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Effect of a single dental health education on the management of permanent avulsed teeth by different groups of professionals

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Abstract – *Introduction*: Tooth avulsion is the complete displacement of a tooth from its socket due to intentional or non-intentional injuries. Treatment in these cases comprises tooth replantation. This accident is very critical as the success of tooth replantation is directly dependent on several factors, such as extra-alveolar period, storage of the tooth until replantation, type of retention employed, time of endodontic intervention, type of drug prescribed, oral hygiene status as well as general health. This trauma commonly occurs during sports practice, school, and leisure activities. The first measures are critical for the prognosis of the avulsed tooth. Several studies report lack of knowledge of the population, educators, sports professionals, and health professionals in the management of tooth avulsion. This study evaluated the influence of education on different groups of professionals, addressing the knowledge and prevention and emergency management of the avulsed tooth. *Method*: The study was conducted on five different groups of professionals (elementary school teachers, physical education professionals, bank employees, dental doctors, and pediatricians) from the city of Brasília, DF, Brazil. The professionals attended a lecture and were evaluated by a questionnaire applied twice, before and after the lecture. *Results*: The results of the 479 returned questionnaires were analyzed. The difference between questionnaires before and after the lecture was statistically analyzed by the Wilcoxon test. There was statistically significant change in the performance of professional groups after information was provided ($P < 0.0001$). *Conclusion*: Education is extremely important to favor the knowledge on prevention and emergency management of an avulsed tooth, and may enhance the prognosis of tooth avulsion.

Tooth avulsion is the complete displacement of a tooth from its socket due to accidental or non-accidental injuries and may cause loss of healthy teeth; tooth replantation should be performed in these cases. This accident is very critical as the success of tooth replantation is directly dependent on several factors, such as extra-alveolar period, storage of the tooth until replantation, type of retention employed, time of endodontic intervention, type of drug prescribed, oral hygiene status as well as general health (1). Time, handling, and storage medium of the tooth are fundamental in late replantation. Preventing tooth dehydration and minimizing root manipulation are important to preserve the periodontal ligament cells. A replanted tooth with a viable periodontium has higher regeneration potential (1, 2).

Tooth avulsion is common in school, sports, and leisure environments. Additionally, epidemiological studies have reported the lack of training of the population, educators, sports professionals, and even health professionals on the management of dental trauma (3–7). In case of avulsion, in which emergency management is fundamental for tooth maintenance, a correct protocol should be followed. Studies have demonstrated the effectiveness of information on the management of tooth avulsion, enhancing the prognosis of replantation (6, 8–10). This study evaluated the knowledge of different professionals on the management of tooth avulsion, investigated the level of training on this subject provided to professionals and the influence of dental health education on the emergency management of tooth avulsion.

Material and methods

The study was conducted on five different groups of professionals (elementary school teachers, physical education professionals, bank employees, dental doctors, and pediatricians), registered in their councils or professional associations and living in the city of Brasília, Brazil. Search of the databank of dental doctors, pediatricians, elementary school teachers, bank employees, and physical education professionals revealing a total of 6296 professionals are as follows: 1623 elementary school teachers, 1280 bank employees, 657

pediatricians, 1116 physical education professionals, and 1620 dental doctors. Assuming an approximate prevalence of tooth avulsion of 40% (11) before the lecture was provided, with a sampling error of 4.5% and confidence level of 95%, a sample of 425 professionals was calculated. An addition of 70% was calculated to this value to compensate for possible sample loss, yielding a final sample of 723 professionals. This addition was made because professionals in the sample were invited to participate in the study by mail; in these cases, it is known that the response rate is very low. Proportional random selection was planned within each category, with a sample proportion of 11.48%. However, the response rates were very different; in some cases, some professionals had to be substituted due to technical problems (e.g., invalid addresses) (Table 1).

Invitations to participate in the study were sent to the selected professionals by mail, under jurisdiction of their professional bodies, according to the rules foreseen in their regulations. All professionals responding to the invitations received adequate information on the procedures, steps, and objectives of the study and signed an informed consent term.

