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Knowledge of general dentists in the current guidelines for emergency treatment of avulsed teeth and dental trauma prevention

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Abstract – A high prevalence of dental trauma exists and its effects on function and esthetics deserve the attention of general dentists. The aim of this study was to assess the level of general dental practitioners' (GDPs) knowledge about guidelines for dental avulsion and its prevention using a questionnaire. The 21-item questionnaire was distributed among 264 GDPs and the survey was realized between August–November 2006. The data obtained were statistically analyzed using descriptive analysis and Pearson's Chi-square test to determine associations between knowledge regarding emergency treatment and dentists from public or private dental schools and years of experience. The results showed that the participants exhibited appropriate knowledge concerning procedures in cases of tooth avulsion and its prevention. The number of correct answers was low in relation to recommended treatment at the site of injury. Storage medium, preparation of the alveolus and splint time for receiving the avulsed tooth received a high number of correct answers. One statistically significant association between years of experience and recommended treatment at the site of the injury in the case an avulsed tooth ($\chi^2 = 9.384$, $P = 0.009$). In conclusion, this survey showed appropriate knowledge of dental avulsion management and its prevention among the surveyed dentists. The findings also showed that communication between dentists and the population is deficient, especially concerning practitioners of high risk and contact sports.

With the diminished prevalence of dental caries, dental public health professionals are turning their attention to other oral health questions and dental trauma is an irreversible pathology that has received greater care from these professionals (1).

Studies indicate that there is a high prevalence of dental trauma, being greater in men (2, 3) and may be the result of various factors, such as collisions against objects or persons, automobile accidents, sporting activities, violence, and particularly, falls (1, 3).

Da Silva et al. (2) verified that the occurrence of dental trauma was 15.29% in 340 patients with facial trauma in a period of 1 year. Luxations and tooth avulsions were the most frequent injuries, accounting for 40.3% each, occurring mainly in the second decade of life.

To prevent dental trauma, many authors have suggested the use of mouthguards as efficient devices for reducing their occurrence, particularly during sporting activities. However, the lack of information or knowledge about the importance of mouthguard use contribute to the non-use of this device and consequently to the increased incidence of dental trauma among sports practitioners, when compared with the general population (4–7). Ferrari and Medeiros (5) verified low incidence of dental injuries (11.5%) in hockey players, since the percentage of use of and knowledge about mouthguards was 91.3% and 98.1%, respectively. Furthermore, Sgan-Cohen et al. (1) emphasized early orthodontic intervention in children with accentuated overjet and lip opening, as a method for preventing dental trauma.

Researches related to first aid in cases of tooth avulsion, indicate that dentists, particularly general dental practitioners (GDPs) (8), educators (9), parents (10), and coaches (4, 11) are poorly informed about the clinical protocol of urgency and prevention of these traumas.

The aim of this study was to assess, by means of a questionnaire, the level of general dentists' knowledge about how to proceed in the case of tooth avulsion and how to prevent dental trauma.

Materials and methods

This study was approved by the Research Ethics Committee of the São José dos Campos School of Dentistry

(077/2006-PH/CEP). To conduct the study, a questionnaire, divided into four parts containing 21 multiple choice questions (Appendix S1) was prepared exclusively for this research. The survey was carried out between August and November 2006. The sample was composed by 264 randomly selected general dentists. Professors and specialists in buccomaxillofacial surgery and endodontics were excluded from the research. The first part of the questionnaire dealt with questions related to age, sex, time of professional practice, the institution where the general dentist studied and graduated, continued educational courses and main location of professional practice. The second part included clinical management in cases of tooth avulsion. The third part was related to postoperative care of avulsed and replanted teeth, and the fourth part comprised questions related to dental trauma prevention and predisposing anatomic factors.

The correct responses were determined by evidence in the accepted literature (12–17). The data obtained were tabulated, submitted to descriptive statistical analysis by the MINITAB 14 for Windows program. Results were expressed as a percentage of respondents for each question.

Furthermore, it was also used to questions 8–11 the Pearson's chi-square test to analyze the association between knowledge of clinical management and dentists from Public and Private Dental Schools or years of experience. The level of confidence was set at $P < 0.05$ level of confidence.

