

DENTAL INJURIES FROM SPORTS TRAUMA: REVIEW AND CASE STUDY



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PREVALENCE OF SPORTS-RELATED DENTAL INJURIES

As a growing number of individuals become involved in athletics and recreational activities, the prevalence of sports-related dental injuries continues to rise.¹ This trend is perhaps most evident in adolescents, for whom it is estimated that trauma as a result of sports accounts for 36% of all injuries annually in the U.S.² The prevalence of sports injuries has been analyzed in terms of age, gender, type of sport, cause and type of injury, and yearly and monthly distribution by a number of sources.

Studies reveal that 13% to 39% of dental trauma is sports-related.

DATA

Although the absence of a central data-gathering center has been the basis for significant variance amongst injury rates, the results of such studies have been beneficial in the treatment and prevention of orofacial sports injuries.³ Data concerning sports-related trauma can vary depending on geographical location, as the popularity and predominance of different sports varies by region. Statistics also depend upon method of data collection, sample size and age group, and varying levels of competition. These figures are often obtained from insurance companies, representing only a portion of the actual accidents that can be attributed to sports.⁴ In the pediatric population, injuries occur frequently during informal sporting activities and are often considered play-related accidents instead of sports-related accidents, contributing another possible source of inaccuracy and underestimation.⁵

A 10-year study of sport-related injuries in Austria found the 10- to 19-year-old age group demonstrated the greatest incidence of sports

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Figure 1: Fractured upper left central incisor.



Figure 2: Full face; fractured upper left central incisor.

injuries.⁶ Men and boys accounted for 68% of the injuries, more than twice the proportion of injuries sustained by women and girls (32%).⁶ The most common sources of trauma were falls and collisions with other players; other causes included being struck by one's own equipment, collisions with obstacles, and traffic collisions.⁶ Sports-related injuries have been found to account for 31.3% of all cases of facial trauma, behind only household and play accidents.⁶

STUDIES

Studies reveal that 13% to 39% of dental trauma is sports-related.⁶ Dental injuries occur most commonly in collision and contact sports.³ The National Youth Sports Foundation for Prevention of Athletic Injuries, Inc., has estimated a one in 10 risk of orofacial injury for sports participants in a single athletic session.⁷ Orofacial injuries include soft tissue lacerations, chipped or avulsed teeth, and mandibular/maxillary fractures.³ A number of studies have shown the maxillary

central incisors to be the most frequently injured teeth.^{3,4}

Dental trauma in the young athlete is especially serious, as injury can result in long-term complications: Retardation of growth, ankylosis of the teeth, fractures, endodontic necrosis, and partial or complete tooth avulsion.⁴ Athletes undergoing orthodontic treatment may be at even greater risk of sports-related injuries, as lip entrapment, lip laceration, tooth avulsion, and other complications have been reported as outcomes in the past.^{8,9}

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BASKETBALL

Basketball accounts for a significant number of sports injuries, surpassing trauma rates for popular contact sports such as football and ice hockey.³ Even at the amateur level, football players are required to wear helmets with face shields and mouth guards; basketball players currently have no such rule.³

Dental injury rates among basketball players wearing mouthguards were significantly lower than in athletes without protection.¹⁰ Younger basketball players, as is the case in many sports, tend to suffer more dental trauma while playing than do older athletes.³

HOCKEY

Ball sports and stick-and-ball sports are considered most dangerous, accounting for 59% of orofacial injuries caused by athletics.¹¹ Fortunately, ice hockey, field hockey, and lacrosse have all adopted policies requiring the use of mouthguards in order to protect players from such trauma.³ Although to a lesser extent, despite these precautions, orofacial trauma still prevails.³ Dental injuries among ice hockey players were significantly higher than those among football players in a series of studies conducted between 1988 and 1995.³ It was also found that players wearing half-face shields alone were 10 times more likely to experience a dental injury than those equipped with full-face shields.¹² Of all injuries sustained in hockey, 11.5% are dental trauma.¹³

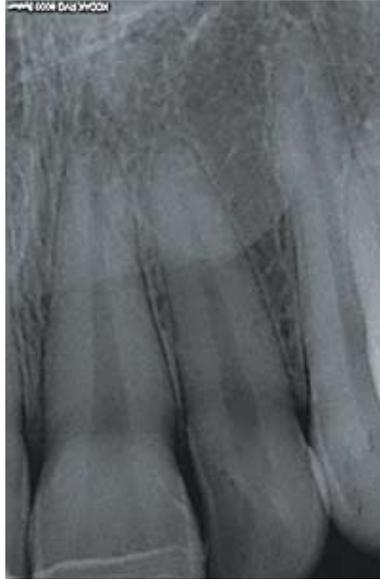


Figure 3: Radiograph of fractured upper left central incisor after provisionalization.