The influence of information on the knowledge and change of attitudes of professionals in the management of tooth avulsion was evaluated by a questionnaire applied twice, before and after they attended a lecture, namely, pre-evaluation and postinformation. The participants answered two questionnaires. The first was handed some minutes before the lecture (pre-evaluation) and the second was responded 2 months after the lecture (postinformation). The first questionnaire aimed to investigate the knowledge of professionals on tooth avulsion and replantation, frequency of management of this type of trauma, measures taken when this occurred, possibility of replantation as well as the place of first aid in these cases. The second questionnaire aimed to verify the improvement in knowledge among these professionals and consequently to evaluate the influence of the information provided. The questionnaire was modified from three questionnaires employed in previous studies (4, 6, 10). It was piloted on 10 professionals from cities outside the study district to identify any problems in understanding the questions. The necessary changes were made before effective application.

The questionnaire was divided into two sections. The first comprised questions on personal information including gender, age, and period of professional practice. The second section composed of 12 multiple choice questions on the knowledge and management of tooth avulsion, training received on this subject, management of cases of avulsion and other types of dental trauma as well as the etiology of such cases (Table 2).

The lecture was given by the investigator immediately after application of the first questionnaire. It lasted 40 min and 10 min was given for answering the questions. It contained texts and images obtained from books and real case reports, addressing the knowledge and prevention and management of tooth avulsion.

The confidentiality of participants was assured by the investigator as professional identification was necessary to allow comparison of outcomes before and after the lecture. The results obtained from the 479 questionnaires applied to professionals were recorded and statistically analyzed on the softwares SAS (version 8; SAS Institute, Cary, NC, USA) and SPSS (version 13, Statistical Package for the Social Sciences; SPSS Inc, Chicago, IL, USA).

Results

A total of 479 professionals responded and participated in the study, including 102 elementary school teachers, 124 physical education professionals, 103 bank employees, 50 pediatricians, and 100 dental doctors. A total of 431 professionals effectively participated in all steps of the study, responding to the first questionnaire before the lecture and to the second questionnaire 2 months after the lecture (101 teachers, 109 physical education professionals, 100 bank employees, 36 pediatricians, and 85 dental doctors). A total of 48 professionals did not answer the second questionnaire (1 elementary school teacher, 15 physical education professionals, 3 bank employees, 14 pediatricians, and 15 dental doctors).

The result of the Wilcoxon test on general evaluation of all professions revealed that the mean number of questions correctly responded after training (lecture) was statistically higher than the mean number of questions correctly responded before training ($P < 0.0001$) for questions 2, 3, 5, 7, and 10 (Figs 1–5). The results revealed that for all questions the proportion of correct responses was significantly increased ($P < 0.0001$) after the lecture. Analysis of specific groups demonstrated a significant increase in correct responses ($P < 0.0001$) after the lecture for the groups of teachers, physical education professionals, and bank employees, for all questions. Among pediatricians, the proportion of correct responses was increased for all questions, with

Table 1. Sample calculation planning

Professional	Population	Planned sample	Invited sample	Included sample	Sample fraction[a] (%)	Coverage[b] (%)	Professionals not responding to the second questionnaire
Elementary school teachers	1623	111	187	102	6.3	92.0	1
Bank employees	1280	86	147	103	8.0	119.8	3
Pediatricians	657	44	75	50	7.6	113.6	14
Physical education professionals	1116	75	128	124	11.1	165.3	15
Dental doctors	1620	109	186	100	6.2	91.7	15
Total	6296	425	723	479	7.6	112.7	48

[a]Sample fraction of the sample included.
[b]The percentage of coverage of the study was obtained by dividing the included sample by the planned sample.

Table 2. Questions presented to participants

1. Do you know what tooth avulsion is? □ Yes □ No
2. If someone suffers facial trauma during sports, leisure or accident, what do you do **first**?
□ Refer to the director □ Perform physical examination
□ Call his/her parents/guardians □ Drive him/her to a health center
3. If you observe that a tooth was completely displaced from the mouth of an injured person, **in which** of these options would you place it?
□ On a paper towel □ In alcohol □ In saline
□ On a gauze □ In milk □ In the hand or pocket
□ In ice □ In saliva (individual's mouth) □ In a plastic bag
□ Others. Specify: _____
4. Concerning this accident, you believe that:
□ the nurse is the best professional to assist the individual
□ the medical doctor is the best professional to assist the individual
□ the dental professional is the best professional to assist the individual
□ any health professional is qualified to assist the individual
5. In your opinion, tooth replantation consists of:
□ Tooth transplantation □ Replacement of a tooth by another
□ Placement of other tooth in the mouth □ Replacement of the same tooth in the mouth
6. Do you think you are able to correctly reposition a tooth completely displaced from the mouth?
□ Yes □ No
7. How would you hold a tooth completely displaced from the mouth?
□ By the crown □ By the root □ By the crown or root
8. Have you ever received information on tooth avulsion? □ Yes □ No
If yes, where?
□ College □ Post-graduation □ Others: _____
9. Do you think that information on tooth avulsion and other types of dental trauma is important for your professional training? □ Yes □ No
10. Read carefully and respond. You may choose more than one option:
Suppose that an adolescent fell down and lost the central incisor (front tooth, maxillary arch, right or left side), which fell on the floor with earth, grass, sand, etc. Which steps would you do?
□ Wash the tooth with a brush to remove the dirt;

