Prevention of traumatic dental lesions: cognitive research on the role of mouthguards during sport activities in paediatric age

E. SPINAS, A. SAVASTA

ABSTRACT. Aim This study reports a personal contribution and the analysis of the most recent literature on prevention of dentoalveolar traumas, and the lack of knowledge and use of protective oral devices in children (7-12 years old) practicing sports. Different oral protection devices will be illustrated, and among them the types more suitable for the investigated age group. Materials and methods Recently we conducted a survey on a sample of 300 children between 8 and 11 years of age practicing basketball, to assess the frequency of oral traumas, correlated predisposing factors, level of knowledge of mouthguards and possible frequency of use of such devices. Results From the survey it emerged that only 30 subjects knew about mouthguards (15 of them received the information from their dentist) and none of them received information from the coach or within the sport club. Furthermore, only 3 subjects (1% of the sample) wore a mouthguard during practice. Our study and other literature contributions highlight the total lack of information of the practitioners, especially the young ones, and the unconcern for these problems by the organisations (clubs) where sports are practiced. A cycle of 2 brief conferences about orofacial trauma prevention and use of mouthguard was administered. Regarding the type of mouthguard more suitable to adolescent athletes, the semi-individual types of new generation seem to be the best choice, since they can be refitted multiple times in order to adapt to the dental and skeletal growth. Conclusion We can conclude reasserting the absolute need of providing information about the risks of orofacial trauma related with basketball and other contact sport activities, and to promote the use of mouthguards as a primary protective measure among athletes, which will considerably reduce the social costs associated with such trauma occurrences.

KEYWORDS: Sport, Dental trauma, Mouthguard, Prevention.

Introduction

From the analysis of the literature on traumatic pathologies due to sport activities it emerges that in contact sports the incidence of dental trauma is rarely high if compared with other anatomical districts, being variable between 12 and 33%, in relation to the type of sport discipline and age of the practitioners [Feliciano and de Franca Caldas, 2006; Flanders and Bhat, 1995; Ferrari and Ferreria de Mederios, 2002]. On the other hand, social costs associated with such events are high and relatively disproportionate to the low number of reported incidents [US National Youth Sports Foundation for the Prevention of Athletic Injury Inc., 199; Glendor, 2000]. For this reason it is imperative to carry out effective preventive programs aimed to raise the awareness on the phenomenon together with the application of systems able to reduce the incidence and gravity of such lesions.

The prevention of dentoalveolar trauma in sport practitioners [Spinas and Caprioglio, 1996; Johnsen and Winters, 1991; Flanders and Bath, 1995; Lang et al., 2002] should be carried out at three levels.

1) Analysis and awareness of the problem (by educative training of sport operators and subjects responsible for the athletes such as: teachers, coaches, welfare workers and parents).

2) Control of predisposing factors: general (state of
repair and maintenance of sport facilities) and local anatomical (dentsoskeletal anomalies such as dental and skeletal Class II, OVF >6 mm, mouth breathing etc).

3) Study and realisation of methods and devices aimed to reduce trauma outcomes.

Due to the nature of this contribution we will focus on the analysis of the aforementioned 3 levels of intervention, giving special prominence to the third one because of its strictly clinical relevance. It is well known that the devices able to protect the dentsoskeletal structures can be of extra and/or intraoral type. The main responsibility of the dentists is to be informed about types and correct use of intraoral devices designed to protect the dentoalveolar structures from trauma: they are called mouthguards. Such devices should protect in particular the upper incisors from direct frontal impacts, preventing soft tissues lacerations by drifting them away from teeth (essential in orthodontic appliances wearers), protect the whole dentition from violent trauma occurring with closed arches (indirect trauma), reduce the risk of mandible fractures from swinging blows directed upward and reduce the strength of impact on the mandible, which can be transmitted to teeth, skull, neck and temporo-mandibular joint by indirect mechanism [Hickey et al., 1967; Takeda et al., 2004]. Therefore it is important to define the compliance and safety features required for these appliances [Padilla, 1996; Takeda et al., 2006] in order to exert an effective protective action. For this reason a reference standard table has been proposed (table 1).

International literature is rich in studies and researches that highlight the need of mouthguard use during potentially risky sport practice [Çetinbafl and Sönmez et al., 2006; Lieger and von Arx, 2006; Ranalli et al., 1999; Hill, 1984; Spinas, 1999; Kececi et al., 2005; Deyoung et al., 1994] and all these studies underline the poor divulgation and knowledge of protective devices within sporting communities. Aim of this study is to emphasise the generalised lack of knowledge about the risks of oral trauma in sport practitioners through the analysis of a targeted personal research and the review of the most recent literature on the topic. We also aim to indicate the modalities for a renewed commitment to informing about the real hazard and gravity of traumatic outcomes derived from the lack of use of oral protective devices especially in children (7-12 years old), age group usually considered to be at high risk for this kind of pathology and its consequences [Bauss et al., 2004].

