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Dental injury and its prevention in Swiss rugby

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Abstract – *Objectives*: Rugby players are at a high risk of sustaining dental injury because of the high number of tackles implicit to the game. This study aimed to determine the frequency of injuries sustained by players in the Swiss rugby league. *Methods*: During the 2010/11 season, 517 rugby players from 19 clubs were questioned about dental trauma as well as the use of mouthguards and other forms of body protection. The level of awareness about tooth avulsion and replantation was also assessed. Participants included athletes from four different leagues; National (155), Premier (122), Women's (90) and Juniors (150). *Results*: Of the 517 players taking part in the survey, 54.4% had sustained at least one serious injury and 39.5% had sustained a facial injury. One hundred and thirty-nine athletes (37.3%) had observed another player sustain a dental injury during a game, whilst 35 (6.8%) had personally sustained one or more dental injuries. Dental injury rate was considerably higher amongst forwards than backs. Four hundred and fifty-six players (88.2%) wore a mouthguard of which three-quarters were tailor-made. Three hundred and thirteen players (60.5%) were aware that an avulsed tooth can be replanted; however, only 27 (5.2%) had heard of the tooth rescue boxes. These results demonstrate that, whilst general injuries occur with regularity in rugby, dental injuries are not amongst the most common forms. This is almost certainly attributable to the high level of mouthguard usage. Particularly for players in the junior league, in which the use of mouthguards was lowest, the risk of dental injury may be reduced by an increased level of education about tooth protection. *Conclusions*: To this end, an increased awareness about and usage of tooth rescue boxes would be desirable. It would seem sensible to make the wearing of mouthguards compulsory in contact sports such as rugby.

Rugby belongs to the most popular team-sports in the world and is played in more than 100 countries across five continents (1). In 2016, for the first time since 1924, rugby will once more be an Olympic discipline. Injuries occur commonly and are often a result of the tackles that characterize the sport (2–5). The face and head are most often injured, and lacerations and soft tissue sprains are the most frequently occurring wound (5–7). To date, a wide range of injury rates (32–120 per 1000 playing hours) have been reported (5–8).

Playing rugby carries a considerable risk of dental and facial injury (9–12). The World Dental Federation (FDI) classifies rugby, along with other sports such as ice hockey, American football and various martial arts, as a high-risk sport with regard to the risk of sustaining dental injury (13).

A survey of 281 English rugby players showed that 45% had sustained a dental injury over the course of their playing careers (14). Other studies have demonstrated a similarly high level of dental injury amongst rugby players (11, 12). In comparison with the more serious rugby-related injuries, dental injuries are relatively inconsequential. However, they incur high costs and may require extensive treatment (15). Several studies have demonstrated that the majority of orofacial and dental injuries are sustained by players who do not use mouthguards (16–18). However, the wearing of a mouthguard is not a requirement of the sport's governing body, the International Rugby Board (IRB) (19), which strictly regulates the use of other protective equipment such as helmets and shoulder pads. Mouthguard usage is high amongst rugby players and has been shown to reduce the occurrence of dental injuries from 56% to 24% in this sport (20). Similar findings have been reported in various studies and also in other sports (21–23). It has also been suggested that the wearing of mouthguards may reduce the incidence of brain and temporomandibular joint injuries (24–26). Coaches have an important role to play in the education of players about the potential benefits of mouthguards (27–29).

This study examines the level of injury in the Swiss rugby league with a focus on dental injuries and mouthguard usage. In addition, the level of player awareness about tooth avulsion and the tooth recue boxes is assessed.

Materials and methods

During the 2010/2011 season 517 players from 19 Swiss rugby league clubs (including clubs from both Lichtenstein and Germany) were interviewed with a standardized questionnaire. At this time, about 2000 players were

registered with the Swiss Rugby Federation. Players were categorized according to level of play: National leagues A, B and C (combined to form one group), Premier league, Junior league (< 18 years) and the Women's league (Table 1).