Table 2. Continued

□ Wash the tooth only with tap water;

□ Wash with other substance; specify: _____

□ Place the tooth in a flask with alcohol;

□ Place the tooth in a flask with milk;

□ Place the tooth in a flask with hydrogen peroxide;

□ Place the tooth in a flask with saline;

□ Reposition the tooth in the mouth;

□ Refer to a dentist;

□ Any other measure? _____

11. Have you already been asked to provide first aid to someone whose tooth had been completely displaced from the mouth? □ Yes □ No

And other type of dental trauma? □ Yes □ No Which? _____

12. If positive, what was the cause of dental trauma?

□ Falling □ Accident during sports practice

□ Hit □ Fight

□ Car accident □ Others: _____

Note:

– When applied to dental professionals, the item "Refer to a dentist" was replaced by "Refer to a colleague. Which specialty? _____"

– When the questionnaire was applied for the second time, the following question was included at the end: "This space is yours! Give your opinion on the study."

statistically significant difference ($P < 0.01$) for questions 2, 3, and 5. In the group of dental doctors, the proportion of correct responses was increased for all questions, with statistically significant difference ($P < 0.01$) for questions 2 and 3 (Figs 1 and 2).

Analysis of results for question no. 10 revealed higher proportion of correct responses for all groups, with statistically significant difference for the groups of bank employees ($P < 0.0001$), physical education professionals ($P < 0.0003$), and elementary school teachers ($P < 0.0001$). Overall analysis of professionals by the McNemar test revealed statistically significant difference in the management after training ($P < 0.0001$, Fig. 5).

Discussion

The results of this study demonstrated that 18.37% of participants had been requested to provide first aid in cases of tooth avulsion – 8% of teachers, 14% of physical education professionals, 5% of bank employees, 6% of pediatricians, and 45% of dental doctors. Also 26.69% of participants had already been requested to assist other types of dental trauma – 14% of teachers, 17% of physical education professionals, 10% of bank employees, 6% of pediatricians, and 75% of dental doctors.

The literature reveals high prevalence of dental trauma reported in several studies as well as lack of knowledge of lay population and even of health professionals on this subject. According to Marcenes et al. (12), the epidemiology of dental trauma varies according to the local culture of each region. Few studies have attempted to achieve data on dental trauma in Brasília, Brazil. This study investigated the local situation.

The target population of this study comprised physical education professionals and elementary school

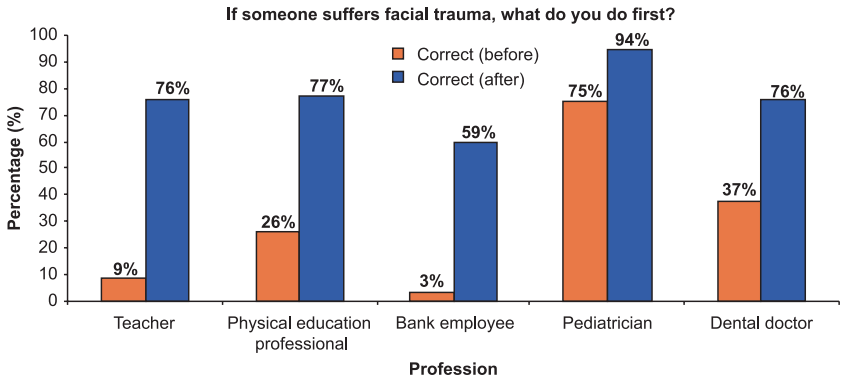

Fig. 1. Frequency distribution of participants according to correct responses to question no. 2, before and after the lecture. Brasília, DF, 2005.

