

Dental squash injuries – a survey among players and coaches in Switzerland, Germany and France

Persic R, Pohl Y, Filippi A. Dental squash injuries – a survey among players and coaches in Switzerland, Germany and France. © Blackwell Munksgaard, 2006.

Abstract – Squash belongs to sporting activities with medium risk of causing dental trauma. Because of high velocity, close body contact and the use of rackets the injury potential in squash has increased. The aim of this work was to conduct a comparative study between Switzerland, Germany and France on a number of issues: the frequency of dental and facial injuries in squash, athletes' habits of wearing mouthguards, as well as the general level of information about emergency measures after a dental trauma and the resulting consequences. Using a standardized questionnaire a total of 653 individuals, 600 squash players and their 53 coaches, were interviewed. In each of the three countries 200 players belonging to four different divisions (juniors, amateurs, semi-professionals and professionals) were surveyed. Of these 653 interviewees 133 (20.4%) have already observed a dental injury; 27 (4.5%) have experienced a dental trauma themselves. Less than half of all interviewed players and coaches (47.6%) were aware of the possibility of replanting avulsed teeth. Just 5.1% were familiar with the tooth rescue kit. Only one individual wore a mouthguard. The results show that the area of squash requires more information about prevention through sports associations, coaches and dentists.

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Dental sports injuries are frequent (1). In high-risk sports like inline skating, skateboarding and mountain biking the probability of suffering injuries in the orofacial area has increased (2–5). Today up to 35% of all children and adolescents suffer dental accidents to their permanent teeth (6–9), especially to the front teeth of the upper jaw (10–12). Crown fractures are the most frequent dental sports injury (13, 14). Serious dental trauma like an avulsion requires extensive therapy and is expensive (12). The estimated life-long cost for an avulsed tooth amounts up to €18 000. Squash belongs, like handball, soccer and basketball, to sports activities with a medium risk for suffering dental trauma (15). The injury risk is higher in squash because of high velocity, close contact, small area and the use of rackets (16, 17). Squash also has a greater incidence

of such injuries because athletes wear neither a helmet nor a protective visor. Conclusive data about the frequency and type of dental injuries do not exist, although many studies about the epidemiology of squash injuries have already been published (16–19). Sports activities using stocks and rackets have special danger of causing dental injuries (20). Every third dental trauma happens because of racket hits (21). The practice of racket sports activities should be controlled by skilled coaches (22). Studies showed that 70% of all squash injuries happen because of racket hits (19, 23). Especially amateurs do hurt their opponents because of less experience and bad techniques (16, 17, 19, 24). Eye injuries are the most common orofacial squash injuries (25–28).

Wearing mouthguard reduces orofacial injuries and jaw fractures substantially (29–33). In most

types of sports mouthguards are not an integral part of the protective gear. The wearing of mouthguards is partly regulated in boxing, ice hockey, rugby and American football. The use of mouth protectors in squash is rare and there are no recommendations yet. In many types of sports with close contact mouthguards are not widely accepted. Points of criticism are, among others, restriction of breathing, communicative problems and disagreeable esthetics (34–37). These problems are reduced if mouthguards are custom-made. Custom-made mouthguards fit perfectly and offer best protection (38–42). The most frequent reason for not wearing mouthguards is that most people think they do not need one (20, 36, 43).

Because to date no data regarding squash are available, the objective of this work was to conduct a comparative study between Switzerland, Germany and France on a number of issues: the frequency of dental and facial injuries in squash, athletes' habits of wearing mouthguards and the general level of information about emergency measures after a dental trauma and the resulting consequences.