Results

All of the participants who were initially approached gave their consent to participate in the study. The demographic data from the completed surveys are summarized in Table 1.

The majority of the participants (90.5%) responded that they knew how to proceed in cases of tooth avulsion. However, only 37.1% correctly indicated replace the tooth in alveolus at the accident site. A high number of participants (59.1%) were in favor of seeking attendance by a general dentist immediately. In these cases, 44.7% and 38.7% of the participants correctly responded that the tooth should be maintained in milk or saline solution, respectively.

Concerning the preparation of the alveolus, 64.1% of the participants correctly responded that they would perform careful irrigation and aspiration using saline solution. After positioning the avulsed tooth in the alveolus, 82.2% correctly indicated the use of a flexible splint to maintain the avulsed tooth in position (Table 2).

In order to determine the level of general dentists' knowledge about clinical management in cases of tooth avulsion, cross tabulations were then realized between knowledge of emergency treatment, questions 8–11 and dentists from Public and Private Dental Schools or years of experience (Tables 3–6, respectively). One statistically significant association was determined between years of experience and recommended treatment at the site of the injury in the case an avulsed tooth (Q8) ($\chi^2 = 9.384$, $P = 0.009$) (Table 3b).

The data from the part III and part IV are summarized in Tables 7 and 8.

Table 1. Demographic characteristics of participants ($n = 264$)

Question 1	
Age (Median; mean ± SD)	30 years; 32.7 ± 7.9 years
Question 2	
Female, *n* (%)	170 (64.4)
Male, *n* (%)	94 (35.6)
Question 3	
Public, *n* (%)	131 (49.6)
Private, *n* (%)	126 (47.7)
Did not answer, *n* (%)	7 (2.7)
Question 4	
Years of experience(Median; mean ± SD)	17 years; 9 ± 7.6 years
<5 years, *n* (%)	122 (46.2)
6–15 years, *n* (%)	103 (39.0)
>16 years, *n* (%)	39 (14.8)
Question 5	
Specialization course, *n* (%)	147 (55.7)
Question 6	
Location of main professional activity, *n* (%)	126 (47.7)
Private consulting room, *n* (%)	36 (13.6)
Health plan, *n* (%)	102 (38.7)
Others, *n* (%)	

Discussion

The knowledge of the appropriate treatments of dental avulsion can reduce stress and anxiety for both patients and the general dentists. Correct application of procediments after the traumatic injury should improve both short- and long-term outcomes.

Although 90.5% of the participants responded that they knew how to proceed in cases of tooth avulsion. In the present study was verified that a low number of the participants (37.1%) indicated replanting the tooth back into its socket as soon as possible, since the younger'

Table 2. Percentage distribution of questions about clinical management in cases of avulsed teeth (Part II)

Question 7	
Yes, *n* (%)	239 (90.5)
No, *n* (%)	23 (8.7)
Did not answer, *n* (%)	2 (0.8)
Question 8	
Seek attendance by a general dentists immediately, *n* (%)	156 (59.1)
Replace the tooth in the alveolus at the accident site, *n* (%)	98 (37.1)
Others, *n* (%)	10 (3.8)
Question 9	
Milk, *n* (%)	118 (44.7)
Physiologic saline, *n* (%)	102 (38.7)
Saliva, *n* (%)	37 (14.0)
Water, *n* (%)	4 (1.5)
Others, *n* (%)	3 (1.1)
Question 10	
Careful irrigation and aspiration with physiologic salina, *n* (%)	169 (64.1)
Non-removal of the coagulum, *n* (%)	60 (22.7)
Removal of the coagulum with curettes, *n* (%)	26 (9.8)
Others, *n* (%)	9 (3.4)
Question 11	
Flexible splint, *n* (%)	217 (82.2)
Rigid splint, *n* (%)	31 (11.7)
Others, *n* (%)	16 (6.1)

Table 3a. Distribution of dentists' knowledge about recommended treatment at the site of injury in the case of an avulsed tooth by type of dental school graduated (question 8)

Dental school	Correct (B)	Incorrect (A, C, D, E, F, G)	Total
Private	51	81	132
Public	44	81	125
Total	95	162	257

χ^2 = 0.325; df = 1; *P*-value: 0.568 > 0.05.

