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Original Research Article

Sanitization of sports mouthguards

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Abstract

Introduction: Mouthguards are removable intra-oral devices that, if used correctly, make the protection of the teeth and soft tissues such as gums, lips and cheeks from the impact during the sport activity. **Objective:** To know about the habits and attitudes towards the hygiene and use of mouthguards for athletes and evaluate the ability of a new product in spray form to decontaminate mouthguards. **Material and methods:** An interview by means of a questionnaire was conducted with 22 men, young adults, rugby players, in order to know their habits and attitudes about the use and cleaning of mouthguards. After this step, microbiological testing was conducted to evaluate the efficacy of a test product in the decontamination of mouthguards. **Results:** The sample consists of young adults, well-educated, but who had little information about cleaning of mouthguards. Only one participant executed the decontamination adequately. By microbiological assessing the test product was effective in decontaminating the samples of mouthguards. **Conclusion:** The risk of saliva contamination of mouthguards, the hygiene care and storage and the need for disinfection of these devices should be better disseminated among professionals and especially among athletes. The test product was effective in decontaminating salivary mouthguards.

Introduction

The sports dentistry is a new area in which the performance of the dentist aims to prevent and treat oral diseases and injuries resulting from physical activities. The sports dentistry, and other dental specialties, advocates prevention. Most of the injuries can be reduced or minimized by the use of mouthguards [11]. Mouth guards are removable intra-oral devices, commonly used in the upper arch, the area most susceptible to trauma. Mouthguards, if used correctly, make the protection of the teeth and soft tissues such as gums, lips and cheeks during an impact. The mouthguard should be used in all sports activities where contact, fall or collision can occur [2], mainly but not exclusively on athletes using orthodontic appliances, due to the greater likelihood of cuts and lacerations in the mucosa adjacent to brackets and wires [14].

According to the American Academy of Sports Dentistry, the use of mouthguards is responsible for 80% reduction in the risk of dental trauma. Athletes in contact sports have a 10% chance of having an accident in the mouth during sports. Without the use of customized mouthguard, the risk of dental trauma increases more than 60 times [10].

Mouthguards are made with silicone, EVA or other normally porous polymer. These removable intra-oral devices can be purchased ready to use or custom-made for each athlete through the impression of their teeth, construction of the device and adjust for the individual occlusal and orthognathic movements [15].

With the growth and appreciation of the sport in recent years, along with growing concern about the safety of athletes and prevention, the use of mouthguards has grown and become increasingly common among some sports. However few studies have evaluated these devices contamination by saliva. It is little known that human saliva from a healthy individual houses more than 100 million bacterial cells per 1 ml of saliva [9].

Therefore, the aim of this study was to know the habits and attitudes of athletes as the use and cleaning of their mouthguards and also assess the ability of disinfection of a new product specially developed for this purpose.

Material and methods

An interview by means of a questionnaire (PU Protocol n. 100/2011, CAAE: 0086.0.094.000-11) was performed with 22 men, young adults, rugby players, to know their habits and attitudes about the use and cleaning of mouthguards. After this step, microbiological testing was conducted to evaluate the efficacy of a test product in a spray for decontaminating mouthguards.

Two mouthguards were used, a colorless (Pretorian©, Zhejiang, China) and another one blue (Kipsta, Villeneuve, France.), commercially available. Six samples (5 mm diameter x 7 mm height) were removed through *punch* on the occlusal portion of the mouthguards, totalizing 12 samples.

About 3 to 4 ml of saliva were collected from two healthy adult non-smoking subjects who did not use antimicrobial agents in the last 3 months prior the collection. A *pool* of 5 ml of fresh saliva was obtained, mixed and homogenized 2.5 ml of saliva of each subject. The contamination of the specimens was performed by submerging all samples in this pool of saliva in a sterile plastic bottle. The process contamination occurred for 40 minutes in the bacterial incubator at 35ºC. After this period, the six samples of the colorless mouthguards were randomly divided into two groups: control and test. The same was executed with the six samples of the blue mouthguard. The test groups were sprayed with about 1 ml of the antiseptic product so-called test to evaluate their antimicrobial efficiency. After contact with the product for 1 minute, the specimens were rolled on a surface of sterile absorbent paper to remove the excess of the product on the surface of the specimens, and then they were transferred to test tubes containing 5 ml of sterile brain heart infusion broth (BHI Broth, Biobras, São Paulo, SP, Brazil) and stored into bacteriological incubator at 35ºC for 24 hours. The control group underwent the same procedure but received no chemical treatment aimed to the decontamination of the specimens. After incubation, all tubes were removed from the incubator and evaluated for turbidity of the culture medium.

