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# SPORTS INJURIES OF STOMATOGNATHIC SYSTEM WITH REFERENCE TO PREVENTION AND FIRST AID - REVIEW ARTICLE

*Brief systematic review*

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## ABSTRACT

**Introduction:** Engaging in sports is crucial for maintaining and enhancing the health of both children and adults. However, it can also be a cause of injuries with temporary or permanent consequences. The primary causes of sports injuries are mechanical forces acting during intense physical exertion. A significant number of sports injuries involve the stomatognathic system, often occurring suddenly and unexpectedly, accompanied by pain and bleeding. The complexity of injuries depends on the type of sport, the athlete's age, and the force's strength, leading to serious aesthetic, functional, psychological, and economic consequences for the injured.

**Purpose of the study:** The purpose of the study is to highlight the significant role of sports in physical and mental health, while also addressing potential injuries that may occur during sports activities, with a particular focus on dental and surrounding tissue injuries. The study emphasizes the importance of preventing traumatic and non-traumatic damage to dental tissues and surrounding structures through the mandatory use of sports mouthguards.

**Methods:** This review article focuses on enriching knowledge about dental traumas caused by sports injuries, their prevention, and trends in the therapy of dentoalveolar traumas.

**Results:** In this work, the authors aimed to briefly summarize, analyze, and present the latest available information from contemporary literature dealing with dentoalveolar traumas, including their causes, diagnosis, and treatment, while emphasizing the importance of prevention.

**Conclusion:** Sports injuries, with a specific emphasis on injuries to the stomatognathic system, whether occurring in recreational or competitive sports, require a serious approach in terms of prevention, diagnosis, and therapy. The education of sports professionals, coaches, sports doctors, parents, and athletes themselves on providing first aid for the occurrence of dentoalveolar traumas is of great importance.

**Keywords:** sports injuries, dental traumas, prevention, therapy of dentoalveolar traumas.

## INTRODUCTION

Engaging in sports is a crucial factor in preserving and improving the physical and mental health of both children and adults. The promotion of sports participation, especially in childhood, should be a priority role for teachers and educators due to the health benefits gained through involvement in sports activities. However, sports involvement carries the risk of acute injuries and illnesses.

Approximately 3 million sports injuries are reported annually among around 30 million children and adolescents participating in sports in the United States (Landry et al., 2007). A substantial number of these injuries involve the stomatognathic system, with one-third of all orofacial injuries occurring because of sports activities (Bubalo, V., 2014; Škrinjarić, et al., 2010). Besides maintaining health sports also play a significant social role focused on educational

educational values, allowing children to develop humane qualities and acquire true human values (Landry et al., 2007; Mirić, D., 2001; Đonlić et al., 2005.). However, sports involvement carries the risk of acute injuries and illnesses. Approximately 3 million sports injuries are reported annually among around 30 million children and adolescents participating in sports in the United States (Landry et al., 2007).

The stomatognathic system comprises teeth, upper and lower jaws, left and right temporomandibular joints, chewing muscles, lips, tongue, as well as blood vessels and nerves (Čatović, A., 1999). The coordinated functioning of all these structures is a prerequisite for the overall health of the body. Sports involvement entails a certain risk of orofacial system injuries, which can result from macrotrauma and microtrauma, potentially leading to temporary or permanent discontinuation of sports participation (Čatović, A., 1999). Unfortunately, orofacial sports injuries occur frequently, regardless of an athlete's training, equipment use, or preparedness. Injuries are significantly more common in contact sports (e.g., boxing), team sports (soccer, basketball, handball, rugby), winter and ice sports (hockey, skating, downhill skiing), extreme sports, etc. (World Dental Federation, 1990; American Academy of Pediatric Dentistry, 1996; Keith et al., 1994.). Various factors such as gender, athlete characteristics, age, orthodontic status, competitive level, player position in team sports, sports season, weather conditions, type of sports field, etc., also play a crucial role in the occurrence of orofacial sports injuries (American Academy of Pediatric Dentistry, 1996).

## TYPES OF OROFACIAL INJURIES

Injuries to the orofacial system can be classified based on numerous factors, with one of the most acceptable classifications being Andreasen's classification of dental trauma (Andreasen et al., 2008). This classification encompasses injuries to teeth, supporting structures, gingiva, and oral mucosa, considering anatomical, therapeutic, and prognostic factors. Applicable to both primary and permanent teeth, this classification includes injuries to hard dental tissues and pulp, as well as alveolar processes and supporting tissues (Andreasen et al., 2008).