The questionnaire comprised 13 questions about general, facial and dental injuries sustained, tooth replantation, knowledge about tooth rescue boxes such as Dentosafe® (Medice, Iserlohn, Germany), Curasafe® (Curaden international AG, Kriens, Switzerland) or SOS Dentobox® (Miradent, Hager & Werker, GmbH& Co., Duisburg, Germany) and the usage of mouthguards and other forms of body protection (Table 2). Similar questionnaires have been used in other sports (30–35). With the permission of coaches and club presidents, the interviews were carried out with the whole team during a single visit: In this way, there was no risk of bias through the selection of which players should participate. A single interviewer questioned each player individually and recorded demographic data including age, level of play, position and number of years of playing experience. Interviews were carried out during training sessions or at matches.

Statistical analysis involved the comparison of data between groups, age and positions. For the comparison of categorical variables, cross-tables are reported as counts and percentages. *P*-values were calculated by Fisher's Exact Test. The level of significance was set at $P \leq 0.05$. Because of the descriptive nature of the study, adjusting for multiple comparisons was omitted. All analyses were performed using R version 2.9.2 (36).

Results

The average age of the 517 players taking part in this study was 23.1 years (10–47). The overall median number of playing years was 5.1 years (0–40). This was highest amongst players in the National league who had an average of 8.4 years (1–33) of playing experience. Player demographics are presented in Table 1.

Of the 517 players, 281 (54.4%) had sustained at least one relatively serious injury over the course of their playing career. In total, 454 serious injuries (individual or multiple) were reported (Fig. 1) and the frequency of injuries varied significantly according to level of play ($P < 0.001$): National League players experienced a higher percentage of injury (70.3%) than Premier league (61.5%), Women's League (53.3%) or Junior players (32.7%). There was no significant difference in frequency of injuries between playing positions (Forwards 55.7% vs Backs 59.3%, $P = 0.45$) (Fig. 2). The most frequently reported serious injuries included ligament injuries (30.8%), bone fractures (20.7%) and muscle injuries (17.4%).

Two hundred and four (39.5%) players had sustained at least one facial injury of which there were 249 incidents (with some players reporting more than one). Similar to frequency of serious injury, this was more common amongst National league (58.7%) players than in the Premier (43.4%), Women's (30.0%) or Junior leagues (22.0%) ($P < 0.001$), and there was no significant difference in facial injury percentage between playing positions (Forwards 45.1% vs Backs 37.4%,

Table 1. Player demographics

Group	Position	Number	Total	Age in years: mean (range)
National League	Forward	87	155	27.8 (18–44)
	Back	68		
Premier League	Forward	67	122	25.7 (18–47)
	Back	50		
Women	No fixed position	5	90	25.5 (16–40)
	Forward	46		
	Back	39		
Juniors	No fixed position	5	150	14.6 (10–17)
	Forward	46		
	Back	57		
	No fixed position	47		

Table 2. Questionnaire

No.	Question
1	Have you ever suffered from a serious injury in rugby?
2	If yes, what kind of injury? (muscle/ligaments/bone fracture/laceration/others)
3	Have you ever had a facial injury?
4	If yes, what kind of facial injury? (laceration/nasal bone fracture/jaw fracture/cheek bone fracture/eye injury/others)
5	Have you ever experienced a dental injury?
6	(a) what kind of injury? (avulsion/crown fracture/dislocation) (b) how many times? (once/several times)
7	Have you ever observed a dental injury to another player during a game?
8	Do you know that it is possible to replant an avulsed tooth?
9	Where would you go with an avulsed tooth? (hospital/dentist)
10	Have you heard of the tooth rescue boxes?
11	Do you wear a mouthguard?
12	If yes, what kind of mouthguard do you have? (stock/custom-made)
13	Do you wear other protection? (shoulder/head)