Results and discussion

All 22 questionnaires were fully completed. After analyzing the results, it was observed that the 22 subjects, all male, with a mean age of 23.5 years (minimum 19 and maximum of 31 years-old), ten (45.5%) were currently enrolled in undergraduate, eight (36.4%) completed higher education and four (18.1%) secondary school students. Therefore, the sample is composed of young adults, well-educated, since 81.9% of the respondents are attending or have graduated from high school. However, only two (9.1%) reported having received guidance on how to sanitize

their mouthguard. This result may reflect the lack of disclosure in the media and professional sports about the need of cleaning and decontamination of these devices. The lack of scientific research in this field can also be understood as a reflection of the ignorance of the potential for contamination and disease transmission by saliva. Studies on Dentistry, through analyzing saliva contamination of toothbrushes, have shown that the bristles of the brushes are shelters for various microorganisms, from bacteria, yeast and fungi [3, 12], and even to Hepatitis C virus [7]. These microorganisms can cause caries, gingival disease, fungal infections and even more serious infectious diseases such as hepatitis C. The dental literature shows that salivary microbiota can cause common diseases and simple treatment, such as herpes simplex and throat inflammation [1], to systemic and potentially fatal complications such as infective endocarditis [8] or other opportunistic infections in the respiratory and gastrointestinal system, as well as cardiovascular and renal problems [6]. The saliva that infects the toothbrush is the same as the mouthguard contaminates, so the mouthguard can also be considered as a potential vehicle of contamination and disease transmission among athletes. When asked if they performed some type of mouthguard cleaning, only one respondent (4.5%) answered that always cleaned it. However, when this same subject was questioned how he cleaned his protector, the response was that it was just water. Another seven (31.8%) said they sometimes cleaned it, four confirmed that they only used water, two said they used toothbrush and toothpaste and one just washed with water and performed the decontamination with an oral antiseptic prior to storage.

In the dental literature, it has been well established that cleaning with water and even some daily oral antiseptics are insufficient to keep the toothbrushes free of contaminants. Also the type of storage can influence on the proliferation of microorganisms and, therefore, all the expected benefits arising from toothbrushing could be compromised [5]. By analogy, the same saliva contamination observed in the bristles of the toothbrush is also observed on the surface of mouthguards, with some aggravating factors that may enhance microbial contamination on the protector, once the exposed area is larger, the teeth are normally juxtaposed to the surface of the device for a period of time much longer than that of the toothbrush during brushing, the protector suffers no microbial reduction by possible action of antimicrobial toothpastes used in some toothbrushing, and also the protector can fall and suffer consequent contamination by microorganisms exogenous to oral cavity, which is not even cleaning before returning to the mouth of the athlete during sports. Thus, the shared use of this device should be completely avoided and discouraged, and the mouthguard must be thoroughly cleaned and decontaminated, especially after use and prior to storage.

To evaluate the ability of decontamination of the mouthguards for a product especially designed for this purpose, 12 test samples were made from two mouthguards commercially available. After contamination with saliva, decontamination of the test group and the incubation of control and test group in BHI tubes were, it was observed turbidity of the tubes and microbial growth in all tubes of the control group. The tubes of the test group showed no turbidity or microbial growth. These results can be explained by the presence of saliva contamination in samples of the control group. The spray product test promoted full decontamination of the specimens from the test group in the experimental conditions of this study. It is true that in general, there are several factors that can affect the quantity and quality of the microbiota adhered to mouthguards, and toothbrushes, such as plaque index of the patient, their frequency and duration of use, how they are sanitized and the environment/storage conditions of mouthguards and/or toothbrushes [4].

The advantages of spray application of antiseptic solutions in the decontamination of toothbrushes are highlighted by Neal and Rippin [13]. The advantages are: ease and speed of use, the economy of the amount dispensed, application of a new portion of the product at every decontamination, as well facilitating transportation to the place of practice or competition. Considering the aforementioned discussion, it is suggested to raise awareness of the risks of saliva contamination of mouthguards to health professionals and especially to athletes. The results also suggest the use of antiseptics for the disinfection of any devices in contact with saliva, to avoid or minimize cross-contamination, the chance of infections and reduce surface contamination. It was clear that even individuals highly educated, do not know the means and do not perform the correct hygiene of their mouthguards. It was also found the effectiveness in vitro for a new product for disinfecting mouthguards which seems quite promising for its purpose.

Conclusion

The risks of saliva contamination of mouthguards, care of cleaning and storage and the need for disinfection of these devices should be better disseminated among professionals and especially among athletes. The test product was effective in decontaminating salivary mouthguard.

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