Sports, and particularly contact sports, represent one of the main causes of trauma: up to 19% of injuries involving head and face and approximately 33% of dental injuries are indeed sports related [Glendor, 2009]. Oral predisposing factors are increased overjet with protrusion and inadequate lip coverage [Årtun et al., 2005; Bauss et al., 2004; Burden, 1995; Nguyen et al., 1999]. Due to the high frequency and the time-consuming and costly treatment, the prevention of sports-related injuries is essential. The role of the mouthguard to reduce the incidence and severity of dental trauma is well known: the frontal and axial impact force is absorbed and dissipated over a wider area [Patrick et al., 2005; Sigurdsson, 2007].

Three types of mouthguards are generally available: stock mouthguards, mouth-formed mouthguards (most commonly “boil-and-bite” type) and custom made mouthguards [American Dental Association, 2006; Newsome et al., 2001; Patrick et al., 2005; Ranalli, 2002; Sigurdsson, 2007].

The purpose of this study was to evaluate the awareness of sports as risk factor of dental injuries and the personal experience of trauma during sports practice, the emergency management, particularly when a tooth avulsion occurs, and finally the knowledge and use of mouthguards.

**Materials and methods**

A specific questionnaire (Table 1), similar to questionnaires used in previous studies [Ferrari and Ferreira de Medeiros, 2002; Levin et al., 2003; Perunski et al., 2005], was distributed to the participants. On account of the paediatric age of the sample, the questions were written down in plain words. The questionnaire was structured into three parts:

1. Questions about age, sex, type and time of sports practice;
2. Questions about dental injuries, particularly personal experience, awareness of first aid and procedure about tooth avulsion;
3. Questions about knowledge and use of mouthguards.

**Results**

Sixty-five per cent of the athletes were aware of the possibility of oral injuries during sports practice and 8.5% referred an experience of dental trauma; 71.5% of the participants think that the immediate management of dental injuries by a dentist is very important to increase the rate of success; 31% know that the avulsed tooth may be reimplanted: 33.9% would reimplant the tooth within an hour and 62.9% would keep it in a wet storage medium. Finally, 80.5% of the athletes knew about mouthguards as protective devices, but only 5% actually used them; eight out of ten were provided by the dentist.

**Conclusion**

Educational programs organized by the sports dentistry community are needed to inform coaches, teachers, athletes and parents about dental injuries and to promote the mouthguards use, especially in contact sports practice.

**Keywords:** dental trauma, tooth avulsion, sports-related injuries, mouthguard, preventive dentistry, children.

**Introduction**

Sports, and particularly contact sports, represent one of the main causes of trauma: up to 19% of injuries involving head and face and approximately 33% of dental injuries are indeed sports related [Glendor, 2009]. Oral predisposing factors are increased overjet with protrusion and inadequate lip coverage [Årtun et al., 2005; Bauss et al., 2004; Burden, 1995; Nguyen et al., 1999]. Due to the high frequency and the time-consuming and costly treatment, the prevention of sports-related injuries is essential. The role of the mouthguard to reduce the incidence and severity of dental trauma is well known: the frontal and axial impact force is absorbed and dissipated over a wider area [Patrick et al., 2005; Sigurdsson, 2007].

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**Results**

200 children and youngsters, 147 boys and 53 girls, returned the questionnaire a week later. The time range of sports practice was between 1 and 8 years. The sports involved were soccer 35% (70/200), martial arts 16% (32/200), tennis 14% (28/200), swimming 12% (24/200), volleyball 11% (22/200), basketball 7.5% (15/200) and cycling 4.5% (9/200) (Fig. 1). 65% of the sample (130/200) were aware that a dental injury can occur during sports practice and 8.5% (17/200) actually suffered this experience (Fig. 2). 31% know that the avulsed tooth may be reimplanted: 33.9% would reimplant the tooth within an hour and 62.9% would keep it in a wet storage medium. Finally, 80.5% of the athletes knew about mouthguards as protective devices, but only 5% actually used them; eight out of ten were provided by the dentist.

