

Research Article

# Orofacial Trauma Prevalence and Mouthguard Awareness in Basketball Players

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Received 12 December 2018; Revised 01 January 2019; Accepted 11 January 2019

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## Abstract

**Introduction.** Basketball players are vulnerable to distinct orofacial traumas that are possibly related to the sport itself, together with the lack of preventive measures. The aim of this investigation was to study the prevalence of orofacial trauma in the competitors of Portuguese basketball and the use/awareness of the mouthguard. **Methodology.** It was ran a survey using Google Form, which was completed by 285 participants. SPSS Statistics 24.0 was used to analyze the data. It was found 274 lacerations of the soft tissue, 38 dental fractures, 28 cases of tooth mobility, 24 traumas in the temporomandibular joint, 4 maxillary fractures, 3 dental avulsions and 1 mandibular fracture. **Results.** There was no statistically significant differences comparing the risk of orofacial trauma between males and females, game-positions or international with non-international players. Approximately 98.6% (n=281) of the participants knew about the mouthguard and only 18 used it more than "frequently". **Discussion.** Portuguese basketball community may be considered one at relative risk of orofacial trauma. It seems there are not a game position and/or gender that have a higher risk to orofacial trauma. **Conclusion.** There is still a very low use of the mouthguard despite the awareness of it and the high number of orofacial traumas documented.

**Keywords** orofacial trauma; basketball; mouthguard; prevention; dental medicine; prevalence

## 1. Introduction

Nowadays more and more people are getting involved in a wide variety of sports and doing physical activity. With the increasing interest in sports practice, the number of dental or orofacial lesions rises. This kind of lesion may not only affect the professional career of the athlete, but also his or her personal life [1,2].

Orofacial trauma (OT) related to sports practice happens both in competition and in friendly situations. Basketball is a team contact sport in which orofacial trauma usually

happens as a result of a fall, an impact against objects (basketball table, rim or ball), impacts against elbows, hands or shoulders while the players are trying to still the ball, anticipate a pass or during specific tasks of the sport, such as, the rebound, dribble, shooting or block [2,3]. The size of the player may be a predisposing factor to orofacial trauma [4,5]. In basketball, approximately 10% of the lesions involve the head, neck or orofacial areas. The most common OTs are soft tissue lacerations to the tongue, lips and oral mucosa, followed by dental fractures, dental luxation, intrusion, extrusion, lateral luxation and avulsion. [4-6] Temporomandibular injuries related to sports can also occur resulting in pain, temporomandibular joint (TMJ) sounds and mandibular movement limitation [7]. Besides the aforementioned lesions, there are reports of fractures of the zygomatic, nasal and/or orbital bone, and furthermore, cerebral and medullar lesions [8].

A New Zealand study carried out by Loye et al (1998) showed that in the sports TOP 10, basketball was the third biggest contributor to dental lesions. Regarding the prevalence of orofacial trauma in basketball, it has been described a range from 16,6% to 80,6%. (Table 1) [9-14].

Normally during a competition, if a player suffers a lesion and is bleeding, they have to leave the court as a safety measure. Furthermore, any trauma may increase the insecurity of the player and decrease his/her performance. It is important to say that an indispensable player who has to leave the court due to an OT may reduce substantially the probabilities of a team winning [3]. Sports dentistry includes the treatment and prevention of dental lesions,

**Table 1:** Orofacial trauma prevalence reported by other authors regarding basketball athletes.

Author and year of publication	Prevalence reported
Perunski et al. [9]	16.6%
Cornwell et al. [10]	23%
Maestrello-deMoya et al. [11]	31%
Tiryaki et al. [12]	35%
Frontera et al. [3]	50%
Kvittem et al. [13]	55.4%
Azodo et al. [14]	62.8%
Ma W [6]	80.6% Professionals e 37,7% semi-professionals

orofacial trauma, and oral diseases and its manifestations. The use of mouthguards has been recommended by the American Dental Association (ADA) since 1950 [15-17]. The American Society of Materials and Testing declare the existence of three different types of mouthguards, also described by Jerominov [18] as intra-dental mouthguards:

Type I: Standard mouthguard, it can be stock acquired in different sizes and do not require modifications;

Type II: Boil-and-bite mouthguard, it's sold in sports centers/shops. It's made from a thermoplastic material that allows its modification to be better adapt to the athlete's maxilla when emerged in hot water;

Type III: Custom-made mouthguard, it can only be acquired from an oral health care professional. Once it's personalized, do require the impression of athlete's maxilla;

Sports where the use of mouthguard is mandatory have shown a decrease in the number of orofacial traumas by about 60% [19]. On the other hand, there are some disadvantages. Some athletes affirm that mouthguards can be uncomfortable and affect their communication and breathing. However, there is no conclusive proof suggesting that the levels of oxygen and breathing are affected even during high intensity exercise [20].

Dentistry, for the majority of the time, is occupied with improving the treatments and the results and due to that, clinicians abandon the preventive measures, when this should be also one of the objectives. Any patient that enters the clinic should be approached with an organized and comprehensive prevention program. The risk factors of the patient should be taken into consideration, recognizing their susceptibility to an OT and if they are exposed to risk [21].

The aim of this investigation is to study the prevalence of orofacial trauma in Portuguese basketball, as well as the use and awareness of a mouthguard.

## 2. Methodology

For this, an online survey was distributed to basketball athletes and ex-athletes. The participants of this study were a group of 285 male and female Portuguese official basketball athletes or ex-athletes. The survey

was conducted organized into 4 categories. Firstly, the identification of the athlete. Secondly, his/her role in the game. Thirdly, the history of the athlete's orofacial trauma during a basketball game or practice, number of cases and type of lesion. Moreover, the participants' was questioned about the risk of a basketball athlete suffering an OT and if there is a game position which they consider to be more susceptible of suffering an OT and if so, which one. The final part was directed to the athletes' awareness of the mouthguard, the frequency of use, the type used, how they were informed or advised to use one and the reasons why they wouldn't use one.

Google's Form was used to collect the information. After gathering 285 forms, it was used SPSS Statistics version 24.0 (Statistical Package for the Social Sciences) to analyze the data; comparing the number of years of practice as well as the number of OTs between genders, game positions and international vs non-international participants. Thus, the necessary criteria were taken into consideration to complete the parametric tests. The sample did not follow a normal distribution in the variables studied. Subsequently, non-parametric tests were used, such as Mann-Whitney U test and Kruskal-Wallis [22].

## 3. Results

From the 285 survey participants, 62.1% (n=177) were male and 37.9% (n=108) female. The ages of the participants were between 11 and 57 years old and the average age was 23. The average number of years of practice was approximately 11, the minimum number of years practicing basketball was 1 and the maximum was 50. Regarding the type of athlete, 62.5% (n=178) were official basketball athletes, 31.2% (n=89) used to be official basketball athletes, 5.6% (n=16) were coaches and 0.7% (n=2) were a physiotherapist and an assistant coach. Concerning the player's game position, 22.3% (n=63) were point-guards, 14.2% (n=40) were shooting-guards, 21.3% (n=60) were small-forwards, 22.7% (n=64) were power-forwards and 15.2% (n=43) centers. About 73.7% (n=210) had never being in an international competition and the other 26.3% (n=75) had had at least one game in an international competition.

In this research about 72.9% (n=207) of the participants had suffered an OT at least once in their life playing basketball. Moreover, 78.9% (n=225) knew someone that had suffered an OT playing basketball. For each dental lesion assessed, it was registered the number and percentage of participants who had it (Table 2).

About 79.6% (n=227) of the participants believed that the player's game position influenced the risk of having an OT. In addition, 72.3% (n=206) ensured that the center would be the player with the highest risk for suffering an orofacial trauma. In relation to a basketball player's risk of suffering an OT during practice or a game, on a scale of 1 to 10, the 285 participants classified it with a mode value of 6.