Table 3b. Distribution of dentists' knowledge about recommended treatment at the site of injury in the case of an avulsed tooth by years of experience (question 8)

Years of experience	Correct (B)	Incorrect (A, C, D, E, F, G)	Total
<5 years	56	66	122
6–15 years	34	69	103
>16 years	8	31	39
Total	98	166	264

χ^2 = 9.384; df = 2; *P*-value: 0.009 < 0.05.

Table 4a. Distribution of dentists' knowledge about recommended transport mediums of an avulsed tooth from the site of injury to the dental office by type of dental school graduated (question 9)

Dental school	Correct (A, B)	Incorrect (C, D, E, F)	Total
Private	106	26	132
Public	107	18	125
Total	213	44	257

χ^2 = 1.270; df = 1; *P*-value: 0.259 > 0.05.

Table 4b. Distribution of dentists' knowledge about recommended transport mediums of an avulsed tooth from the site of injury to the dental office by years of experience (question 9)

Years of experience	Correct (A,B)	Incorrect (C, D, E, F)	Total
<5 years	101	21	122
6–15 years	91	12	103
>16 years	28	11	39
Total	220	44	264

χ^2 = 5.631; df = 2; *P*-value: 0.060 > 0.05.

Table 5a. Distribution of dentists' knowledge about recommended treatment of the alveolar socket in the case of an avulsed tooth by type of dental school graduated (question 10)

Dental school	Correct (C)	Incorrect (A, B, D)	Total
Private	79	53	132
Public	86	39	125
Total	165	92	257

χ^2 = 2.238; df = 1; *P*-value: 0.135 > 0.05.

Table 5b. Distribution of dentists' knowledge about recommended treatment of the alveolar socket in the case of an avulsed tooth by years of experience (question 10)

Years of experience	Correct (C)	Incorrect (A, B, D)	Total
<5 years	74	48	122
6–15 years	65	38	103
>16 years	30	9	39
Total	169	95	264

χ^2 = 3.455; df = 2; *P*-value: 0.178 > 0.05.

Table 6a. Distribution of dentists' knowledge about recommended splinting after tooth replantation by type of dental school graduated (question 11)

Dental school	Correct (C)	Incorrect (A, B, D, E)	Total
Private	110	22	132
Public	101	24	125
Total	211	46	257

χ^2 = 0.280; df = 1; *P*-value: 0.596 > 0.05.

Table 6b. Distribution of dentists' knowledge about recommended splinting after tooth replantation by years of experience (question 11)

Years of experience	Correct (C)	Incorrect (A, B, D, E)	Total
<5 years	99	23	122
6–15 years	86	17	103
>16 years	32	7	39
Total	217	47	264

χ^2 = 0.221; df = 2; *P*-value: 0.900 > 0.05.

participants (< 5 years) had a higher number of correct answers ($P = 0.009$). Replantation of the tooth while still at the accident site is the treatment of choice (12–17), but it may be a difficult process for the accident victim or the person in charge, justifying the answer of the majority of participants, who indicated that the patient should seek immediate attendance by a dentist.

If immediate replantation is not possible, avulsed teeth should be stored in a physiologic storage medium (12–17). The majority of the respondents (83.4%) indicated properly that the avulsed tooth should be kept in milk and saline solution. Saliva should only be indicated when neither milk nor saline solution are available (12). Andreasen & Andreasen (12) clarified that when saliva is used as a storage medium, the extra-alveolar period must be limited to a maximum of 2 h due to the slightly hypotonic nature of the medium and the fact that bacteria present in saliva may also have a harmful effect on later healing. Water is the least desirable storage medium because the hypotonic environment causes rapid cell lysis and increased inflamation on replantation (18).