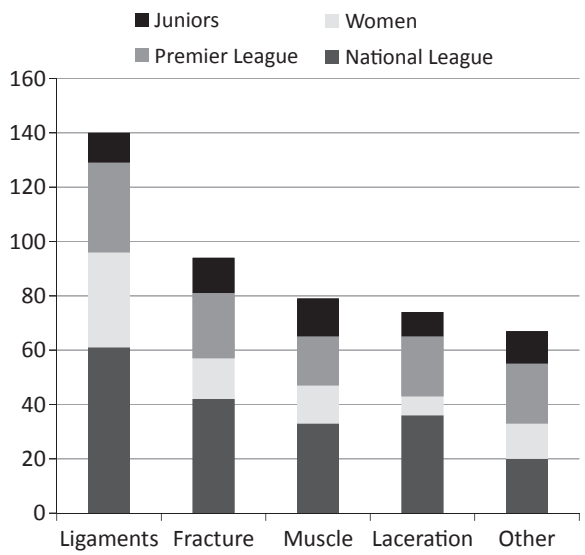

Fig. 1. Frequency of injuries of different types according to level of play.

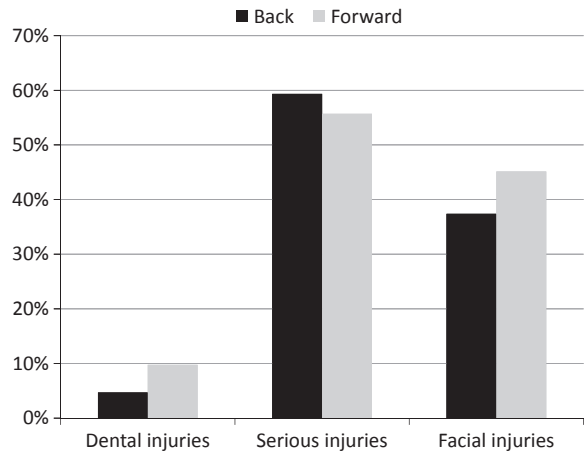

Fig. 2. Injury rates according to playing position.

$P = 0.107$) (Fig. 2). The most frequently occurring facial injuries were lacerations (54.2%), broken noses (17.3%) and eye injuries (13.3%). Five players reported having sustained a fractured jaw and two had suffered breaks of the cheek bone.

One hundred and ninety-three players (37.3%) had observed another player sustaining a dental injury during a game. This differed significantly between groups with 47.7% of National league players compared with only 26.7% of Women's league players reporting having observed a dental injury ($P = 0.001$). Thirty-five (6.8%) of the 517 players had personally sustained a dental injury, three of whom had experienced multiple dental injuries throughout their playing careers. The highest percentage of dental injury was seen in National League players (11.0%) and the lowest percentage in the Women's league (4.4%) (Fig. 3), although this difference was not significant ($P = 0.127$). In contrast, there was a significant difference in the frequency of dental injury sustained by forwards (9.8%) compared with backs (4.7%, $P = 0.048$) (Fig. 2). Twenty-six crown fractures, nine dislocations and only three avulsions were reported (Fig. 4), and these players were more likely to have sustained facial injuries than players who had not experienced dental injury ($P = 0.012$).

Overall, 456 (88.2%) of the interviewed players wore mouthguards; usage was highest amongst female players (94.4%) and lowest in the juniors (84.0%), although this difference was not significant ($P = 0.059$) (Fig. 5). Similarly, there was no difference in usage between playing positions (Forwards 91.1% vs Backs 89.3%, $P = 0.533$). In this study, 76.5% of mouthguards worn were tailor-made compared with 23.5% stock mouthguards.

Players without mouthguards generally wore fewer other forms of body (head and shoulders) protection than mouthguard-wearing players ($P = 0.026$).