Material and methods

Using interviews 653 persons in three countries (Switzerland, Germany and France) were surveyed. Of these 600 were squash players and 53 coaches. The participating athletes played in four different divisions: juniors, amateurs, semi-professionals and professionals. In each division the study analyzed and evaluated 150 players; 50 from each country (Table 1). The interview contained 18 questions about observed and experienced injuries, tooth replantation, tooth rescue kit and mouthguard (Table 2). The questionnaire had already been used in previous studies (36, 43). The investigator went through the questionnaire with each of the participants separately in order to avoid similar answers. The age, nation and league status of each interviewee were recorded. The interviews took place mainly at national championships and bigger tournaments. Amateurs were surveyed in public squash centers. Statistical evaluation was performed using the aspects of the country (Switzerland, Germany and France) and the league status (junior, amateur, semi-professional and professional). By

Table 1. Interviewees in Switzerland, Germany and France

	Juniors	Amateurs	Semi-professionals	Professionals	Coaches	Total
Switzerland	50	50	50	50	21	221
Germany	50	50	50	50	17	217
France	50	50	50	50	15	215
Total	150	150	150	150	53	

Table 2. Questionnaire

No.	Question
1.	Have you ever suffered from an orofacial injury?
2.	If yes, what kind of orofacial injury (nose fracture, laceration, jaw fracture, lip injury, eye injury)?
3.	Have you ever observed an orofacial injury?
4.	If yes, what kind of orofacial injury (nose fracture, laceration, jaw fracture, lip injury, eye injury)?
5.	Have you ever experienced a dental injury?
6.	If yes, what kind of dental injury (avulsion, crown fracture, dislocation)?
7.	Have you ever observed a dental injury?
8.	If yes, what kind of dental injury (avulsion, crown fracture, dislocation)?
9.	Do you know that it is possible to replant an avulsed tooth?
10.	Are you aware that immediate action is essential for a successful outcome?
11.	Do you know the tooth rescue kit?
12.	Do you know the dental emergency service?
13.	Do you know that an avulsed tooth has to be located for legal reasons?
14.	In your opinion how high are the life-long subsequent costs for a lost anterior tooth?
15.	Do you know a mouthguard?
16.	If yes, which kind of mouthguard do you know (stock, custom-made)?
17.	Do you wear a mouthguard?
18.	If not, why (communication, breathing, esthetics, no necessity)?

means of a general linear model, a variance analysis was carried out in order to determine significant dependencies. The software program used for the analysis was SPSS/WIN 11.0 (SPSS Inc., Chicago, IL, USA). The level of significance was set at $P \leq 0.05$.

Results

A total of 653 individuals, 600 players and 53 coaches, were interviewed. The average age of all interviewees was 30.3 years (10–75); 37.7% of all players suffered from an orofacial injury. Most frequent face injuries were lacerations ($n = 139$), eye injuries ($n = 60$) and lip injuries ($n = 45$); 27 (4.5%) of those questioned players have experienced a dental trauma. Statistical differences between the three countries (Switzerland 10, France 9 and Germany 8) ($P = 0.891$) and the league status (amateurs 10, professionals 8, semi-professionals 6 and juniors 3) ($P = 0.247$) could not be determined. Twenty players suffered a crown fracture, six experienced an avulsion and one a dislocation; 68.5% of all players and coaches have already observed an orofacial injury. Most common injuries were eye injuries ($n = 252$), lacerations ($n = 247$) and lip injuries ($n = 157$). In response to the question ‘Have you ever observed a dental injury?’, 133 of the 653 interviewees answered yes (20.4%). Statistical differences were found between the countries ($P < 0.001$) as well as between the league

status ($P < 0.001$): in France ($n = 59$) and Germany ($n = 47$) more dental injuries were observed than in Switzerland ($n = 27$). Professionals and coaches observed among divisions most dental accidents (Fig. 1). Crown fractures were seen most frequently (89/142 observed dental injuries). Forty-two avulsions and 11 dislocations were also noted (Fig. 2).