**Table 2:** Number and percentage of participants that have suffered a particular type of orofacial trauma.

Laceration of the lip	184 (64.6%)
Laceration of the tongue and/or oral mucosa	90 (31.7%)
Dental fracture	38 (13.3%)
Tooth mobility	28 (9.8%)
Dental avulsion	3 (1.1%)
Maxillary fracture	4 (1.4%)
Mandibular fracture	1 (0.4%)
Trauma in the temporomandibular joint	24 (8.4%)
Other	8 (2.8%)
Data are presented as whole numbers and percentages	

The average number of OTs registered in males was 2.95 and in females 2.64. Comparing the number of years of practice between genders, a  $p(0.004) < 0.05$  was obtained. Comparing the number of OTs between genders, a  $p(0.514) > 0.05$  was obtained. The average number of OTs registered between the game positions was 3.77 for point-guards, 2.33 for shooting-guards, 3.00 for small-forwards, 2.73 for power-forwards and 2.31 for centers. Comparing the number of years of practice between the game positions, we obtained a  $p(0.004) < 0.05$ . Comparing the number of OTs between the game positions, we obtained a  $p(0.158) > 0.05$ . Regarding the international athletes and the non-international athletes, the average numbers of OTs registered were 3.42 and 2.57, respectively. Comparing the number of years of practice between international and non-international athletes, we obtained a  $p$  of 0.001. Comparing the number of OTs between these two groups, we obtained a  $p(0.171) > 0.05$ .

Considering the present study we found that 98.6% (n=281) of the participants already knew of the existence of the mouthguard. The principal informants of the mouthguard were firstly the "Television", secondly, "Team mates" and thirdly, the "Dentist". The frequency of use of the mouthguard during basketball practices and competitions was the following: 78.6% (n=224) never used, 15.1% (n=43) rarely, 3.2% (n=9) frequently, 1.4% (n=4) most of time and 1.8% (n=5) always. The principal motivator to start using a mouthguard was "Having orthodontic bracelets", 9.1% (n=26), and "After suffering an orofacial trauma", 6.0% (n=17). About 3.9% (n=11) were using or had used a type I mouthguard (stock/standard), 13.7% (n=39) were using or had used a type II mouthguard (boil-and-bite) and 6% (n=17) were using or had used a type III mouthguard (custom-made). In consideration to the reasons why the participants did not use a mouthguard during basketball practices and games, the following parameters were assessed on a scale from 1 to 10, 1 being a very important reason for not using it and 10 a reason of small importance (Table 3).

#### 4. Discussion

Basketball is known to be one of the most dynamic sports for the entirety of the game. In the present study it was found that 72.9% (n=207) of the participants had suffered

an OT during basketball practice/competition at least once, which was the second highest value found in the literature. Soft tissue lacerations were the most common lesion, such data is generally found in other sports oral traumatology studies [1,9,23,24]. In the present study, lip lacerations had a higher frequency than tongue or oral mucosa lacerations, which is a particularity also found by Frontera et al. [3] and Zamora-Olave et al. [25]. This large number of lip lacerations is easily explained by Seifert et al. [26], who affirms that due to anatomical reasons, the lip is the first structure of the stomatognathic system to contact an object or opponent directly during an impact. Its anatomical characteristics, such as prominence, mobility and mucosal tissue, make it more susceptible to lacerate. In addition, athletes with orthodontic bracelets have generally a higher risk of lip lacerations when not using a mouthguard [13,27]. Regarding dental fractures, similar values found in the present study were reported by Perunski et al. [9] (12.7%) and Ma et al. [6] which reported 12.9% of dental fractures in basketball players; Azodo et al. [24] affirmed such lesions to be "Uncommon" and Lesic et al. [23] 2.2%. It was not collected the information about which teeth were more commonly affected by trauma. Although, literature says that the teeth which are most affected by orofacial trauma are the maxillary central incisors [3,9,28]. Individuals, mostly children and teenagers, with an overjet superior than 7mm, with an insufficient lip sealant or with both factors, may be more susceptible to dental lesions to the maxillary central incisors, as these are exposed directly to the impact with no protection of the soft tissue [1,4]. This way, orthodontic treatment at a young age may be a good preventive measure, but also the use of mouthguard, which would decrease the incidence and severity of an OT [4].