Injuries to hard dental tissues and pulp include enamel infraction, enamel fracture, uncomplicated crown fracture (enamel and dentin), complicated crown fracture (enamel, dentin, and exposed pulp) (Andreasen et al., 2008).

Injuries involving hard dental tissues, pulp, and alveolar processes include crown and root fracture, root fracture, mandibular or maxillary dental socket fracture, mandibular or maxillary alveolar process fracture (Andreasen et al., 2008).

Injuries to periodontal tissues involve concussion, subluxation, extrusive luxation, lateral luxation, intrusive luxation, and avulsion (Andreasen et al., 2008). Injuries to gingiva or oral mucosa include gingival laceration, gingival contusion, and gingival abrasion (Andreasen et al., 2008).

Figure 1. A.Lateral luxation, B.Complicated fracture of the tooth crown, C. Tooth avulsion, D.Upper lip injury, E. Extrusive luxation, F. Intrusion luxation (27).



According to available literature, over 50% of all orofacial injuries involve soft tissue injuries, while dental injuries (e.g., crown and root fractures, alveolar socket fractures, dental alveolar bone fractures) occur in approximately 40% of cases. When discussing sports-related dental injuries, the majority are to the anterior teeth, specifically in the intercanine sector. Other types of stomatognathic injuries, such as temporomandibular joint injuries and jaw fractures, occur much less frequently, accounting for around 10% of cases (Andreasen et al., 2008; Ranalli et al., 2000; Jerolimov et al., 2006.).

## DIAGNOSTIC AND THERAPEUTIC PROTOCOL

When an orofacial injury occurs, it is crucial to implement a complete diagnostic protocol and assess the condition of the injured individual. In sports settings, due to various complicated factors, a shortened diagnostic procedure is usually conducted, focusing on providing first aid. Timely and detailed diagnostic procedures and therapeutic interventions are of particular importance in such types of traumas (Ranalli et al., 2000; Jerolimov et al., 2006; Saini, R., 2011.). According to the diagnostic protocol, a general medical examination of the athlete, in the case of orofacial trauma, should precede dental examination and therapy (Subramanian & Chogle 2009). Injured athletes may have associated life-threatening injuries or health obstacles that can affect (delay) the timing and manner of providing dental care. Concerning orofacial injuries, it is essential to note that such injuries may not be isolated but may be an integral part of serious head injuries (Knowlton et al., 1998; Padilla et al., 1993). After ruling out the possibility of airway obstruction caused by fractured teeth, blood, dental

Figure 2. Mouthguards: Extraoral guards, Interdental guards, Combined guards (Source: Internet)



prosthetics, and interdental guards, ensuring that the neurological status is normal, the patient is oriented in time and space, and the absence of headache, nausea, drowsiness, or unconsciousness of the injured, a detailed dental examination is initiated. This examination consists of extraoral and intraoral examinations (Knowlton et al., 1998; Padilla et al., 1993). It is crucial to gather information about the recent event preceding the trauma, obtained by answering three fundamental questions: where, how, and when? The extraoral examination involves inspecting the head, evaluating the appearance and condition of the skin, checking for abrasions, lacerations, contusions, edema, or ecchymosis. The color and vascularity of the face and mucous membranes are observed, as well as the appearance of the nose, ears, and eyes. When examining the temporomandibular joints and chewing muscles, the presence of pain and the range of motion, i.e., the ability to open the mouth, are assessed. The intraoral examination includes examining soft tissues, teeth, and jawbones. In cases of multiple injuries and hemorrhages, it is necessary to identify the bleeding site and appropriately manage it. If possible, X-ray images should be taken during the diagnostic protocol (Knowlton et al., 1998; Padilla et al., 1993; Subramanian & Chogle 2009). In the limited time and material conditions prevalent in sports fields, a shortened diagnostic protocol is performed, where diagnostics need to be adapted to the available resources. Inspection and palpation are the preferred methods.