Only 311 (47.6%) of all interviewees were aware of the fact that an avulsed tooth can be replanted. Statistical differences were found among the league level ($P = 0.004$): adults were better informed than

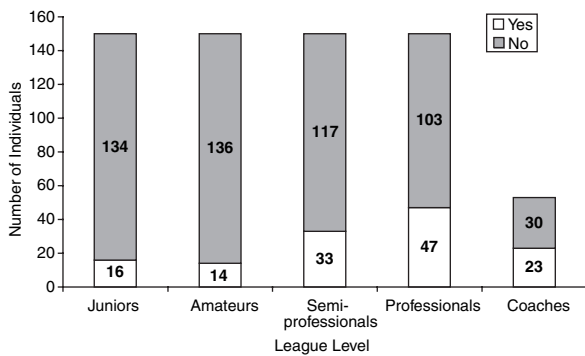


Fig. 1. Comparison of observed dental injuries according to league level.

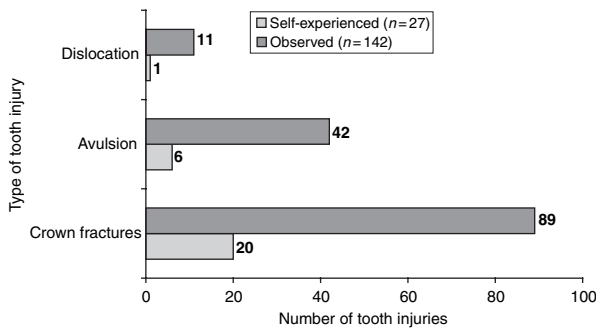


Fig. 2. Comparison between kind of observed and self-experienced tooth injuries.

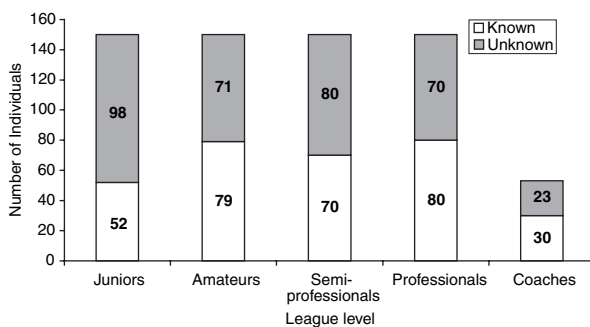


Fig. 3. Awareness of tooth replantation according to league level.

juniors (Fig. 3). No statistical differences were found between the countries ($P = 0.068$). The question ‘Are you aware that immediate action is essential for a successful outcome?’ was only answered by those who knew that an avulsed tooth could be replanted ($n = 311$). A total of 206 (66.2%) knew that the success of replantation depends on immediate action. Statistical differences between the countries could not be determined ($P = 0.108$). Among divisions professionals and coaches were informed best ($P = 0.001$).

Thirty-three (5.1%) of 653 participants were familiar with the tooth rescue kit (Dentosafe®; Medice, Iserlohn, Germany), which allows avulsed teeth to be preserved in a cytophysiological environment. Statistical differences were determined between the three nations (Switzerland 19, Germany 11 and France 3) ($P = 0.003$). A total of 350 of 653 persons (53.6%) knew the dental emergency service. The comparison of divisions showed that adult players were better informed than young players ($P = 0.001$).

Eighteen of 653 (2.8%) interviewees knew that an avulsed tooth has to be located for legal reasons because it is a part of the body. No statistical differences were determined between the countries ($P = 0.118$) or the league level ($P = 0.449$).

The life-long costs after avulsion of an anterior tooth were estimated best in Germany with €9534 (Switzerland €8837 and France €4583) ($P = 0.041$). Statistical differences at the league level could not be determined ($P = 0.867$). Among divisions most of the answers stayed within a comparable range (Fig. 4).