Three hundred and thirteen players were aware that avulsed teeth can be replanted. In this regard, the level of knowledge of the young players (< 18 years) was almost as good as that of the adult players (57.7% vs 61.8%, respectively $P = 0.433$) amongst whom National league players were least well informed (55.5%).

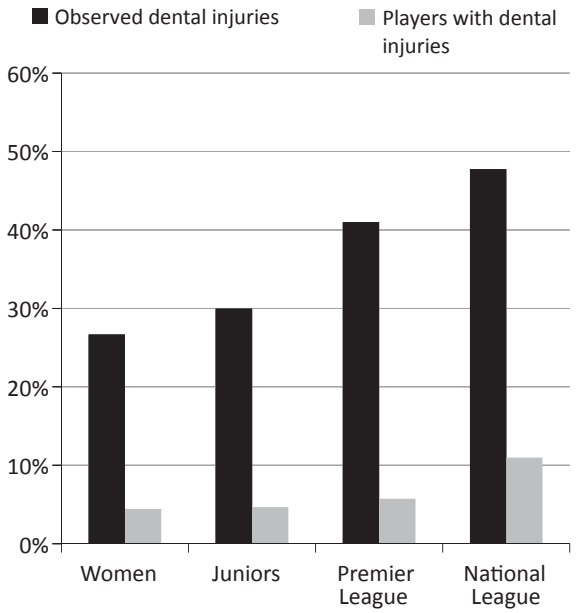

Fig. 3. Percentage of players sustaining and observing dental injuries according to level of play.

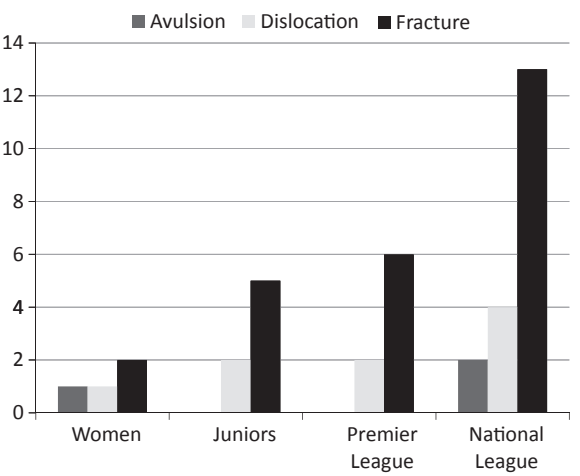

Fig. 4. Frequency of dental injuries of different types according to level of play.

Shoulder protection and head-guards, which serve as ear protectors, were worn by 151 (29.2%) and 114 (22.1%) players respectively. Forwards wore significantly more body protection than backs ($P < 0.001$).

This survey showed a disappointingly low level of awareness (27 players, 5.2%) about the tooth rescue boxes that represent a specially designed physiological storage medium for avulsed teeth. The majority of interviewed players (69.6%) would visit the dentist with an avulsed tooth whilst others (30.4%) would go to hospital.

Discussion

This study investigated the injury rate amongst players in the Swiss rugby league, with a particular focus on the

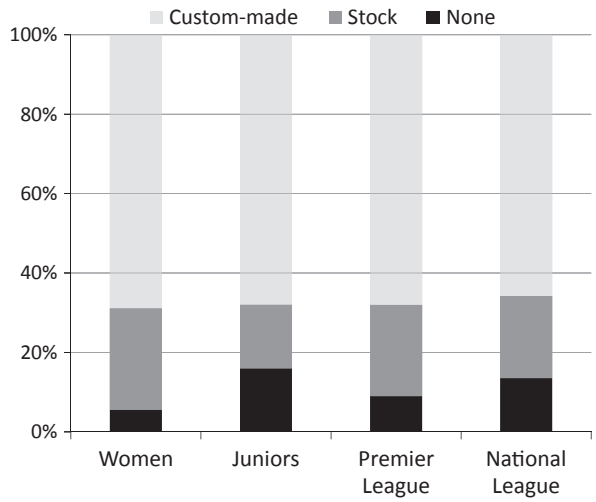

Fig. 5. Mouthguard usage according to level of play.

occurrence of dental injury and the usage of mouthguards. This report also analyses the level of player awareness about tooth replantation and the tooth rescue boxes. The sample size represents about a quarter of the population of interest (517 players out of about 2000 players registered with the Swiss Rugby Federation).

