

# School teachers' knowledge of tooth avulsion and dental first aid before and after receiving information about avulsed teeth and replantation

Adel Al-Asfour<sup>1</sup>, Lars Andersson<sup>1</sup>, Quomasha Al-Jame<sup>2</sup>

<sup>1</sup>Oral and Maxillofacial surgery Division, Department of Surgical sciences, Faculty of Dentistry, Kuwait University; <sup>2</sup>Private clinic, Kuwait city, Kuwait

**Abstract** – School teachers can play an important role in improving the prognosis of avulsed permanent teeth of school children after they are informed about the immediate and proper dental first aid steps to be taken at the time of an accident. The aims of this study were: (i) to assess the knowledge level of emergency measures for tooth avulsion in Kuwaiti intermediate school teachers and (ii) to determine if a short lecture about tooth avulsion and replantation could improve teachers' knowledge on this topic. Eighty-five teachers at two intermediate schools (children 10–14 years old) in Kuwait were interviewed using a questionnaire about their first-aid knowledge with particular focus on the following five categories: General knowledge of teeth and avulsion, replantation of primary and permanent teeth, how to clean an avulsed tooth before replantation, extra-oral time and storage methods and media for an avulsed tooth. For each category, a score ranging from 0–3 was possible. An informative 30-min lecture about tooth avulsion and replantation was presented to a group of 43 teachers. After the lecture, the knowledge level of the teachers was re-tested using the same method. Descriptive statistics was used to describe and analyze the data. Improvement in teacher knowledge to an adequate (score of 2) or complete (score of 3) level was observed after the lecture in all five categories. The general knowledge of tooth avulsion and replantation improved from 39% to 97% and knowledge of avulsed permanent and primary teeth from 8% to 71%. Knowledge of how to clean an avulsed tooth improved from 5% to 93%. The knowledge level on the importance of extra-alveolar time before replantation increased from 1% to 74% and knowledge of a suitable storage medium for the avulsed tooth improved from 4% to 86%. Many avulsed permanent teeth in school children can be saved by replantation if school teachers learn what to do when a tooth is avulsed. A lecture followed by discussion proved to be an effective and efficient method of intervention to enhance the knowledge level of teachers so that proper dental first-aid procedures can be achieved.

Correspondence to: Dr Adel A. Al-Asfour, Faculty of Dentistry, Kuwait University, PO Box 24923, Safat 13110, Kuwait  
Tel.: +965 4986733  
Fax: +965 5347948  
e-mail: adelalalfour@hsc.edu.kw

Accepted 22 November, 2005

The most serious tooth injury is an avulsed (exarticulated) tooth. An avulsed tooth should be replanted in its socket as soon as possible to avoid further damage to the periodontal membrane (1–8). The prognosis is related to the injury of the periodontal membrane during the time the tooth is out of its socket (2–5, 9). Dry storage of the tooth will cause irreversible injury to the periodontal membrane, resulting in loss of the replanted tooth over time. However, storing the tooth in water is not recommended in that the osmolality is too low (8, 10, 11). Wrapping the tooth in plastic could prevent evaporation for at least 1 h (3) and the tooth can be stored in saline or balanced salt solution (6, 12). Storing the tooth in the patient's saliva is another

alternative for shorter periods (1, 8, 11). Milk has a favorable osmolality and composition for the viability of periodontal ligament cells and has therefore been recommended for temporary storage of avulsed teeth before replantation (8, 11). Although primary teeth may also be avulsed, they should not be replanted because this manipulation may result in injury to the underlying permanent teeth germ (6).

Knowledge of these important steps after the accident increases the success rate for the avulsed and replanted permanent tooth (6, 9). For this reason, it is important to educate the public (e.g. parents, school teachers and children) about accidents involving tooth avulsion in children.