A total of 599 of 653 individuals were familiar with the mouthguard. The mouthguard was better

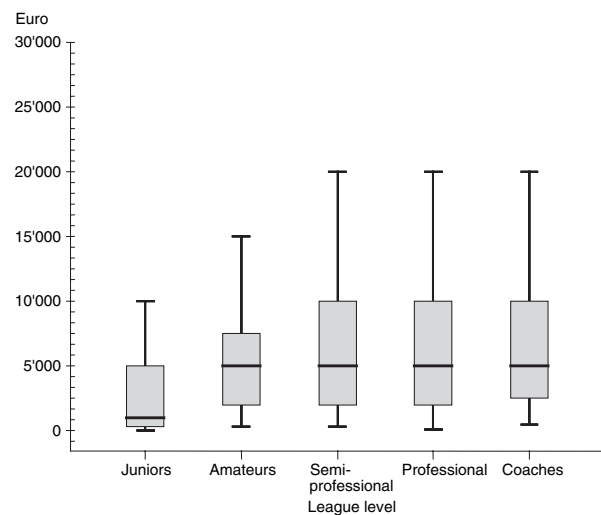


Fig. 4. Estimated life-long costs for a lost anterior tooth according to league level.

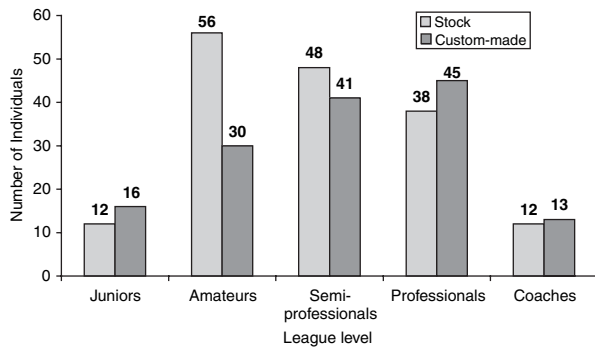


Fig. 5. Type of known mouthguards according to league level.

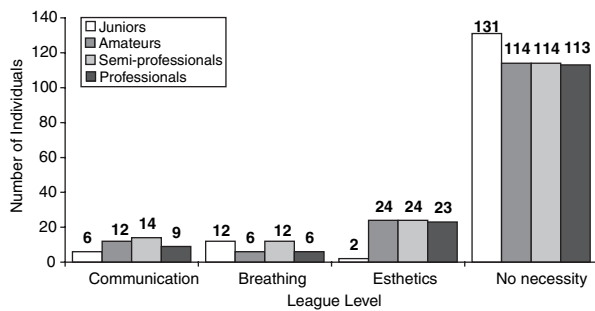


Fig. 6. Reasons for not wearing mouthguards according to league level.

known in Germany (99.1%) and Switzerland (97.7%) than in France (78.1%) ($P < 0.001$). The results showed differences between the league level too: among amateurs the stock mouthguard was better known and among professionals the custom-made version (Fig. 5). Only one individual answered yes to the question ‘Do you wear a mouthguard?’ Notably the answers of only 600 players were analyzed because of their function, none of the 53 coaches required a mouthguard. The most frequent answer for not wearing a mouthguard was by far ($n = 472$) ‘I have never required a mouthguard’ (Fig. 6). Other reasons like impaired communication, difficulties in breathing or bothersome esthetics were rare. Statistical differences between the countries and the league status were not noted.

Discussion

This study focused on athletes and coaches active in squash. Their interest in the survey and the prevention of dental trauma was not good, allowing the conclusion that the topic of prevention of dental injuries definitely does not receive attention in the world of squash. Squash belongs to sporting activities with medium risk for causing dental trauma (15). Other studies showed that the risk