BASEBALL

Possibilities for injury are abundant in baseball and softball, as players face the risk of being hit with either a bat or ball, in addition to collision with other athletes.³ Pitchers are perhaps at the greatest risk, positioned in close proximity to the batter and hard-hit balls.¹⁴ A 1998 study found that 75% of baseball coaches reported at least one dental injury among players.¹⁵ Currently, studies indicate much lower incidence rates of orofacial trauma in softball than in baseball.³

FOOTBALL

Prior to mouthguard use in the 1950s, 54% of all football injuries were of the orofacial class.¹⁶ Since mandating the use of protective facemasks and mouthguards in the U.S., the rate of dental injuries in the sport have been reduced significantly.³ A low 2.8% dental trauma rate among football players at the

college level can likely be credited to the use of this preventive gear.^{17,18}

OTHER SPORTS

Other sports, including gymnastics, martial arts, boxing, wrestling, and even swimming also contribute to the number of dentofacial injuries suffered by athletes each year.³ Although gymnasts do not come into physical contact with one another, they may suffer dental injuries from falls and facial contact with the equipment. Because martial arts, boxing, and wrestling involve much physical contact with an opponent, they pose a significant risk for orofacial damage. In one study, more than 50% of wrestlers interviewed had suffered some type of dental trauma.¹⁹ Extreme sports such as skateboarding and snowboarding contribute to rates of dental injury as well, as protection for the mouth and dentition is rarely utilized.

PREVENTION

Prevention of sports-related orofacial trauma is contingent upon further research and the acquisition of reliable data pertaining to the causes and outcomes of different types of sports injuries.²⁰ Increasing public awareness of the risks involved in sports participation and the importance of preventive measures may result in the decline of sports accidents. Fortunately, dental trauma as a result of athletic activity can often be minimized or prevented with the use of protective mouthguards.

MOUTHGUARDS

Mouth protection for athletes was introduced over 100 years ago, but has yet to be mandated in most sports.³ The mouthguard is a simple, economical, and effective method of preventing injury to the mouth and dentition during sport. The mouthguard's proficiency has been best illustrated through the significant reduction of dental injuries in con-



Figure 4: Provisionalization with reattached fragment, upper left central incisor.



Figure 5: Trans-illumination of upper central incisors for ceramist.

tact sports such as hockey and football, where their use has become obligatory.⁴ The strength required to cause dental injury and damage to the alveolar structure is significantly greater under the protection of a mouthguard.²¹

The notion that mouthguard wear is unnecessary in children prior to the loss of primary teeth is a common misconception. In fact, trauma to the primary teeth can cause serious defects in the permanent dentition.²² Studies reveal low mouthguard use among adolescents in sports when compared to adults.⁴ Children are also more likely to utilize "boil and bite"-style guards in contrast to adults, who report using a greater proportion of the custom-fitted type.²³

Mouthguards are often associated with discomfort, bulkiness, complications in speaking, and difficulty breathing. Through a better fit, the custom-made mouthguard provides the athlete with greater comfort and ability to converse.²⁴

The regular replacement of mouthguards with aging is important in children, as changes in den-

tion can occur rather rapidly.⁴ For this reason, it is recommended that mouthguard fit be assessed by a dentist with each sports season and in conjunction with routine dental exams.⁴

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Mouthguards are required in the U.S. for athletes participating in football, boxing, ice hockey, field hockey, and lacrosse.³ Outside of these sports, mouthguard use is limited, and therefore dental injury is of greater prevalence.³ Mouthguards have consistently been shown to reduce the number and severity of dental injuries.⁴ They may also be effective in preventing concussion in athletes sustaining sports injuries.²⁵ The importance of utilizing this protective measure should be stressed by dental professionals. Equally as important, the regulatory bodies that govern organized youth sports should be encouraged to mandate mouthguard wear in order

to provide athletes with greater protection.

CASE STUDY

The patient was a 16-year-old healthy female who had completed orthodontic treatment and whitening. She was an accomplished student athlete who played varsity girls' basketball and competed at Judo on a national level. She had sustained an injury when she fell on a gym floor, hitting her face and teeth. The upper left central incisor fractured (Figs 1 & 2). The fractured tooth was asymptomatic with no pulp exposure.

PROVISIONALIZATION

The tooth was provisionalized two hours after the accident. The fractured segment of the tooth had been recovered at the accident site. The tooth was anesthetized and the fractured segment and the tooth were both then cleaned with pumice and disinfectant. The fractured segment was then reattached with a highly filled bonding resin, following manufacturer's recommendations (PQ1, Ultradent Products;



Figure 6A: Try in of upper left central incisor, view one for shade refinement.



Figure 6B: Try in of upper left central incisor, view two for shade refinement.



Figure 6C: Try in of upper left central incisor, view three for shade refinement.

