Dental traumatic injuries in sports accidents

Schulze A[1]
General Outpatient Ambulance and Dental Ambulance of the Institute of Sports Medicine, University of Leipzig

Summary
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Introduction

Dental injuries belong to the most frequent traumatic orofacial injuries. Some sports are correlated with a high risk of dental injuries, most crown fractures result from a high-velocity object, such as a ball or hockey stick, or from falls and collisions with other persons. Dentoalveolar trauma occurred most frequently in skateboarding, gymnastics, swimming, ice sports, inline skating, squash, and bicycling. The damage or loss of a tooth causes high expenses in the following lifetime. Front-tooth damage or loss may cause additional aesthetical problems. Especially children and young people have a 50% risk for dental injury while growing up, 39% of all dental injuries in adolescents happen in public sports facilities.
Three basic categories of traumatic injuries to the oral cavity will be discussed:
Teeth, periodontal tissues, and supporting bone.

Teeth
Crown fractures
Dental crown fractures occur more frequently in permanent teeth, mostly the maxillary central incisor is affected. Direct high-velocity trauma is more likely to fracture the teeth. The physiologic and especially severe overjet predispose a maxillary incisor to fracture, especially if there is lack of lip coverage. Alternatively, good lip coverage will diffuse the force, and distribute the energy of impact over a wider area, causing greater surrounding hard- and soft-tissue damage.

The percentage of front teeth damage is as follows (Schützmansky):

77% maxillary central incisor
8% mandibular central incisor
6% maxillary lateral incisor
3% mandibular lateral incisor

The intra- and extraoral wounds must be explored for foreign matter, tooth fragments and debrided before suturing.

The classification of crown fractures is the following:

Crown fractures involving enamel, enamel and dentin, and pulp
Enamel infraction is an enamel crack usually parallel to enamel prisms and extends to the dentin-enamel junction. Sensitivity to temperature, sweets, or biting pressure may result. Bonding restorations can arrest the progression of enamel infraction. Enamel fracture with loss of enamel substance can be restorated with acid-etch bonding of composite for aesthetics. The oral cavity, lips and tongue should be routinely examined for tooth fragments. In case of dentin fracture an adequate pulpal protection and acid-etch composite restoration is the therapeutic measure. Tooth fragments also could be helpful to restore the tooth in perfect aesthetic way.
Crown Fractures involving pulp often result in sensitivity to hot, cold, sweet over a time period of 6 to 8 weeks, correlating to formation of reparative dentin. Crown fractures involving the pulp require a pulpal protective treatment (capping with calcium hydroxide) to prevent infection. If left untreated, the fracture will lead to either a proliferative or destructive response. Bacterial infection will necessitate pulpotomy (removal of inflamed pulp tissue), or pulpectomy and root canal therapy. In case of immature teeth, it is essential that pulpal vitality is maintained to allow completion of root development.

Signs of successful pulp capping and pulpotomy are absence of pain, negative percussion, normal thermal sensitivity, absence of radiographic periapical pathosis, and radiographic evidence of continued root development. Complications are internal resorption, and pulp necrosis. Patients should be recalled to monitor pulp vitality at 1, 3, and 6 months after trauma. Thereafter pulp vitality should be evaluated at 6-month intervals for several years. Pain, palpation, percussion, and radiography are more indicative than electrical and thermal pulp tests.

Crown-root fractures

There are two categories:

1. Uncomplicated – involving enamel, dentin, and cementum. The tooth can be restored by bonding or crown

2. Complicated – involving enamel, dentin, cementum, and pulp. This requires root canal therapy so that a post and crown may be incorporated. If the coronal fragment comprises more than one third of the clinical root length, the tooth is indicated for removal. Extraction is also indicated for vertical root fractures.

Root fractures

Root fractures occur in 7% or fewer of injuries to permanent teeth. Most remain vital, only 20% to 40% become nonvital. Percussion, sensitivity to biting pressure, mobility, and radiographic evidence confirm the diagnosis. Prompt reduction and fixation with a rigid acid-etched splint for 3 to 6 months will promote healing by calcific callus formation internally on the root canal wall and externally on the root surface.