for suffering dental trauma is relatively low (23, 44, 45). This work had similar results: 4.5% ($n = 27$) of all interviewees suffered from a tooth injury at squash. However, 20.4% ($n = 133$) had already seen a dental accident at squash. These numbers show that the orofacial injury risk is increased in squash. Almost all players who suffered from a tooth injury told that the accident happened while playing with amateurs. Up to 87% of all racket injuries occur during friendly games (23). The reason why professionals cause less dental trauma is, besides their experience, the let rule. A let means a repetition of a point if one player is in danger of hurting his opponent by playing the ball in close situations. Unfortunately many amateurs are not aware of this protective rule. Studies showed that amateurs suffer the most from racket injuries (16, 18, 19, 24). The reasons are less experience, bad techniques and faster tiredness. In this study mostly amateurs experienced dental trauma. The most frequent dental injury was by far the crown fracture. The increased occurrence of crown fractures in squash can be traced, among other factors, to the specific injury mechanism. Dental injuries are mainly caused by hits to the facial area with the racket or by collision with the opponent because of high velocity and close contact. Because of the rapid impulse of the impacting force, the injury mechanism results in direct trauma, which is conducive to a crown fracture. Dental accidents often have life-long consequences. Even if crown fractures comprise the most common dental injuries among squash players, serious periodontal damage after dislocation or avulsion may result in the loss of the tooth, due to ankylosis or infection-related resorption (46).

Less than half of all interviewed individuals knew that an avulsed tooth can be replanted: 311 (47.6%) of the 653 interviewees were familiar with this type of therapy. Only two-thirds of those ($n = 206$) knew that immediate action is essential for a successful outcome. Only 30 of 53 coaches knew about the possibility of replanting avulsed teeth. The evidence shows that athletes receive appropriate help regarding dental injuries from their coaches (3). This highlights the fact that not all players and coaches are adequately informed.

The knowledge of the tooth rescue kit is rather unsatisfactory. Only 33 (5.1%) of all interviewees were aware of it. The tooth rescue kit represents an important link in the rescue chain geared toward heightening the success rate of replantation after avulsion by supporting the regeneration of cementoblasts (22). The tooth rescue kit contains amino acids, glucose and vitamins and is available for purchase. It should be provided at public sports

facilities in order to improve the prognosis of avulsed teeth.

Many participants were familiar with a mouthguard. In Germany and Switzerland almost every interviewee was aware a mouthguard. Among amateurs the stock mouthguard seems to be better known, whereas professionals were more aware of custom-made mouth protection. Only one of 600 questioned players wore a protective mouthguard, although every fifth has once observed a dental trauma. This figure is very low. The most frequent reason for not wearing a mouthguard was that the player had never required a mouthguard. Other studies showed similar results (36, 43, 47). Normally the attitude toward mouthguard changes after suffering dental injuries (20, 47). But no player who suffered from a dental accident in this study ($n = 27$) wore a mouthguard after the accident. In boxing, ice hockey, American football and rugby the wearing of mouthguard is partly regulated in the statutes; however for squash such recommendations do not yet exist, although squash is categorized as a medium-risk sport (15). The significant reduction in tooth injuries since the introduction of mouthguard in football (48–50) ought to have a certain emulating effect. The area of squash requires more information. The use of mouthguards should be made mandatory in all sports types with higher risk of orofacial injuries (3). National sports associations as well as dentists and sports functionaries should inform athletes about the necessity of tooth protection. Using mouthguards can effectively reduce dental accidents.