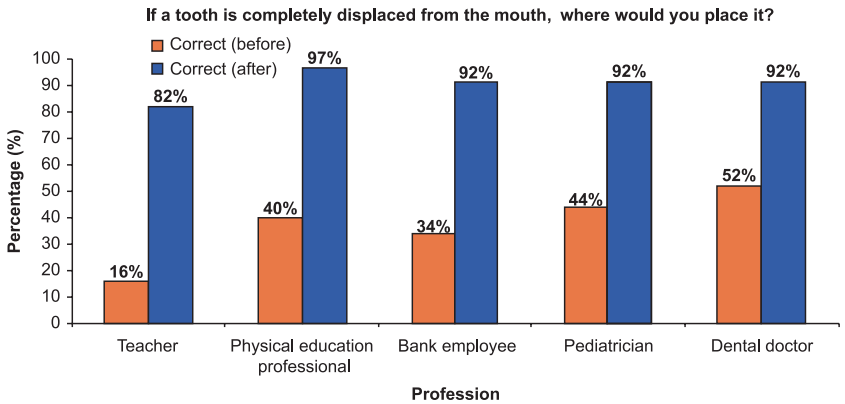

Fig. 2. Frequency distribution of participants according to correct responses to question no. 3, before and after the lecture. Brasília, DF, 2005.

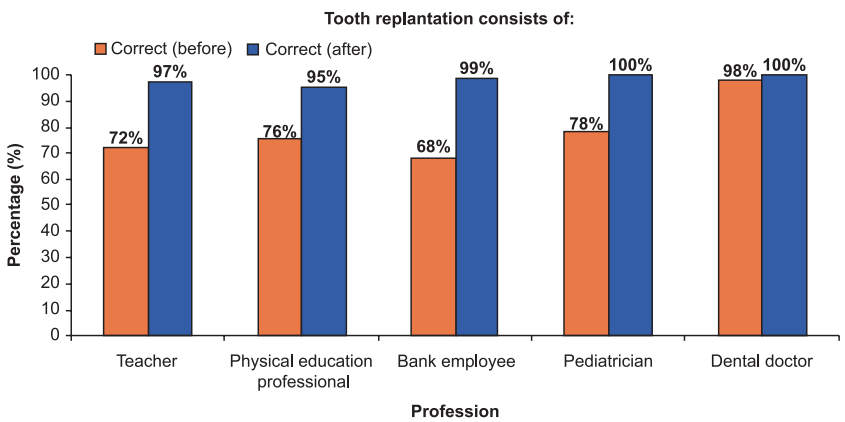

Fig. 3. Frequency distribution of participants according to correct responses to question no. 5, before and after the lecture. Brasília, DF, 2005.

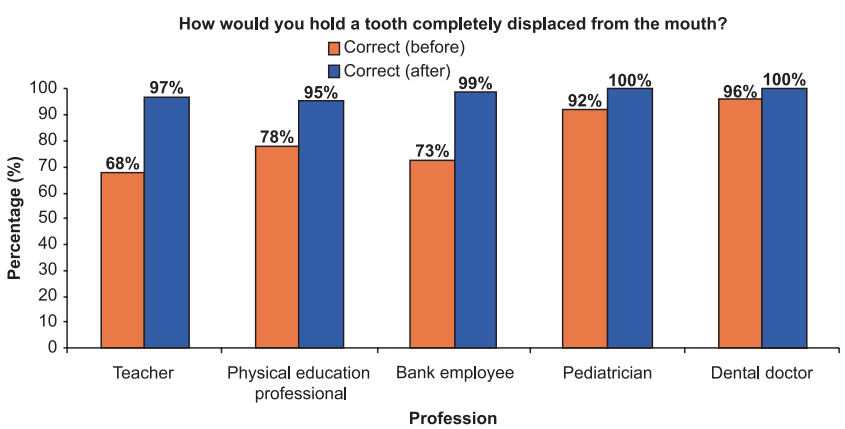

Fig. 4. Frequency distribution of participants according to correct responses to question no. 7, before and after the lecture. Brasília, DF, 2005.