### Materials and Methods

We recently performed a survey at the Orofacial Trauma Center of the University of Cagliari on a sample of 300 subjects, age range 8-11 years (200 males and 100 females), of comparable socioeconomic level, all basketball players of two sporting clubs of the province of Cagliari. Aim of the survey was to ascertain and classify, on the basis of the dental trauma classification by Andreasen [1981], frequency of dental trauma, correlated anatomical predisposing factors, level of knowledge of specific risks and the knowledge and use of mouthguards.

Data were collected over a period of three months, starting at the beginning of 2006, through oral examinations and individual interviews (when necessary they were performed with the parent’s cooperation) conducted by the researchers. After data elaboration and evaluation, advices about prevention of orofacial traumas were given to the subjects together with the opportunity to wear an adequate protective system, to be checked at periodic follow up visits.

<table>
<thead>
<tr>
<th>Features</th>
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<tr>
<td>Made of resilient EVA (ethylene vinyl acetate), since hard materials could provoke soft tissue lacerations and cannot exert a cushioning effect</td>
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<tr>
<td>Be odorless, tasteless, nonporous and easy to clean</td>
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<tr>
<td>Do not generate undesired orthodontic forces and effects</td>
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<tr>
<td>Fitting and retentive: remains securely in place even with open mouth, otherwise it would be uncomfortable and bothersome during sport practice</td>
</tr>
<tr>
<td>Resistant to salivary fluids and delamination</td>
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<tr>
<td>Not bulky so to allow speaking and not limit breathing</td>
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<tr>
<td>Have a vestibular shell extending about 5-6 mm beyond the gingival contour; buccally is should extend about 2 mm beyond the tooth cervical area</td>
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<tr>
<td>Thickness should be at least 3 mm over the vestibular surfaces, 2 mm buccally, not less than 2-3 mm on the occlusal surfaces</td>
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<tr>
<td>Correct occlusal thickness of 2-3 mm. Registration and reproduction of dental casts is a basic step in mouthguards’ construction, in order to provide a comfortable area of occlusion</td>
</tr>
<tr>
<td>Have a Vickers strength of at least 78 shore A</td>
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<tr>
<td>Modifiable and adaptable over time, inexpensive.</td>
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**Table 1 - The requisites of the ideal mouthguard.**
**Results**

From the analysis of the results it emerges that in our study sample (300 subjects, 200 males and 100 females, ranging 8-11 years old), 15 subjects (5%) experienced trauma to the permanent dentition; 5 of them suffered trauma during sport activity (33% of traumatised subjects) and the remaining 10 for other reasons (7 for accidental causes, 2 bicycle falls, 1 car accident). Such traumas involved overall 20 teeth (upper incisors) and comprised 15 crown fractures (5 simple fractures, 7 complex, 3 complicated) and 5 dental luxations. Furthermore, among the predisposing anatomical factors it turned out that 90 subjects had occlusal anomalies considered at risk for dental trauma. In detail, 40 subjects had a dental Class II with overjet $>6$ mm (10 of them with crowding), 30 subjects were dental Class I with overjet $>5$ mm (10 with dental crowding), 10 subjects had labial incompetence with anterior open bite and 10 subjects had a posterior cross bite.

Among the 90 subjects with occlusal anomalies, 35 were orthodontic appliances wearers (20 for Class II treatment, 10 for dental crowding, and 5 for cross bite treatment): 15 of them wore removable appliances, which were removed during sport activity, while 20 young athletes had fixed braces with bands and brackets. In the fixed appliance wearers group 10 subjects complained of frequent soft tissue abrasions due, for the most part, to game contact with an opponent.

Regarding the use and knowledge of intraoral protection, it emerged that only 3 of the interviewed (1% of the whole sample) used a mouthguard (traditional semi-individual boil and bite). These three subjects, all 10 years old, used the mouthguard because they had suffered previous dental traumas on the incisors (crown complex fracture) during training sessions at the ages of 7 to 8 years. From the study it was found that only 30 subjects (10% of the sample) actually knew what a mouthguard was. Such information came from their dentist (15 subjects) or was reported by friends (15 subjects); none of the participants had ever received information by the coach or within the sport group.

The wide lack of information being apparent, the participants were given useful advices for improving the knowledge about prevention of orofacial traumas through a cycle of 2 brief conferences on the topic. The first one was attended by coaching assistants and team managers of the sporting clubs; at the second one the parents of the athletes were invited, and at the end of the conference cycle the whole sample was informed. Finally, 30 subjects (15 males and 15 females) that agreed to cooperate, were provided with preformed mouthguards (boil and bite of new generation), to be used both during training sessions and official games (Fig. 1). After three months of use, only 3 athletes (all males) ceased to wear such protections ascribing their choice to breathing difficulties or perioral muscle soreness; the remaining 27 young athletes showed good acceptance of the mouthguards and expressed willingness to keep using the devices. Up to date none of them underwent dental trauma during sport activities and all the subjects are still undergoing periodical checkups.