References

1. Scott J, Burke FJ, Watts DC. A review of dental injuries and the use of mouthguards in contact team sports. *Br Dent J* 1994;176:310–4.
2. Bemelmanns P, Pfeiffer P. Häufigkeit von Zahn-, Mund- und Kieferverletzungen und Bewahrung von Mundschutz bei Spitzensportlern. *Sportverletz Sportschaden* 2000;14:139–43.
3. Flanders RA, Bhat M. The incidence of orofacial injuries in sports: a pilot study in Illinois. *J Am Dent Assoc* 1995;126:491–6.
4. Kerr IL. Mouthguards for the prevention of injuries in contact sports. *Sports Med* 1986;3:415–27.
5. Jennings DC. Injuries sustained by users and non-users of gum shield in local rugby union. *Br J Sports Med* 1990;24:159–65.
6. Kaste LM, Gift HX, Bhat M, Swango PA. Prevalence of incisor trauma in persons 6–50 years of age: United States, 1988–1991. *J Dent Res* 1996;75:696–705.
7. Borssen E, Holm AK. Treatment of traumatic dental injuries in a cohort of 16-year-olds in northern Sweden. *Endod Dent Traumatol* 2000;16:276–81.
8. Petti S, Tarsitani G. Traumatic injuries to anterior teeth in Italian school children: prevalence and risk factors. *Endod Dent Traumatol* 1996;12:294–7.
9. Hamilton FA, Hill FJ, Holloway PJ. An investigation of dento-alveolar trauma and its treatment in an adolescent population. Part 1: the prevalence and incidence of injuries and the extent and adequacy of treatment received. *Br Dent J* 1997;182:91–5.
10. Caldas AF, Burgos MEA. A retrospective study of traumatic dental injuries in a Brazilian dental trauma clinic. *Endod Dent Traumatol* 2001;17:250–3.
11. Olesegun KA, Narendran S, Williamson DD. Prevalence of fractured incisal teeth among children in Harris County, Texas. *Endod Dent Traumatol* 2001;17:214–7.
12. Sane J. Maxillofacial and dental injuries in contact team sports. *Proc Finn Dent Soc* 1988;84:1–45.
13. Kramer PF, Zembruski C, Ferreira SH, Feldens CA. Traumatic dental injuries in Brazilian preschool children. *Dent Traumatol* 2003;19:299–303.
14. Marcences W, Murray S. Social deprivation and traumatic dental injuries among 14-year-old schoolchildren in Newham, London. *Endod Dent Traumatol* 2001;17:17–21.
15. Federation Dentaire International. Commission on dental products. Working party No. 7: Guidelines for dental protection during sporting activities/Drugs and sport. FDI Technical Report No 38 & 39. London: FDI World Dental Press; 1990.
16. Berson BL, Rolnick AM, Ramos CG, Thornton J. An epidemiologic study of squash injuries. *Am J Sports Med* 1981;9:103–6.
17. Keyl W, Pforringer W, Gast W. How dangerous is squash? Results of an investigation on injury risk. *Munch Med Wochenschr* 1980;122:1037–40.
18. Chard MD, Lachmann SM. Racquet sports-patterns of injury presenting to a sports injury clinic. *Br J Sports Med* 1987;21:150–3.
19. Maylack FH. Epidemiology of tennis, squash and racquetball injuries. *Clin Sports Med* 1988;7:233–43.
20. Bolhuis JH, Leurs JM, Fogel GE. Dental and facial injuries in international field hockey. *Br J Sports Med* 1987;21:174–7.
21. Sane J, Ylipaavalniemi P. Dental trauma in contact team sports. *Endod Dent Traumatol* 1988;4:164–9.
22. Kirschner H, Filippi A, Pohl Y, Ebeleseder K. *Unfallverletzungen der Zähne*. Hannover: Schlütersche; 2002.
23. Willems E, Decaluwe C, Roeseler J, Brohet C. Les risques traumatiques et cardio-vasculaires lies a la pratique du squash. *Ann de Kinesither* 1989;7:325–33.
24. Pforringer W, Engelhardt M. Squashverletzungen vor allem am Kopf und Sprunggelenk. *TW Sport Med* 1991;3:417–22.
25. Capao Filipe JA, Rocha-Sousa A, Falcao-Reis F, Castro-Correia J. Modern sports eye injuries. *Br J Ophthalmol* 2003;87:1336–9.
26. Fong LP. Sports-related eye injuries. *Med J Aust* 1994;160:743–7.
27. Hirsch A, Ashkenasi I, Elchaleh A. Eye injuries due to playing squash. *Harefuah* 1990;15:695–6.
28. Kahle G, Dach T, Wollensak J. Eye injuries in squash. *Klin Monatsbl Augenheilkd* 1993;203:195–9.
29. Morrow RM, Bonci T. A survey of oral injuries in female college and university athletes. *J Athl Train* 1989;24:236–7.
30. Woodmansey KF. Athletic mouth guards prevent orofacial injuries. *J Am Coll Health* 1997;45:179–82.
31. Chapman P. Attitudes to mouthguards and prevalence of orofacial injuries in international rugby: a study of the 1990 Wallabies. *Aust J Sci Med Sports* 1991;23:115–7.
32. Labella CR, Smith BW, Sigurdsson A. Effect of mouthguards on dental injuries and concussion in college basketball. *Med Sci Sports Exerc* 2002;34:41–4.
33. McNutt T, Shannon SW, Wright JT, Feinstein RA. Oral trauma in adolescent athletes: a study of mouth protectors. *Pediatr Dent* 1989;11:209–13.
34. Filippi A, Pohl Y. Der Zahnschutz: Prävention von Zahnunfällen im Sport. *Schweiz Monatsschr Zahnmed* 2001;111:1074–85.