Regarding the preparation of the alveolar socket, numerous authors (12–17) have indicated careful irrigation and aspiration of the alveolus with saline solution as the most suitable procedure, in order to minimize injury

Table 7. Percentage distribution of questions about postoperative care of avulsed teeth (Part III)

Question 12	
30 days, *n* (%)	73 (27.6)
7–14 days, *n* (%)	105 (39.8)
60 days, *n* (%)	30 (11.4)
+60 days, *n* (%)	28 (10.6)
21 days, *n* (%)	28 (10.6)
Question 13	
Yes, *n* (%)	227 (86.0)
No, *n* (%)	30 (11.4)
Did not answer, *n* (%)	7 (2.6)
Question 14	
7 days, *n* (%)	138 (52.3)
14 days, *n* (%)	36 (13.7)
10 days, *n* (%)	27 (10.2)
5 days, *n* (%)	18 (6.8)
Others, *n* (%)	8 (3)
No/did not answer, *n* (%)	37 (14)
Question 15	
Yes, *n* (%)	190 (72.0)
No, *n* (%)	67 (25.4)
Did not answer, *n* (%)	7 (2.6)
Question 16	
7–14 days, *n* (%)	137 (51.9)
Others, *n* (%)	53 (20.1)
No/did not answer, *n* (%)	74 (28.0)
Question 17	
Clinical and radiographic exam upto 2 years or more, *n* (%)	92 (34.8)
Clinical and radiographic exam upto 2 years, *n* (%)	74 (28.0)
Clinical and radiographic exam upto 1 year, *n* (%)	30 (11.4)
Others, *n* (%)	68 (25.8)

Table 8. Percentage distribution of questions about dental trauma prevention and predisposing anatomic factors (Part IV)

Question 18	
Yes, *n* (%)	253 (95.8)
No, *n* (%)	6 (2.3)
Did not answer, *n* (%)	5 (1.9)
Question 19	
Yes, *n* (%)	195 (73.9)
No, *n* (%)	64 (24.2)
Did not answer, *n* (%)	5 (1.9)
Question 20	
Radical sports, *n* (%)	68 (25.8)
Martial arts, *n* (%)	63 (23.9)
Collective sports, *n* (%)	55 (20.8)
Others, *n* (%)	9 (3.4)
No/did not answer, *n* (%)	69 (26.1)
Question 21	
Accentuated overjet, *n* (%)	99 (37.5)
Angle's class II, *n* (%)	79 (29.9)
Short upper lip, *n* (%)	36 (13.6)
Restored teeth, *n* (%)	19 (7.2)
Thin lip, *n* (%)	16 (6.1)
Others, *n* (%)	9 (3.4)
Did not answer, *n* (%)	6 (2.3)

to the periodontal ligament cells. This answer was chosen by majority of the participants (64.1%). Non-removal of the coagulum could make it difficult to replanting the avulsed tooth, since it creates a mechanical obstacle to replantation and the presence of a coagulum in the alveolus at the time of replantation could increase the occurrence of ankylosis (12). However, removal must be carefully realized in order to avoid further damaging or removing the periodontal ligament fibers in the alveolar process, since these are important for replanted teeth repair.

In cases of avulsion, the use of a flexible splint is recommended for 7–14 days (13, 16, 17). In the present research, majority of the participants (82.2%) recommended using a flexible splint to stabilize avulsed teeth, but a splinting period of 7–14 days was recommended by only 39,8% of the participants. Although, a period of 7–10 days is sufficient for achieving periodontal support in order to maintain the avulsed tooth in position, except in cases of tooth avulsion associated with alveolar fracture, when splinting must be maintained for a period of 4–8 weeks (12, 15, 19). The flexible splint must be removed after 7 days to permit some functional movement of the replanted tooth in order to reduce or eliminate the risk of ankylosis (12, 19). Furthermore, Andreasen (20, 21) verified in animals and humans that teeth splinted for shorter periods presented different healing from those splinted for several weeks and that long periods of rigid splinting increased the incidence of external root resorption, especially resorption by replacement.

Antibiotic therapy after replantation was recommended by 86.0% of the participants and the majority (52.3%) prescribed it for 7 days. The best choice of antibiotic and dosage after replantation of human teeth has not yet been determined, thus the systemic administration of penicillin in therapeutic doses is recommended for orofacial injuries, including replanted teeth, for a period of 7 days (19). The American Association of Endodontists (AAE) (16) and the International Association for Dental Traumatology (IADT) (17) also recommend the administration of systemic antibiotics, such as Penicillin V four times a day or Doxycycline two times a day for 7 days, at doses determined according to the patient's age and weight. Furthermore, experimental studies in animals (22, 23) verified a reduction in root resorption with the use of systemic antibiotics in replanted teeth.