Periodontal tissues

Nondisplacement injuries

Nondisplacement injuries are characterized by edema, bleeding, and trauma to periodontal ligament fibers. Clinically, there is sensitivity to biting pressure, percussion and palpation, so a relief of the occlusion and a soft diet is recommended. Radiographic follow-up evaluation for 1 year is advisable to rule out the need for endodontic therapy.

In case of a subluxation occurs a loosening in the horizontal direction without clinical or radiographic displacement. In case of significant mobility, a short-term splinting may be used.

Displacement

Displacement injuries often occur as the result of low-velocity trauma. Characteristics are swelling, discoloration of the crown, mobility, or a change in their occlusion. Primary teeth are more apt to be displaced than permanent teeth. About 50% of permanent teeth with displacement injuries will require root canal therapy. Major complications are pulpal necrosis, root resorption, pulp calcification and obliteration, and loss of alveolar crestal bone height. To limit mobility and promote healing, splinting may be needed. Splinting time for luxated teeth can range between 2 to 3 weeks, depending on the severity of the injury. When two or more neighboring teeth are able to be moved jointly as a block, the alveolar bone is fractured.

Intrusion

With intrusions the highest incidence of pulpal necrosis in teeth occurs (96%). An intruded tooth with incomplete root formation will sometimes spontaneously reerupt. Mature teeth should be treated by orthodontic extrusion back into position.

Avulsion

Avulsion is the complete displacement of the tooth from its socket. The maxillary central incisors are the most frequently avulsed teeth. The sooner an avulsed tooth is replanted, the better its chances of survival. Immature teeth with incomplete root formation have a potential to revitalize and survive. Maintenance of periodontal ligament integrity is critical, therefore no attempt to scrub, treat chemically, or sterilize the tooth should be made. The tooth should be handled by its crown rather than by its root. Avoid wrapping the tooth in tissue paper, and removing the debris. The tooth should be transported in a toothsafer (Dentosafe ®), normal saline, or cold pasteurized milk according to availability in an emergency. Intraoral storage is not recommended because the tooth can be aspirated or swallowed and saliva has much bacteria. In situations where replantation is delayed more than 20 minutes, the type of storage media and the method of handling become important issues. A tooth allowed to air dry will lead to periodontal ligament necrosis with replacement resorption (ankylosis) or inflammatory resorption (external root resorption). Infection prevention is also a good reason to initiate immediate antibiotic therapy after replantation. Patients who have not been immunized previously should receive human tetanus immune globulin. Revascularization is a possibility in replanted immature teeth with open apices. Conversely untreated avulsed teeth with mature roots always develop pulpal necrosis and external root resorption. These teeth must be monitored closely for signs of degeneration. Replanted teeth undergo gradual ankylosis but are capable of functioning for many years.

More than half of all facial sports injuries involve either fractures of the alveolar process or luxation of teeth. Protection from hard- and soft-tissue injuries, jaw fractures are obvious goals of mouth protection. Gum shields are an important preventive aid which works best when produced individually in accordance with specific sports requirements. Custom-made mouth protectors offer the greatest comfort, fit and durability. An efficient, comfortable, and properly-fitted mouthguard can reduce the sports-related dental injuries up to 60%. It protects tongue, lips and cheeks against bite-lesions. The mouthguard absorbs blows and shocks due to its elasticity and is on the other hand rigid enough to spread the energy away from the teeth to at most large surfaces. In consequence of shock absorbency and force distribution alveolar and dental fractures are minimized, and concussions occur up to 16 fold more rare. An absolute indication for a mouthguard is an overjet greater than 3 mm or an insufficient lip-closing.

Additional recommended literature

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Contact: Antina Schulze, DDS
University of Leipzig
Institute of Sports Medicine
Sports Dentistry
Marschner Str. 29
04109 Leipzig

a.schulze@uni-leipzig.de