Despite being considered by the FDI to be a high-risk sport in terms of dental injury, according to the players and coaches taking part in this study, dental injury seldom occurs (13): 6.8% players had sustained one or multiple dental injuries over the course of their playing careers, whilst 37.3% of players had witnessed such an incident. These results are consistent with the players' view of dental injuries occurring relatively infrequent and would actually qualify rugby as a moderate-risk sport according to FDI guidelines. The rate of dental injury demonstrated in this study is comparable to those reported in sports such as handball (10.7%), basketball (16.6%), squash (4.5%), inline skating (9.2%) and mountain biking (5.7%) (30–34). Previous studies examining the incidence of dental injury in rugby have reported rates of 26–45% (11, 12, 14). A possible explanation for the relatively low rate in this study may reflect that in Switzerland, rugby is an amateur sport: it has been well documented that most sporting accidents occur amongst professional sports-men and sports-women (5, 7). Furthermore, the high level of mouthguard usage recorded in this study indicates a further reduction in the likelihood of dental injury (16–18, 21–23). In contrast, a study involving 281 English rugby players, of whom only 24% regularly used a mouthguard, reported a dental injury rate of 45% (14).

The level of mouthguard usage was lowest amongst junior players. It is at these players that education about the prevention of dental injuries should be targeted. At this stage, in the playing career, it is the responsibility of coaches, parents, older players and dentists to promote the wearing of mouthguards. This is all the more important given that for this age group certain treatment methods such as implantation are not recommended. Despite this, in Switzerland, the wearing of mouthguards by athletes younger than 20 years old is only compulsory in ice hockey; this is enforced by the International Ice Hockey Federation (37). Findings from this study, in accordance with previous data, suggest that it would be beneficial if a similar rule were introduced in rugby. Tailor-made mouthguards are clearly preferable to stock mouthguards. Although some of these can be fitted to a certain degree (boil and bite), they tend to, nonetheless, be too thinly moulded, lack occlusal support of the opposing arch, and are often unstable. This preference is demonstrated by the high level (76.5%) of tailor-made mouthguards used by the players in this study.

Further questioning revealed another potential target for increased education: among the high number of mouthguard-wearing players, some reported not wearing mouthguards during training sessions despite the possibility of injury occurring in non-match play (38).

Forwards sustain more injuries than backs ($P = 0.048$) largely because of their being involved, and often injured, in more tackles. To this end, they generally wear more other forms of protection than backs, reflecting the greater injury risk that has been reported in the literature (7).

An avulsed tooth should ideally only be handled by the crown before being transported by means of tooth rescue box to Casualty where it can be replanted. If this procedure is adhered to, there is a good likelihood of a full recovery. Tooth rescue boxes increase the success rate of replantation and should, therefore, be made available in places where dental injury is likely to occur (39). This study revealed a good level of knowledge amongst adults and juniors alike, concerning the possibilities of tooth replantation (60.5%). In contrast only a small proportion of players were aware of the tooth rescue boxes, which is consistent with previously published results (30–35). Despite the amateur status of the game in Switzerland and the high level of mouthguard usage, 6.8% of players taking part in this study had sustained a dental injury. This finding demonstrates the intrinsic risk associated with this high-paced, contact sport and highlights the need for education about and implementation of preventative measures (13). In any sport that carries a similarly high risk of orofacial injury, mouthguard usage should be promoted by sporting associations, dentists and even the media. Such efforts would be strengthened by the introduction of a rule making the wearing of mouthguards compulsory in rugby.

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