Due to the fact that the form was filled out by the athletes/participants and not by a professional clinician, regarding teeth 'mobility', this classification may include others, such as, subluxation, extrusion, intrusion and lateral luxation, all orofacial traumas that normally after the accident the tooth is mobile. Only Ma et al. [6] reports 8 cases, 12.9%, of "teeth displacement". Regarding the dental avulsions, which in the present study had a

**Table 3:** Reasons why the participants did not use a mouthguard, in a scale from 1 to 10, being 1 the most preponderant and 10 the less preponderant.

	Mode
Had never suffered an orofacial trauma	1
Difficulty in communicating during basketball practice	1
Difficulty in breathing	1
Lack of retention	10
Bad adaptation to the mouth	10
Decrease in the flow of saliva ("thirst sensation")	10
Esthetic questions	10
Difficulty in acquiring a mouthguard	10
Economic reasons	10
The use of a mouthguard not being mandatory	10

prevalence of 1.1% (n=3), we can suggest, by comparing to other studies, Lesic et al. [23] (2.2%) and Ma et al. [6] (8.1%), that this dental lesion has a low frequency in the basketball community. Nevertheless, dental avulsion more than other lesions, like intrusion, lateral luxation or extrusion, has more severe periodontal sequels and may even cause dental loss or ankylosis. The cost of an avulsed tooth can be between 5000 and 20 000 American dollars [1]. Similar studies rarely report maxillary fractures and/or mandibular fractures. Usually, this type of OT is only reported in ambulatory care when the athlete is in the hospital service and the etiology of the fracture is documented. Therefore, Mourouzis et al. [29], in his study of maxillofacial fractures related to sports, affirms that basketball, together with football, is one of the most dangerous sports regarding maxillofacial fractures. We cannot say for certain that the mouthguard is able to avoid a maxillary/mandibular fracture. The use of the mouthguard aims to minimize dental lesions and the occlusal/joint instability at the moment of impact. In the study of Lesic et al. [23] a similar frequency of sequels in the temporomandibular area is reported, 13.4%, however in his study muscular rigidity was included. Moreover, in the study of Zamora-Olave et al. [25], 21% of the water-polo players reported TMJ pain. Besides orofacial trauma we also documented nasal fissures and ocular hematomas.

During childhood, there tends to be a superior prevalence of dental lesions in boys compared to girls, but this difference changes while both groups are growing up [15,30]. Azodo et al. [24] found a 2.4 to 1 ratio regarding the risk of OTs comparing male and female basketball athletes. It was found a higher average of OTs for males, 2.95, than comparing for females, 2.64. However, no statistical differences were found between both groups regarding the number of OTs. Taking into consideration the years of basketball training, statistical differences between male and female basketball athletes were found. The reason why male athletes in our sample showed a superior number of OTs than female athletes could have been due to the fact that the male athletes had played basketball for more years than the female athletes. A higher prevalence of OT is expected in an individual that has been exposed to the risk for a longer period. In other words, an athlete who has been training basketball for a longer period has a higher accumulative risk to orofacial trauma [6].

When comparing the number of years playing basketball in the different game-positions and also international with non-international athletes, showed statistical differences. Comparing athletes of different game-positions and comparing international with non-international athletes, the years of basketball practice between groups was statistically different. Thus, we can say that point-guards, shooting-guards, small-forward, power-forward and centers don't play basketball for similar periods of time and the same happens when comparing international

athletes with non-international athletes. Moreover, no statistical differences were found comparing the number of OTs in international and non-international players, and also, when comparing the number of OTs in different game-positions, there were no statistical differences. Although international athletes showed an average of 3.42 OTs and the non-international athletes 2.57, we can suspect that this difference in the average number of OTs between groups was due to the fact that international athletes have been playing basketball for a longer period of time, together with the fact that international players may play more intensively and with a higher level of competition. One interesting discovery was that 72.5% (n=206) of the participants in the survey affirmed that the center would be the game-position with the biggest susceptibility of suffering from an OT. However, the center was the group of athletes with the lowest number of OTs recorded, having an average of 2.31, while point-guards were the group with the highest number of OTs, with 3.77 OTs per point-guard.