**Discussion**

From our analysis and other contributions [Hill, 1984; Kececi et al., 2005; Lang et al., 2002] it emerges the almost total lack of information about the risks of oral trauma and its preventive strategies by the participants; it is especially evident the lack of interest for such topics by the organizations (sporting clubs) where sport activities involving adolescents are practiced. In our study 5% of the sample experienced dentoalveolar trauma of medium severity before the age of 11, and 35 subjects (of the 90 with occlusal anomalies) were currently undergoing orthodontic treatment which, during the therapy, raises the possibility of occurrence of oral lesion, both on teeth (due to their higher mobility) and to the oral mucosa (10% of the subjects referred they had often experienced it) [Bauss et al., 2004].

Regarding the specific knowledge about mouthguards, only 30 subjects (10%) declared to know them and what their scope of use was and, even worse, only 3 subjects (1%) were using a mouthguard, but just because they had suffered a dental trauma before (complex coronal fracture) and feared
reoccurrence of the event. The interviews, moreover, show that 2 other subjects who underwent dental trauma during sport practice (complex coronal fracture of 2 incisors and coronal fracture with intrusive luxation, respectively) declared not to know what mouthguards were. This last element must be taken into greater account since it highlights the absolute lack of information in this field and the lack of specific advices by dental operators (in our sample only 15 subjects received information from their dentists). It emerges, in fact, that all of the 5 subjects who were victims of oral trauma were treated with crown reconstructions, but only 3 of them were advised to use a mouthguard (only 2 subjects informed by the dentist) of traditional boil-bite type and thus of poor quality; it can be speculated about the poor attention to preventive measures also in the specialty field. A previous study [Ranalli et al., 1999] already highlighted (in a sample ranged 14-22 years old) the same difficulties and lack of information: it was estimated that only 2% of the sample had knowledge of preventive measures and their applications. Furthermore, only 35% of the interviewed declared that they were willing to use one, if provided. On the contrary, in another study [Spinas, 1999], the athletes proclaimed their willingness to use oral protections, if provided with adequate information and assistance.

The study sample (300 athletes), sporting assistants and managers (a total of 15 subjects) and a large group of parents (approximately 50 subjects, mainly mothers) attended a cycle of two brief conferences (lasting about 45 minutes) aimed to show the results of the study and during which were illustrated specific and general preventive measures.

The specific measures regarded interceptive orthodontic treatment of malocclusions (Class II and increased overjet) for 55 subject of the sample, since 35 of them already wore a corrective orthodontic appliance, while general preventive measures were provided for the whole sample, consisting of information about the usefulness of new generation semi-individual mouthguards, which appears to be the type of protection more suitable for sport practicing adolescents. Such devices have optimal manufacture and quality materials and provide the great advantage to be suitable for subjects in mixed dentition (7-12 years), being adaptable multiple times according to the evolution of teeth and dentoalveolar growth (fig. 2) [Ranalli et al., 1999; Spinas, 1999].

Finally, about the group that accepted to wear mouthguards, it must be stressed the influence of the coach in making this decision, whose opinion is usually taken into greater account than that of dental professionals’ and parents’ advices (since their opinion is usually perceived as an imposition by the youngsters).

To date, as previously mentioned, 27 subjects wear protections (10 of them are undergoing orthodontic therapy) with optimal results and no traumatic event registered.

It is imperative for dental operators to be informed about the new devices available on the market and especially about what can be proposed to a young subject so to lead to a positive compliance and a constant use of such products.

For completeness of information it is possibile to summarise the types of mouthguard that can be used by 7-12 years old subjects [Spinas, 1999; Deyoung et al., 1994; Mc Nutt et al., 1989] referring to a widely accepted classification (table 2).

It is important to stress out that the use of mouthguards must be encouraged in children practicing contact sport [Mc Nutt et al., 1989] for two main reasons: the highest severity of traumas when they occur in growing children (8-12 years) due to the devastating effects of exarticulations and high costs of biological recovery (estimated between 15.000-20.000 Euro), during the life of the injured party [Glendor, 2000], and the greatest acceptance of mouthguards when they are proposed at a young age, laying the basis for an effective use also during adulthood.

**Conclusion**

It can be concluded reasserting the absolute need for information about dentoalveolar trauma risks connected with basketball and several contact sport activities.
The information should be provided early in the school environment and within the sporting clubs, involving primarily instructors, coaches, sport managers (instructed by means of appropriate stages) and secondly athletes and their families. Such informative stages should be held periodically (annually) to preserve their informative value over time.

There are many children and adolescents with severe occlusal anomalies practicing sport disciplines at high risk for dental traumas (about 30% in our sample) and it has been emphasised the lack of information about mouthguards (10% of the sample) and the fact that they are rarely used (1%), usually only after a traumatic event already occurred (60% of traumatised subjects). For these reasons it is necessary that the dental specialists (paediatric dentists and orthodontists) promote the use of such devices among patients at proven risk of dentoalveolar trauma, and later adopt all the orthodontic corrective measures, if necessary. This would determine an undeniable promotion of oral health, reducing the number of traumatic events and severity of their outcomes, with concurrent reduction of the related social costs; nevertheless, further studies, including other sport disciplines as well, will be necessary in order to verify the degree of knowledge regarding traumatic risks and the use of mouthguards, so to obtain a detailed picture of the overall phenomenon countrywide.

References


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