Most studies on lay knowledge of tooth avulsion indicate that the level of knowledge is low (13–21). In a recent study in Kuwait it was shown that children have a low level of knowledge about avulsed teeth. Children had received information on general dental first aid from school teachers, parents and television (TV). Although many of them had received first-aid information, dental injuries were not included (22). The authors concluded that providing information to society is a way to increase the knowledge level of dental first aid. School teachers can play an important role in improving the prognosis of avulsed permanent teeth of school children after they are informed about the immediate and proper first-aid steps to be taken at the time of accident. Brief information in the form of a lecture given to school teachers could be a way to increase their knowledge level. However, we must learn more in how to inform the public and to improve the efficiency of our modes of information.

We have not found any studies measuring the effects of such information on school teachers. Therefore, the aims of this study were: (i) to assess the knowledge level of emergency measures for tooth avulsion in Kuwaiti intermediate school teachers and (ii) to determine if a short lecture could improve the knowledge level of a group of teachers.

### Materials and methods

Eighty-five teachers at two intermediate schools (children 10–14 years old) in Kuwait agreed to take part in the study, which involved filling in a questionnaire. They did not know in advance what the questionnaire was about in detail, only that dental questions would be asked. The questionnaire concerned first-aid knowledge of tooth avulsion and replantation, with all questions given in their mother tongue, i.e. in Arabic. A translated version of the questionnaire is given in the Appendix. The teachers were then interviewed about their knowledge regarding first aid with particular focus on the following areas:

- 1 General knowledge of teeth and avulsion
- 2 Special knowledge of tooth avulsion and replantation
  - a replantation and primary/permanent teeth
  - b cleaning of an avulsed tooth before replantation
  - c extra-oral time
  - d storage method and media for an avulsed tooth

The questions were asked consecutively, first assessing general knowledge and then gradually evaluating knowledge of a more specialized character. For each section, three to five questions were designed to assess the participants' general and special knowledge level regarding tooth avulsion and replantation. For each area, a knowledge score ranging from 0–3 was possible, where 0 = no knowledge demonstrated, 1 = minor knowledge demonstrated, 2 = adequate, but not complete knowledge demonstrated and 3 = complete knowledge demonstrated. For a definition of the scoring criteria of the answers, see the Appendix (italic sections).

Six months later, an informative 30-min lecture about tooth avulsion and replantation was given to a group of 43 teachers using a computer, projector and screen. The lecture was given by one of the authors (AA) in the

Arabic language using simple layman's language. The lecturer focused on the emergency treatment of avulsed permanent teeth and what should be performed by teachers in trauma situations before transferring the child with an avulsed tooth to a nearby dentist. Important messages were emphasized by illustrations using figures, clinical pictures and cartoon pictures with comments under each picture.

The steps illustrated to the teachers included:

- 1 Short introduction on dental tissues.
- 2 A tooth can be saved by immediate replantation of an avulsed permanent tooth and that replantation of a primary tooth is not a good option.
- 3 Handling of the avulsed tooth, how to hold it and that only permanent (not primary) teeth should be replanted.
- 4 Cleaning of the avulsed tooth if it is dirty before replantation and avoidance of scraping.
- 5 Suitable storage media for the avulsed tooth if it cannot be replanted immediately or cannot be stored in the child's mouth.
- 6 Because it is readily available, milk is emphasized as being the most suitable storage medium in trauma situations at school and home.
- 7 Emphasis on the importance of the time factor in replantation and splinting of the avulsed tooth by the dentist.

The lecturer allowed time for discussion after the lecture and even interactions between the lecturer and teachers during the lecture were encouraged.

After the lecture and discussion, the same questionnaire that was given to the teachers before the lecture was given a second time. The same scoring criteria that were used before the lecture were used (Appendix italic sections). Comparison of the teachers' knowledge level in the five categories before and after the lecture was performed and descriptive statistics was used to describe and analyze the data.

### Results

Seventy-four teachers completed the questionnaire and were considered valid for the study. The knowledge level of the teachers before and after the lecture is summarized in Figs 1–5.