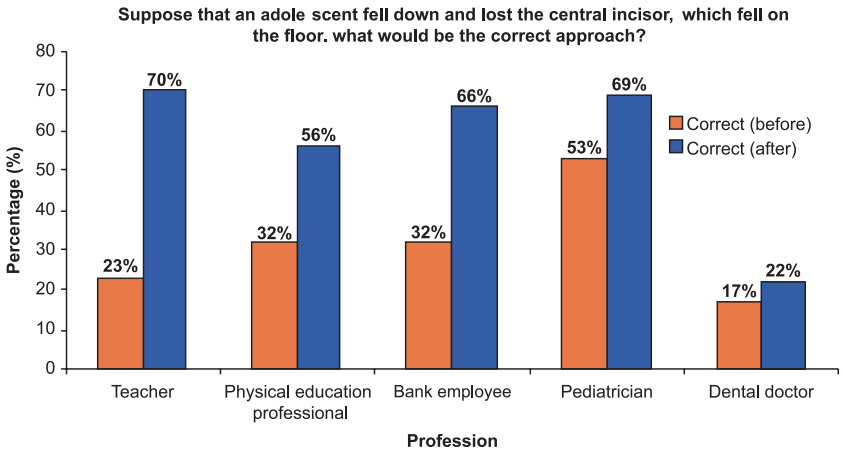

Fig. 5. Frequency distribution of participants according to correct responses to question no. 10, before and after the lecture. Brasília, DF, 2005.

teachers (first to eighth grades, corresponding to children aged 7 to 15 years) as several epidemiological studies demonstrate that school and sports environments are places with high prevalence of dental trauma (2, 11–15). According to Ravn (14), causes such as a stumble, plays, shoves, and fights at school were common in their study conducted in Copenhagen. The author mentions that many children are restricted to a relatively small place and this may lead to occurrence of accidents. Marcenes et al. (12) also mentioned that pushes of children against each other or against objects are common at schools which favors the occurrence of accidents. Inclusion of dental doctors and pediatricians in the present sample was also based on previous studies that reported the search of these professionals for management of dental trauma and demonstrated lack of training of many professionals in the emergency care and treatment of these lesions (16–19). Inclusion of bank employees who are not directly related with the occurrence of dental trauma aimed to describe the knowledge on this subject among the lay population.

Tooth avulsion has been investigated in several countries. The results reveal high prevalence of this injury among children and adolescents (20–22). Moreover, it is known that tooth avulsion may lead to early tooth loss (1, 8). The loss of an avulsed tooth causes not only functional problems but also psychological disturbances, stress, and high financial costs (both direct and indirect), demanding time for treatment (22–25). The different factors that may contribute to early loss of an avulsed tooth include lack of technical information on tooth avulsion among people who may provide first aid to such accidents. In addition, in cases of tooth avulsion, emergency procedures are essential for the success of treatment.

Little information has been reported on this subject (6, 8, 9). The results of this study agree with these findings. For example, the results for question no. 8 in the questionnaire (Have you ever received information on tooth avulsion?) revealed that despite the high prevalence of dental trauma during sports practice and at school, few professionals had received information on the subject before the lecture. Only 3% of elementary school teachers, 12% of physical education professionals, 4% of bank employees, and 18% of pediatricians participating in the study had received information on the subject. The results of question no. 1 (Do you know what tooth avulsion is?) confirmed these findings: a high number of professionals (84% of teachers, 78% of physical education professionals, 93% of bank employees, and 44% of pediatricians) did not know what tooth avulsion was, before the lecture. Conversely, after the lecture, 96% of professionals considered that information on this subject was very important for their professional training. The interest on the subject was also favorable in the study of Sae-Lim and Lim (26) who observed interest in 95% of the sample.

With regard to dental education, questions no. 2 (If someone suffers facial trauma during sports, leisure or accident, what do you do first?) and 3 (If you observe that a tooth was completely displaced from the mouth of an injured person, in which of these options where would you place it?) revealed that the lecture favored the change in measures taken by professionals in case of tooth avulsion. Ferrucio et al. (8) reported that the lack of awareness on the need of physical examination after the injury leads to loss of many teeth even after attempts of replantation. On question no. 2, before the lecture, it was observed that only 9% of teachers, 24% of physical education professionals, 5% of bank employees, and 40% of dental doctors would perform physical examination. Conversely, after the lecture these numbers were increased in all groups of professionals; namely, 78% of teachers, 71% of physical education professionals, 61% of bank employees, 94% of pediatricians, and 89% of dental doctors understood the importance of physical examination.