During the examination, attention should be given to the following: 1. Are all teeth present? 2. Is there any bleeding? 3. Is there an injury to the tongue? 4. Are the teeth in both jaws approximately in the same position? 5. Is there swelling of the soft tissues? 6. Is there any mobility of teeth or jaw parts? 7. Is there a possibility of full-range mouth opening and closing?

First aid must be provided immediately at the location of the trauma, and treatment should be continued at an appropriate healthcare facility (Padilla et al., 1993; Subramanian & Chogle 2009).

## PREVENTIVE MEASURES

Engaging in sports can lead to injuries in any part of the body, with the head, especially the orofacial area, being the most exposed part in many sports (Padilla et al., 1993). It is crucial in sports to limit or completely eliminate the risk of injuries. Most sports injuries occur for predictable reasons, making preventive measures possible (Ranalli, 2000 & 2002; Jerolimov et al., 2006; Ileš, D., 2012). Injuries can occur during professional training and competitions, but they most commonly occur in amateur sports due to a lack of experience, coordination, and weaker physical fitness (Badel et al., 2004). Injuries result from contact with teammates, sports equipment, or falling to the ground. Contact sports belong to the high-risk sports group due to the frequency and severity of orofacial injuries, emphasizing the importance of prevention in such sports. In contact sports without sports equipment (boxing, kickboxing, taekwondo, wrestling, and others), there is close physical contact between teammates using uncontrolled force. In contact sports with sports equipment (soccer, basketball, handball, and others), athletes come into contact with sports equipment or other athletes. In both cases, contact can cause severe traumatic injuries to teeth and surrounding soft tissues, making the use of protective equipment extremely important (World Dental Federation, 1990). The goal of protective equipment is to reduce the possibility of athlete injuries, including injuries to the stomatognathic system, and mitigate the consequences if they occur (World Dental Federation, 1990). The World Dental Federation (FDI), in 1990, divided sports into two groups based on risk: high-risk sports (boxing, football, ice hockey, combat sports, and skating) and moderate-risk sports (basketball, water polo, handball, gymnastics, and baseball). For these sports, the protection of the orofacial system is recommended using various guards (Cathcart et al., 1951). All athletes engaged in sports considered high-risk are recommended to use mouthguards and mouth protectors during sports activities. It is crucial to highlight that mouthguards should be used in both recreational and competitive sports, as well as during training and preparation for competitions, to minimize the risk of injuries (Knapik et al., 2007; Badel et al., 2007). Mouthguards for teeth and mouth can be divided into three groups:

I. Extraoral guards that have a grid or mesh shape and are attached to a protective helmet.

II. Interdental guards (intraoral), located in the mouth, match the appearance of the dental arch, usually in the upper jaw, to which they are attached. They are also called protective bite splints or sports splints. They can be bimaxillary or monomaxillary. The advantage of bimaxillary guards lies in stabilizing the lower jaw,

reducing the risk of jaw fracture and temporomandibular joint injury.

III. Combined guards are those that have both intraoral (tooth guard) and extraoral parts (helmet with face and lip guard) (Knapik et al., 2007; Badel et al., 2004 & 2007). All mentioned guards differ in quality, but they all play a crucial role in preventing orofacial injuries (Knapik et al., 2007). Dental guards must be comfortable to wear, not affect the bite and jaw position, retain a constant shape during prolonged non-use, be pleasant in smell and taste, and not cause allergic or toxic reactions (Knapik et al., 2007; Badel et al., 2004). Choosing the appropriate dental guard depends on the athlete's age and the type of sport they are involved in, as each sport carries a different risk of traumatic dental injury. Individual dental guards provide the best protection as they are fully customized to the individual, recommended for use in any sport with the risk of injury (Sports Dentistry Online, 2006; Berman et al., 2006).

## CONCLUSION

Injuries to the stomatognathic system account for 4% to 18% of all sports injuries, with dental injuries being the most common (Jegier et al., 2005). Contact sports (boxing, kickboxing, taekwondo, and others) are high-risk due to close physical contact between teammates using uncontrolled force. Unlike other traumas, dental injuries caused by sports can be prevented by using mouthguards. Education of sports professionals, coaches, sports doctors, parents, and athletes themselves on providing first aid for dentoalveolar trauma is of great importance.

## Conflict of Interest

The authors do not have any conflicts of interest to disclose. All co-authors have reviewed and concurred with the manuscript's content, and no financial interests need to be reported.

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