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### Sports and Dental Injuries: Knowledge of First Aid and Mouthguard Use

1. **Sex?**
   - M
   - F

2. **Date of birth**

3. **What kind of sport do you practice?**

4. **How long have you been practising this sport?**

5. **Sports Society**

6. **Do you think that a dental trauma can occur during sports practice?**
   - Yes
   - No
   - I don’t know

7. **Did you have any experience of dental trauma?**
   - Yes
   - No
   - I can’t remember

8. **Did you have any experience with other kinds of trauma during sports practice?**
   - Yes
   - No
   - I can’t remember

9. **What kind of dental trauma did you experience?**
   - Tooth avulsion (the tooth is completely out of its socket)
   - Tooth luxation (the tooth moved to a different position)
   - Tooth fracture (the tooth is broken)
   - Tooth wet
   - I don’t know

10. **Do you think that immediate management of dental injuries by a dentist is very important to increase the rate of success?**
    - Yes
    - No
    - I don’t know

11. **If you suffered a dental trauma, where did you go?**
    - Hospital Emergency
    - Dentist (public dental service)
    - Paediatrician
    - Your dentist (private practice)

12. **Do you think that it is possible to put the tooth back in its original socket?**
    - Yes
    - No
    - I don’t know

13. **If you answered “yes” to the last question, what is the maximum time for a tooth to be out of the mouth before being put back in its socket?**
    - Within 1 hour
    - 1 day
    - 1 week
    - 1 month
    - Over 1 month
    - I don’t know

14. **If you answered “yes” to question 12, what is the right way to store it while going to the dentist?**
    - Dry
    - Wet
    - I don’t know

15. **Are you aware of mouthguards for use during sports practice?**
    - Yes
    - No

16. **If yes, you have been informed by?**
    - Medical doctor at school
    - Dentist
    - Coach
    - Sports mates
    - Teachers
    - Parents

17. **Do you wear a mouthguard during sports practice?**
    - Yes
    - No

18. **If you answered “yes” to the last question:**
    - Did you buy it in a sports shop?
    - Was it supplied by your dentist?
    - Was it provided by your Sports Society?

19. **If you answer “no” to question 17, please explain why**
    - Difficult breathing
    - Hindrance to sports practice
    - Treatment with fixed orthodontics appliance
    - Aesthetics
    - It is expensive
    - I am not interested

**Table 1 - Questionnaire distributed in Sports Societies of Isernia.**

![Graph of Sports](image1)

**Figure 1 - Question 3 “What kind of sport do you practice?”.**

![Pie Chart of Dental Injury Experiences](image2)

**Figure 2 - Question 6 “Do you think that a dental trauma can occur during sports practice?”.**

![Pie Chart of Dental Trauma Experience](image3)

**Figure 3 - Question 7 “Did you have any experience of dental trauma?”.**

![Pie Chart of Dental Injury Experience](image4)

**Figure 4 - Question 8 “Did you have any experience with other kinds of trauma during sports practice?”.**
immediately, because they believe in the importance of a professional management of dental injury in order to increase the rate of success (Fig. 6) and a Public Dental Service is preferred (47% - 8/17) (Fig. 7); 43% (86/200) did not answer the question “Do you think that it is possible to put the tooth back in its original socket?”, while 26% (52/200) answered that it is not possible (Fig. 8). According to the participants who would reimplant the avulsed tooth in its socket, 33.9% (21/62) believed that 1 hour is the ideal time for a tooth to be out of the mouth prior to the procedure (Fig. 9), while 62.9% (39/62) preferred to put the tooth in a wet storage before the reimplantation (Fig. 10). Although the mouthguards are known by most of the sample (80.5% - 161/200) (Fig. 11), mainly through the parents (67.8% - 109/161) (Fig. 12), only
FIG. 13 - Question 17 “Do you wear a mouthguard during sports practice?”.

FIG. 14 - Question 18 “How did you get your mouthguard?”.

FIG. 15 - Question 19 “Why don’t you wear a mouthguard during sports practice?”.