If immediate replantation of the avulsed tooth is not possible, the tooth should be immediately stored in favorable storage medium to preserve the viability of periodontal ligament cells until care by the dental professional. This remaining periodontal tissue is essential to allow the repair (27–29). Analysis of question no. 3 revealed that results before the lecture were similar to those reported by Hamilton et al. (17), showing the importance of change in professional management and the correct storage media. Before the lecture, the professionals had difficulty to select the best storage medium for the avulsed tooth. Inadequate choices were mentioned by 257 professionals such as paper towel which was selected by 58 professionals. Alcohol was

mentioned by 10 professionals. Dry gauze was selected by 72 professionals. Storage in the hand or pocket was mentioned by 10 professionals, plastic bag was selected by 26 professionals, and ice by 54 professionals. This variation in responses was also observed in the studies of Sae-Lim and Lim (26), Blakytny et al. (30), Chan et al. (4), and Pacheco et al. (31). However, after the lecture, most professionals were able to indicate an adequate storage medium for the avulsed tooth: 363 professionals indicated milk, 27 indicated saline, and 28 professionals selected the saliva. According to Trope (32), the appropriate biological media for storage of an avulsed tooth until replantation keep the vitality of periodontal ligament cells, reduce the inflammatory response, and prevent sequelae as ankylosis and root resorption. The lecture provided in this study addressed the several storage media, their advantages and limitations. The best storage media are the Hank's balanced salt solution (HBSS), milk, and saline (33). Isotonic solutions are recommended. After the lecture, the study revealed that even though the different possibilities for storage of avulsed teeth were mentioned, most professionals selected milk, saline, and saliva. These data agree with the reports of Andreasen et al. (29) who stated that the media most currently used are still milk, saline, and saliva. This selection may be related to easier access to these media.

Before the lecture, 54 professionals (15 teachers, 18 physical education professionals, 18 bank employees, 2 pediatricians, and 1 dental doctor) indicated ice as storage medium. This was also reported by Chan et al. (4) who associated this preference due to the widespread use of ice for transportation of organs or amputated limbs, as demonstrated by the press. Cold water was also mentioned by some professionals in this study. Ice and cold water are considered as inadequate by Dreyer et al. (34) who stated that these media might increase root resorption when applied directly or indirectly on the periodontal ligament.

Studies have demonstrated that dental education improves the adequate management in case of emergency care to dental trauma (8, 9). Immediate replantation has the greatest influence on the success of treatment of an avulsed tooth. In this study, questions no. 5 (In your opinion, tooth replantation consists of:) and 6 (Do you think you are able to correctly reposition a tooth completely displaced from the mouth) revealed that before the lecture, 72% of teachers, 74% of physical education professionals, 70% of bank employees, 80% of pediatricians, and 98% of dental doctors knew what tooth replantation is. However, only 2% of teachers, 8% of physical education professionals, and 7% of bank employees stated that they were able to correctly perform this emergency procedure. Similar data were reported in the study of Chan et al. (4) in which only 5.4% of teachers stated they were able to perform this procedure. Conversely, after the lecture, 97% of teachers, 95% of physical education professionals, 99% of bank employees, 100% of pediatricians, and 100% of dental doctors knew what tooth replantation is, and 68% of teachers, 79% of physical education professionals, 83% of bank employees, 91% of pediatricians, and 98% of dental doctors stated they were able to correctly perform tooth replantation. Interestingly, even though the confidence of professionals to perform tooth replantation was increased after the lecture, many of them (32% of teachers, 23% of physical education professionals, 17% of bank employees, 9% of pediatricians, and 2% of dental doctors) did not feel they would be able to perform tooth replantation. This may indicate the need of continuing education campaigns to reinforce the technical procedures of tooth replantation. This is in accordance with the study of Kahabuka et al. (35) who reported that a single lecture provided to teachers was not sufficient to promote the care required for dental trauma.