#### Knowledge level before the lecture

Teachers scoring either adequate or complete knowledge (scores 2 or 3, respectively) were low in all five categories (general knowledge of teeth and avulsion, replantation of primary and permanent teeth, how to clean an avulsed tooth before replantation, extra-oral time and storage methods and media for an avulsed tooth). Concerning general knowledge of tooth avulsion and replantation, only 39% of the teachers had a score of 2–3, and only 8% of the teachers had a score of 2–3 regarding general knowledge of avulsed permanent and primary teeth. Five percent, 4% and 1% were the teacher scores on cleaning of avulsed teeth, extra-alveolar time and suitable storage medium for avulsed teeth, respectively.

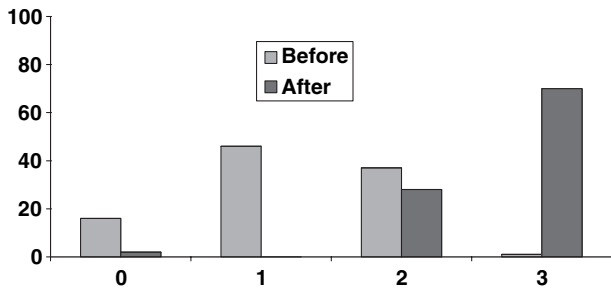


Fig. 1. Distribution (%) of general dental knowledge level (0–3) before and after the intervention lecture.

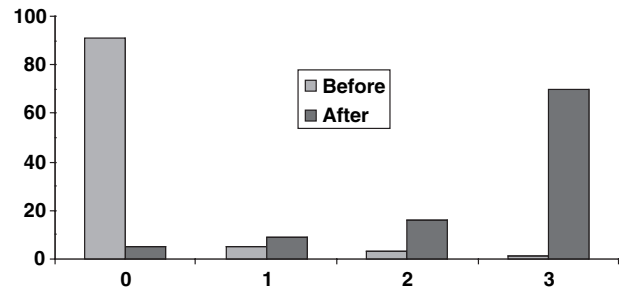


Fig. 5. Distribution (%) of knowledge level (0–3) in relation to extra-oral storage before and after the intervention lecture.

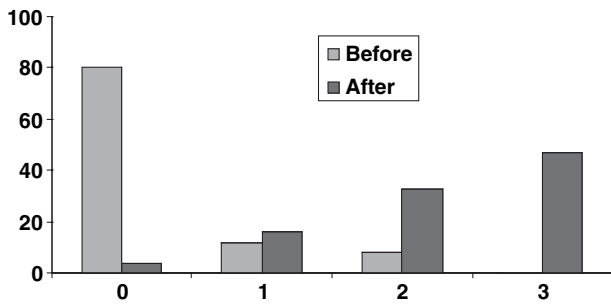


Fig. 2. Distribution (%) of knowledge level (0–3) about primary/permanent teeth before and after the intervention lecture.

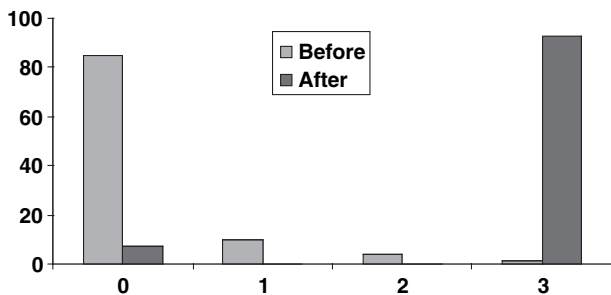


Fig. 3. Distribution (%) of knowledge level (0–3) regarding cleaning of the avulsed tooth before and after the intervention lecture.

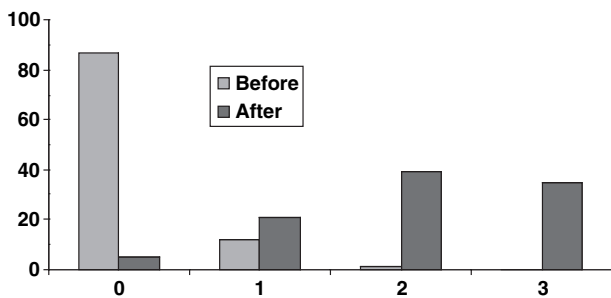


Fig. 4. Distribution (%) of knowledge level (0–3) on storage methods and media before and after the intervention lecture.