The majority of participants prescribed oral antiseptic during splinting (72.0%) and a period of 7–14 days was the most recommended (51.9%). Chlorexidine mouth rinse should be used as an auxiliary for maintaining adequate oral hygiene while the splint remains in place (13, 14, 16), since patients find it difficult to brush the area adequately in the initial period after replantation.

Monitoring replanted teeth by means of clinical and radiographic exams must be performed for a minimum period of 5 years (13, 14, 16), aimed at verifying possible treatment complications, such as inflammatory resorption, resorption by substitution (6, 13–15), ankylosis (6, 13, 14) and teeth in infraocclusion (13, 14). Majorana et al. (6) evaluated 261 permanent teeth that suffered luxation or avulsion during a 5-year period and verified that root resorption was observed in 45 teeth (17.2%) and that 36 (80.0%) of these were associated with avulsion. Moreover, of these 45 monitored teeth, 30 exhibited transitory or progressive inflammatory resorption and 15 presented ankylosis with resorption by bone substitution. However, clinical controls (24, 25) showed

that replanted teeth could remain in function for over 20 years. Despite these findings, in the present study, only 34.8% of the participants recommended clinical and radiographic controls for periods longer than 2 years.

According to Ranalli (7), physical activities like competitive sports offer their practitioners a variety of benefits; however, when participating in such activities, athletes run the risk of suffering some type of injury, including dental and facial traumas. Fortunately, the majority of these traumas can be prevented with the use of appropriate protective equipment.

In this study, 95.8% of the participants reported that they knew what a mouthguard was and 73.9% of the participants indicated the use of one, especially for radical, martial arts and team sports. This result appears to be promising, since almost 100% of the general dentists that participated in the study knew of the protective device and more than half of them indicated its use to those engaged in high risk and contact sports. In spite of the awareness among general dentists regarding the importance of the use of mouthguards, dentists have been unable to transmit this message to the population, especially to those practicing high risk and contact sports, since the rate of mouthguards usage was low (4, 5, 11, 26, 27).

Concerning predisposing anatomic factors, 37.5% of the participants considered accentuated overjet as the main risk factor for dental trauma, followed by Angle Class II malocclusion (29.9%), in agreement with observations made by Araújo & Valera (13). Sgan-Cohen et al. (1) obtained a higher prevalence of severe dental traumas among children with an overjet of 4–6 mm or > 7 mm and with incomplete lip closure, emphasizing that dental trauma prevention must be achieved by means of mouthguards and early orthodontic intervention.

Several authors have verified dentists' knowledge regarding dental avulsion (8, 28–30). Hu et al. consulted GDPs and endodontists only in the city of Sao Paulo (8), and observed poor and high knowledge, respectively. Westphalen et al. evaluated the knowledge of GDPs from the city of Curitiba (28) and verified appropriate knowledge. In the present study, the questionnaires were sent to GDPs in different cities and states of Brazil, and professors and specialists in buccomaxillofacial surgery and endodontists were excluded from the research. Therefore, the results represent the level of general dentists' knowledge concerning avulsion and dental trauma prevention in Brazil and not just a particular city in the country. Based on the findings of this study, it is possible to suggest that the level of knowledge of GPDs is appropriate, similar to Westphalen' research (28). In addition, studies conducted in others countries (29, 30), such as Kuwait and USA, concluded that there is a need to improve the knowledge of GPDs in the current guidelines for emergency treatment of avulsed teeth.

Conclusion

The GDPs surveyed demonstrated appropriate knowledge concerning procedures in cases of tooth avulsion; however, in relation to recommended treatment at the site of injury, the number of correct answers was low. Regarding the storage medium, preparation of the alveolus and splinting time for receiving the avulsed tooth, a high number of correct answers were received, however knowledge of GDPs in the current guidelines for emergency treatment of avulsed teeth can still be improved. Furthermore, deficient communication exists between dentists and the population, especially in relation to practitioners of high risk and contact sports. This communication should be further stimulated in order to minimize the occurrence of dental trauma.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Appendix S1. Knowledge of GPD's for emergency treatment of avulsed teeth and dental trauma prevention-Brazil.

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