Late replantation of an avulsed tooth is the indicated treatment when immediate replantation is not possible. Stokes et al. (7) and Chan et al. (4) observed great difference in the number of health professionals selected to assist cases of tooth avulsion. Before the lecture, most participants in this study indicated the dental doctor as the best professional to assist a case of tooth avulsion. This result was increased in the second questionnaire, revealing strong association of these professionals with dental trauma. The results of this study were higher than reported by Raphael and Gregory (10) who observed 70.7% of referral to a dental doctor, instead of a medical doctor. There was also an increase in the number of professionals indicating any professional for the care of tooth avulsion. This increase was caused by physical education professionals (17%) and pediatricians (61%) who were possibly encouraged by the information on emergency management of tooth avulsion provided during the lecture. According to the studies of Holan & Shmueli (18) and the present findings, there is lack of knowledge on the subject and on the correct emergency procedures for tooth avulsion among pediatricians. These findings explain the concern of Kostopoulou & Duggal (19) who stated the need of more emphasis on dental trauma in the undergraduate and postgraduate training of health professionals in general, and suggested the diffusion of a standard protocol for follow up and initial care of these lesions for all health professionals and the population. The literature reveals lack of knowledge in general on the management of an avulsed tooth (7, 17, 36).

Manipulation is an important aspect in case of tooth avulsion. The avulsed tooth should not be held by the root. Touching the root is contraindicated as it may damage the remaining periodontal tissue and increase the contamination of the avulsed tooth (29). On the first questionnaire, it was observed that 23% of teachers, 23% of physical education professionals, and 24% of bank employees were unaware of correct manipulation of the tooth. A similar finding was observed in the study of Pacheco et al. (31), in which the participants would hold the tooth in any manner. After the lecture, correct manipulation of the tooth by the crown was indicated by nearly all groups of professionals.

Question no. 10 aimed to analyze the attitudes of professionals in a hypothetical case of tooth avulsion. All possible correct and incorrect combinations were considered. On the first questionnaire, it was observed that several professionals indicated mistaken attitudes, such

as washing the tooth with a brush to remove the dirt, washing the tooth with water and soap, and washing and storing in hydrogen peroxide or alcohol. Washing the tooth with a brush to remove the dirt was indicated by 14.61% out of 479 participants (17% of teachers, 15% of physical education professionals, 24% of bank employees, 4% of pediatricians, and 8% of dental doctors). This inadequate measure which may damage the remaining periodontal tissue was also observed in the investigation of Pacheco et al. (31), in which 5% of elementary school teachers analyzed, also indicated this practice. These results are similar to the findings of Raphael & Gregory (10), in which 15% of the sample would wash a contaminated tooth with a brush, ignoring that this measure would reduce the success rate of replantation. Hamilton et al. (37) found higher values in which 22.1% would brush the tooth.

On the same question, when asked about any other measure, inadequate, incorrect, and unrelated responses were observed for all groups of professionals on the first questionnaire. Storage of the tooth in alcohol was mentioned by 3.34% of participants (3% of teachers, 6% of physical education professionals, and 7% of bank employees). Chan et al. (4) reported that 5.4% of physical education professionals analyzed in their study would store the tooth in alcohol. Hydrogen peroxide which is inadequate for rinsing and storage was also mentioned in this study by some professionals – 1.25% out of 479 participants. Pacheco et al. (31) revealed higher values in which 33% of teachers indicated this measure. After the lecture, 100% of professionals understood the harmful effects of alcohol and hydrogen peroxide for avulsed teeth, yet one teacher and two physical education professionals still mentioned washing the tooth with a brush, demonstrating lack of attention to the information provided. These results reveal the need of continuing education programs to constantly reinforce the emergency and preventive procedures for dental trauma.

After the lecture, responses to the question about any other measures revealed greater coherence, demonstrating the effect of information provided in the lecture. The teachers, physical education professionals, and bank employees responding to this item on the second questionnaire unanimously indicated urgent referral to a dental professional. Pediatricians were concerned about antibiotic therapy, tetanus vaccine, and urgent referral to a dental professional for further treatment. The dental doctors provided complete responses on continuity of emergency care at the dental office, including correct treatment and follow up.

Concerning the adequate measures, the results of question no. 10 indicated that before the lecture, only 23% of teachers, 32% of physical education professionals, 32% of bank employees, 53% of pediatricians, and 17% of dental doctors were able to establish correct combinations for the management of an avulsed tooth. After the lecture, there was statistically significant improvement in management for all groups of professionals ($P < 0.0001$, Fig. 5).