The knowledge of dental emergency procedures is very important, particularly when a tooth avulsion occurs in children. So this aspect was investigated in this study. About three-quarters (71.5%) of the sample think that the immediate management of dental injuries by a dentist is very important to increase the rate of success. Only one-third knows that the avulsed tooth may be reimplanted, moreover one-third of them would reimplant the tooth within an hour and two-thirds would keep it in a wet storage medium. First aid may be handled by everyone, so the knowledge of emergency procedures by athletes is very important. First of all the avulsed tooth must be reimplanted into its socket immediately, or must be kept in a wet storage medium, i.e. milk, to save the periodontal ligament cells in order to prevent ankylosis and root resorption. When ankylosis occurs before the age of 10 or before the growth spurt, there is a high risk of severe infra-position of the reimplanted tooth, due to the retarded growth of the alveolar bone and tilting of adjacent teeth [Malmgren and Malmgren, 2002]. Recent studies emphasized the lack of information of sport practitioners regarding tooth reimplantation. Mori et al. [2009] referred that only 51.7% of 310 adult athletes participating to the study would reimplant the tooth in its socket, 28.1% washed the tooth in tap water and 18.1% considered additional procedures not to be necessary. Dramatically a very low number of athletes (7%) indicated milk as an ideal wet storage medium. 778 students, mostly 12 year-old females, answered the questionnaire proposed by Castilho et al. [2009]. 61.7% of them would pick up the tooth and look for a dentist immediately, 23.9% would store the tooth in sterile saline and only 3.6% in milk, the remaining students would store the tooth incorrectly or did not know how to proceed.

Many studies and literature reviews support the protective value of athletic mouthguards, especially in contact sports [American Dental Association, 2006; Newsome et al., 2001; Onieaso, 2004; Patrick et al., 2005; Ranalli, 2002; Sigurdsson, 2007; Spinas and Savasta, 2007]. In the present study, 161 of the 200 children and youngsters interviewed (80.5%) were aware of the existence of mouthguards as a protective device. The information came mainly from parents (67.8%) and dentists (19.2%), to only 12 athletes (7.4%) from coaches and none from teachers. These data emphasise the importance of educative training to coaches and teachers because they are responsible for children and youngsters
at play [American Dental Association, 2006; Spinas and Savasta, 2007]. So the Sports Societies and Schools might be encouraged to use posters sponsored by the national association of dental traumatology [Sigurdsson, 2007]. The poor culture of mouthguard use explains the low number of athletes that usually utilize it: in this investigation 10 athletes (5% of the sample) wear it regularly. Fakhruddin et al. [2007] referred a similar percentage (5.5%) among 12- to 14-year-old Ontario schoolchildren for school sports, but a higher percentage (20.2%) in league sports, where mouthguard use is mandatory in some sports, i.e. hockey, that are not included in the present study. Spinas and Savasta [2007] referred a lower percentage (1%) among 8- to 11-year-old basketball players in Cagliari: all of them have begun to use the device after suffering a dental injury.

The most common answer for not using an oral device during sports practice was “I am not interested” (80.5%). Among the other reasons, discomfort was the most frequent answer (12.7%), particularly difficulty in breathing (3.7%). Keçeci et al. [2005] evaluated that custom-made mouthguards do not significantly affect ventilatory gas exchange of taekwondo elite athletes, while performing maximal exercise. Mouthguards were considered unsuitable by a 4.2% of the sample because fixed orthodontic treatment was in progress, but by moving soft tissue away from teeth they prevent intraoral laceration and bruising [American Dental Association, 2006], moreover they prevent the loosening of the brackets and/or the bending of the wires [Newsome et al., 2001].

Eight of ten mouthguards of this study were supplied by a dentist and only two were bought in a sports shop.

Financial aspects may be a problem, such as referred by three athletes (1.6%) participating to this investigation. Matalon et al. [2008] provided custom made mouthguards free of charge to 80 youngsters aged 9-17. After one year, 69 participants answered the questions: 68% still possessed the mouthguard, but 44.9% don’t wear it because they forgot and 42% because they found them not to be comfortable, confirming a low compliance to sports device. Finally, sometimes athletes refuse to use a mouthguard for aesthetics (two in the present study 1%), probably because the devices affect their image as players [Tulunoglu and Özbek, 2006] or for embarrassment: “I am the only kid wearing this device among all my friends” [Matalon et al., 2008].

Conclusion

The present study revealed a lack of knowledge regarding the emergency management of tooth avulsion and the importance of mouthguards to prevent sports-related dental injuries. The unawareness of dental trauma risk factors and the poor culture of mouthguard use explain the low compliance of athletes. So educational training to coaches, teachers, athletes and parents is essential to promote oral health in sports practice and according with American Dental Association “the key educational message is that the best mouthguard is one that is worn”.

References


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