From the previous data is possible to conclude that independently from the gender, level of competition and/or game position of the player the risk is similar. Nevertheless, male players, international players and point-guards still show a higher prevalence of OTs.

Concerning the participant's opinion regarding a basketball athlete's risk of suffering an OT, it was classified with a mode of 7, so subjectively it can be considered basketball a sport with a "moderate risk", which is also documented by other authors [9,26,31]. On the other hand, there are also authors in the literature who describe basketball as a sport of "high/severe risk" with regards to dental lesions [1,5,15].

The risk of suffering an OT is 1.6 to 1.9 times higher when the mouthguard is not being used [32]. The use of one may not only prevent, but also reduce the damage of dental lesions. The mouthguard acts by restructuring and absorbing the shock, reducing and preventing eventual dental or maxillary fractures, offering protection to soft tissue and decreasing oral and/or lip lacerations and supporting edentulous areas [1].

Although 98.6% (n=281) of the participants knew about the mouthguard, about 78.6% (n=224) answered that they had never used one before when playing basketball. This contradiction where the preventive measure is known, but is not practiced is also described by Ma et al. [6] and Frontera et al. [3]. In the present study, the most common type of mouthguard used was the type II (boil-and-bite). The justification for this type of mouthguard being used more than a custom-mouthguard may be the fact that it is easier to acquire, the price is more suitable and it is well promoted by sports shops [33]. It is the Dentist's responsibility to promote and to make easier the use of a mouthguard to those interested and to potential individuals at risk of dental lesions [1,4,15,30]. The main factor for an individual to acquire a mouthguard

in the present study was “Having orthodontic bracelets” which reinforces the idea previously referred to by Salam et al. [27], concerning lip lacerations and orthodontic treatment.

Apparently, an individual will only resort to a mouthguard as a preventive measure after having suffered an orofacial trauma and realizing the consequences of not using one [4,34]. Thus, one of the main reasons why Portuguese athletes from this sample weren't using a mouthguard, was the fact that they did not suffered an orofacial trauma before. Furthermore, most of the participants replied that if they used a mouthguard, they would have problems communicating and breathing. However, multiple studies already showed that a properly done custom-mouthguard has almost none inconvenient to the athletes' performance [20,35,36].

Although mouthguards have multiple benefits, the majority of players still don't use them regularly. Thus, it's strongly believed that it is necessary to delve deeper into this matter, as basketball is a sport with moderate risk of orofacial trauma.

It's the author's opinion that by introducing at a young age the use of a type II mouthguard, once it's easier to adapt it while growing up, when the players reach a high level of competition the use of a custom-made mouthguard would already be easily accepted. In addition, it's important to inform and instruct both players and coaches the precautions, safety measures and risks of the sport. Likewise, basketball federations would have a major impact, if the regulations would impose the use of a mouthguard to practice the sport, this rule is already applied to other sports, such as, boxing and American football.

Regarding to the study limitations it can be said that:

The sample size could be bigger and the sub-groups of basketball players should be similar in number to improve the statistical analysis;

Prior research studies on orofacial trauma in basketball players report different methodologies;

The clinical data from part 3 of the survey should have been collected by a dentist, to be more accurate;

## 5. Conclusion

High prevalence of orofacial trauma in the Portuguese basketball community studied was reported. Although the majority of orofacial traumas documented were not severe, such as lacerations of the lip, oral mucosa and tongue; severe, irreversible orofacial traumas, with severe repercussions to the athletes' oral health were also found. There weren't statistical differences between genders, between game-positions or between international and non-international regarding the number of orofacial trauma. Statistically, none of the groups of athletes showed a higher probability of suffering an orofacial lesion. Although almost all of our participants

knew about the mouthguard and its benefits, the number of athletes using it is still very low.

Dental clinicians should spend more time preventing orofacial traumas and encouraging the use of mouthguards. It's emphasize, the idea that, with regards to orofacial trauma, Portuguese basketball athletes are a group at risk.

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