Hamilton et al. (17) observed the insufficient knowledge of dental professionals on the treatment of dental trauma. These authors reported that even professionals with postgraduate degree indicated inadequate procedures for the treatment of severely traumatized incisors in adolescents. Kostopoulou and Duggal (19) also observed inadequate knowledge of dental professionals on the emergency management of dental trauma in children. Both suggested more emphasis on this subject in undergraduate and postgraduate training as the emergency care, repair, and maintenance of traumatized teeth require clinical skills, knowledge, diagnosis of the problem, adequate initial management as well as proper treatment and long-term follow up. Analysis of responses to question no. 10 (item: Would you refer to a colleague? Which specialty?) revealed that 45% of dental professionals would refer the patient to another colleague. This result evidences the lack of interest of dental doctors and pediatricians to provide care to patients who suffered these injuries and may explain the low values observed for these professionals in Fig. 5. It should be highlighted that the study was conducted regardless of the specialty of dental doctors. These professionals, independently of their area of expertise, should be able to provide emergency care to patients after the occurrence of trauma. Also, this may be related to lack of confidence on the correct measures to be taken in these cases. The specialties most frequently indicated for referral by dentists were Endodontics, indicated by 24 dental doctors and Pediatric Dentistry, mentioned by 19 dental doctors.

Data in previous studies (17, 38) and in this investigation reinforce the need of more effective information on dental trauma during undergraduate and postgraduate training, and according to Andreasen et al. (29), dental trauma often requires complex care, demanding the interaction among several specialties and professionals prepared to provide such care. Hu et al. (5) conducted a study on 274 dental professionals (graduated and endodontists), which revealed that professionals receiving information on this subject during undergraduate and postgraduate training presented statistically higher level of knowledge compared with professionals who had not received such information. Westphalen et al. (39) also observed adequate knowledge on the management and treatment of avulsed teeth and reported that 60% of general dentists received continuing education on their own initiative after completion of undergraduate education, reinforcing the aforementioned conclusions.

Reports in the literature unanimously indicate that coronal fracture is the most common injury caused by trauma to the permanent dentition (2, 20). In this study, coronal fracture was the most frequently reported by participants, followed by luxation. Several types of trauma were reported by these professionals. According to Marcenes et al. (12), the etiologic factors of dental trauma vary according to local habits of each region and should be considered when different regions are compared.

In Brazil, variable etiologic factors have been reported between regions. Studies are conducted on different methodologies, populations, and age ranges; however, despite the different prevalence of etiologic factors between regions, falling was the most frequent in all

studies (21, 22, 40). These results revealed variable etiology of trauma between groups of professionals. Falling was also the main cause of reported accidents (20%), followed by accident during sports practice (10%), hit (9%), car accident (6%), and fight (4%). Other reasons (2%) were also mentioned by professionals such as faint and work accident. It should be highlighted that the etiology of dental trauma is important as this knowledge may enhance the strategic planning for prevention and treatment of these lesions (41).

Finally, in general, analysis of questionnaires before and after the lecture revealed significant changes in management among the groups of participants, with better outcomes on the second questionnaire. The professionals understood the reported concepts to promote the awareness on correct physical examination, adequate storage media and transportation of avulsed teeth, benefits of immediate replantation, and utilization of mouthguards. It may be assumed that this information might favor the correct emergency management, and that procedures may not be controlled by dental professionals, but rather by people in direct contact with traumatized individuals. Thus, general education may enhance the prognosis of new cases, especially if provided to parents or guardians of children, adolescents, and adults susceptible to accidents to the teeth and face. The study revealed that dental education is extremely significant and is necessary as a tool to prevent and improve the prognosis of avulsed teeth as well as for other types of dental trauma (Figs 1–5). These results corroborate the findings of Ferrucio et al. (8) who also observed the positive effect of information on the improved management among participants.

Conclusion

Analysis of the present results allowed the following conclusions:

1 The level of information offered to professionals on this subject is insufficient even among health professionals.
2 Knowledge on the emergency procedures for tooth avulsion was lower before the education lecture in all groups, except for dental professionals.
3 Emergency management in cases of tooth avulsion was reported by the different professionals, demonstrating that any person may unexpectedly have to face this situation.
4 Education may significantly enhance the likelihood that the correct measures would be taken in cases of tooth avulsion after the lecture.
5 Knowledge on the measures to be taken in cases of tooth avulsion is essential for people and especially for health professionals as the success rate of tooth replantation may be increased, if adequate procedures are performed for first aid, treatment, and follow up.

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