South Jordan, UT). The enamel and dentin were etched for 15 seconds with 35% phosphoric acid. The tooth was rinsed and lightly dried, leaving the surface moist. PQI was applied to the enamel and dentin. The bonding agent was air-thinned, then cured for 20 seconds. The fractured segment was etched in the same manner. PQI was then applied to the fractured segment and air-thinned; the segment was then positioned back on the tooth and the tooth was cured for 20 seconds on the facial and 20 seconds on the lingual (Figs 3 & 4).

RESTORATION

The final treatment was to be a porcelain veneer. Restoring a single central incisor can be one of the most challenging esthetic dental procedures. Great care in the selection of the restorative material, preparation, and information conveyed to the fabricating ceramist must be taken. The material selected was IPS Empress Esthetic (Ivoclar Vivadent; Amherst, NY), due to its enamel-like light-scattering properties and translucency. To ensure an optimum shade, the patient underwent a touch-up whitening treatment prior

to a final restoration (the patient had undergone in-office whitening a year prior to the accident). After provisionalizing the traumatized tooth, an in-office touch-up whitening session was performed using Opalescence Xtra (Ultradent), a 35% hydrogen peroxide gel. After isolation, the gel was applied for three consecutive 15-minute sessions. The patient then used TresWhite Supreme (Ultradent), a 10% hydrogen peroxide disposable tray product, for three days at one hour per day. The shade was allowed to stabilize for 14 days after the touch-up whitening.



Figure 7: Final restoration, upper left central incisor.



Figure 8: Restored smile.

PREPARATION APPOINTMENT

At the preparation appointment, local anesthesia was achieved. A complex shade mapping was drawn and trans-illumination was done on the upper right central incisor in order to view the dentin formation (Fig 5). The custom shade diagram, photographs of the shade tabs next to the teeth, and the photographs of the trans-illumination were sent to the ceramist. The tooth was prepared for a conservative porcelain veneer. The facial surface was reduced .75 mm. The facial preparation extended interproximally without breaking the remaining contacts. The enamel along the fracture was beveled to the lingual surface. The shade of the preparation was noted and photographed with a shade tab for the ceramist. Tissue retraction was accomplished with Expasyl (Kerr; Orange, CA). A full arch impression was taken with Impregum (3M ESPE; St. Paul, MN). A bite registration in centric relation was recorded and opposing impression was taken. Provisionalization was accomplished utilizing an RSVP (Cosmedent; Chicago, IL) stent as a custom matrix, in a "shrink wrap" technique. A thin layer of bonding

resin, Permaquik (Ultradent), was initially placed on the prepared and unetched tooth, and the bulk of the provisional was RSVP.

TRY-IN APPOINTMENT

Several weeks later the provisional was removed under local anesthetic. The porcelain veneer was tried in for shade and fit. At the try-in appointment, the restoration was determined to need a slightly brighter hue and to require additional superficial enamel characteristics to attain a closer likeness to the right central incisor. Multiple photographs from all angles were taken with the restoration seated on the preparation (Figs 6A-6C). The photographs and restoration were returned to the ceramist for the refinement of the shading. One week later, the patient was again anesthetized and the restoration was evaluated. Deemed an excellent match, the restoration was seated with Variolink II (Ivoclar Vivadent). Translucent base was used for cementation, which maximized the "chameleon" effect, allowing the healthy underlying tooth structure's color to come forth.

The restoration was cleaned with alcohol, etched with 9% hydrofluor-

ic acid for 15 seconds, treated with silane, and then treated with bond resin according to the manufacturer's directions. The prepared tooth was cleaned with Consepsis (Ultradent), a 2% chlorhexidine gluconate solution; etched with 35% phosphoric acid for 15 seconds; rinsed completely; and lightly air-dried but left moist. Then Excite (Ivoclar Vivadent) bond resin was applied, air-thinned, and cured for 20 seconds. A thin bond resin such as Excite provides good bond strength with very little thickness, which is desirable for the light transmission through the Empress restoration. The restoration was loaded with the translucent luting cement and seated in place. The excess material was removed with a brush. The restoration was then tacked into place with a 5-mm curing tip for 10 seconds. Any additional excess material was removed, then the restoration was fully cured into place with a full-size curing tip. The occlusion was checked. The layering, shading, and superficial characteristics of the restoration combined to make an excellent match to the patient's existing dentition (Figs 7 & 8).

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SUMMARY

Dental trauma from sports injuries is a common occurrence that seems to be increasing in frequency as a growing number of individuals participate in sporting activities. Many injuries are being prevented by the use of mouthguards; sports that mandate mouthguard use report lower rates of injury than sports that do not mandate such use. Athletes seem to comply better with wearing custom-fitted mouth guards than they do with alternative types. Dental traumas also occur during recreational activities and are harder to prevent, as mouthguards are rarely if ever worn at those times. The cosmetic dentist's role in the treatment of sports-related dental trauma is becoming more important than ever before, because as the prevalence of these injuries continues to rise with the ever-growing popularity of sports and recreational activities, the esthetic expectations of the athletes suffering trauma rise as well.

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