp testing (false negative possible up to 3 months). No signs of apical periodontitis. Continue to next evaluation	• Symptomatic; negative response to pulp testing; signs of apical periodontitis; no continuing root development in immature teeth. Root canal treatment is indicated • Negative response to pulp testing (false negative possible up to 3 months). Clinical signs of periodontitis. Radiolucency adjacent to fracture line. Root canal treatment is indicated only to the line of fracture • Negative response to pulp testing (false negative possible up to 3 months). Signs of apical periodontitis or external inflammatory resorption. Root canal treatment is indicated

Favorable & unfavorable outcomes include some, but not necessarily all of the following

Favorable outcome	Unfavorable outcome
• Asymptomatic; positive response to pulp testing (false negative possible up to 3 months); continuing root development in immature teeth; intact lamina dura • Minimal symptoms; slight mobility; no excessive radiolucency periradicularly • Asymptomatic; clinical and radiographic signs of normal or healed periodontium; positive response to pulp testing (false negative possible up to 3 months). Marginal bone height corresponds to that seen radiographically after repositioning • Tooth in place or erupting; intact lamina dura; no signs of resorption. In mature teeth, start the root canal treatment within the first 3 weeks	• Symptomatic; negative response to pulp testing (false negative possible up to 3 months); no continuing root development in immature teeth, periradicular radiolucencies • Severe symptoms; excessive mobility; clinical and radiographic signs of periodontitis. Root canal treatment is indicated in a closed apex tooth. In immature teeth, apexification procedures are indicated • Symptoms and radiographic sign consistent with periodontitis; negative response to pulp testing (false negative possible up to 3 months); breakdown of marginal bone. Splint for additional 3- to 4-week period; root canal treatment is indicated if not previously initiated; chlorhexidine mouth rinse • Tooth locked in place/ankylotic tone; radiographic signs of apical periodontitis; external inflammatory resorption or replacement resorption

Splinting guidelines for tooth/bone fractures and luxated/avulsed teeth

Type of injury	Subluxation, Extrusive luxation, Avulsion	Lateral luxation, Root fracture (middle third), Alveolar fracture	Root fracture (cervical third)
Splinting time	2 weeks	4 weeks	4 months

Type of splints - Acid-etch bonded composite splints are recommended, e.g. wire-composite splints and TTS (titanium trauma splint). For detailed description of splinting see current textbooks

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