35. Francis KT, Brasher J. Physiological effects of wearing mouthguards. *Br J Sports Med* 1991;25:227–31.
36. Lang B, Pohl Y, Filippi A. Knowledge and prevention of dental trauma in team handball. *Dent Traumatol* 2002;18:329–34.
37. Seals RR, Morrow RM, Kuebker WA, Farney WD. An evaluation of mouthguard programs in Texas high school football. *J Am Dent Assoc* 1985;110:904–9.
38. DeYoung AK, Robinson E, Godwin WC. Comparing comfort and wearability: custom-made vs. self-adapted mouthguards. *J Am Dent Assoc* 1994;125:1112–8.
39. McClland D, Kinirons M, Geary L. A preliminary study of patient comfort associated with customised mouthguards. *Br J Sports Med* 1999;33:186–9.
40. Padilla RR, Lee TK. Pressure-laminated athletic mouthguards: a step-by-step process. *J Calif Dent Assoc* 1999;27:200–9.
41. Ranalli DN, Lancaster DM. Attitudes of college football coaches regarding NCAA mouthguard regulations and player compliance. *J Public Health Dent* 1995;55:139–42.
42. Winters JE. Role of properly fitted mouthguards in prevention of sport-related concussion. *J Athl Train* 2001;36:339–41.
43. Perunski S, Lang B, Pohl Y, Filippi A. Level of information concerning dental injuries and their prevention in Swiss basketball – a survey among players and coaches. *Dent Traumatol* 2005;21:195–200.
44. Borgogna E, Fogliano F, Bisio G, Bertolino M. Dentomaxillofacial traumatology in the game of squash. *Minerva Stomatol* 1986;35:1005–6.
45. Love RM, Carman N, Carmichael S, MacFayden E. Sports-related dental injury claims to the New Zealand Accident Rehabilitation & Compensation Insurance Corporation, 1993–1996: analysis of the 10 most common sports, excluding rugby union. *N Z Dent J* 1998;95:65–9.
46. Filippi A, von Arx T, Buser D. Externe Wurzelresorption nach Zahntrauma: Diagnose, Konsequenzen, Therapie. *Schweiz Monatsschr Zahnmed* 2000;110:712–29.
47. Yamada T, Sawaki Y, Tomida S, Tohnai I, Ueda M. Oral injury and mouthguard usage by athletes in Japan. *Endod Dent Traumatol* 1998;14:84–7.
48. Bureau of Dental Health Education and Bureau of Economic Research and Statistics. Mouth protectors: 1962 and the future. *J Am Dent Assoc* 1963;66:539–43.
49. Heintz WK. Mouth protectors: a progress report. *J Am Dent Assoc* 1968;77:632–6.
50. Moon DG, Mitchell DF. An evaluation of commercial protective mouthpiece for football players. *J Am Dent Assoc* 1961;62:568–72.