**Knowledge level after the lecture**

Improvement in the teachers' knowledge level was observed in all five categories. Concerning the category general knowledge of tooth avulsion and replantation, teachers with scores of 2 and 3 (adequate to complete knowledge) improved from 39% to 97%. Improvement in knowledge level of avulsed permanent and primary teeth increased from 8% to 71%.

When it came to cleaning an avulsed tooth, improvement in knowledge level was found to increase from 5% to 93%.

Knowledge level of the importance of extra-alveolar time before replantation and a suitable storage medium for the avulsed tooth increased from 1% to 74% and from 4% to 86%, respectively.

**Discussion**

The results of this study showed that the knowledge level of tooth avulsion and how first aid should be carried out is low in intermediate school teachers in Kuwait. However, with a 30-min lecture followed by questions and answers, it was possible to dramatically change the knowledge level first aid in dental trauma in school teachers from low to an adequate level.

Informing the public of what to do when a tooth is knocked out is exceedingly important for the prognosis of the tooth. Persons likely to be involved in avulsion trauma at the site of the accident are school-aged children, who are frequently injured, and persons in their surroundings when the injury occurs, i.e. teachers and parents. Some studies have shown that the level of knowledge of avulsed teeth and first aid is generally inadequate in school teachers (15, 16, 18, 20), parents (17, 19) and children (22). The results of the present study confirmed that Kuwaiti intermediate school teachers also have a low knowledge level of traumatic tooth avulsion and first aid.

In this study, teachers' knowledge of emergency measures for tooth avulsion was measured using structured standardized questions. This method of measuring knowledge was tested and found suitable in a recent study in children (22). An advantage with this method is the possibility to compare knowledge level over time (e.g. before and after a specific group has been given information). Furthermore, different ways of informing

the public can also be compared in order to discover the most suitable cost effective methods for society. The content of the information can also be adjusted and improved after such measurement has been carried out. Finally, the long-term effects of information and knowledge can be measured over long time to determine the effectiveness of the intervention procedure.

A short 30-min lecture followed by discussion was chosen as the method of information dissemination to the teachers. By giving a lecture, we could reach a large number of teachers in a very short amount of time. All teachers at the school were invited and attended the lecture.

Furthermore, the lecture provides a good opportunity for a direct meeting between the lecturer and the receiving group, with a possibility to raise questions and discuss issues. In addition, the lecturer can get immediate feedback if the message was understood or not and what kind of information should be further developed.

However, when giving lectures, it is important that the group is homogenous so that the information can be delivered to people with a similar background. It is not recommended to mix different categories of staff in the audience or to mix teachers with children. Instead, it is better to give information separately to different staff groups.

We first measured the knowledge level of all 85 teachers in one school district and then 6 months later contacted the school administration asking to give a lecture about dental trauma.

To be able to have a surprise effect, so that the teachers did not prepare themselves in advance, the details of the lecture were not mentioned, neither that a measurement of knowledge was going to take place. The lecture time was arranged by the school administration and 43 teachers could attend this lecture. Although all teachers in the school district could not be reached, one advantage is that the lecture could be given to one group. Furthermore, we did not want to give more lectures than one in the school with the risk that teachers who had attended a lecture would inform others. The difference in number of attending teachers between the registrations is thus an effect decided by that only 43 could attend the lecture. The difference in numbers should therefore not have any bias on the knowledge level before and after information was given.

Although the evaluation yielded valuable information about school teachers' knowledge of tooth avulsion, replantation and first aid and how the information in the lecture was understood, it is not possible to draw any conclusions regarding the long-term effect of this intervention procedure. Kahabuka et al. (23) suggests that a single educational input to school teachers is not enough to promote childhood self care. Most likely the information has to be repeated before any long-standing effect can be noted. Such repetition can be performed in other ways such as with brochures and posters.

Ideally, after the lecture, we would have liked to have observed the percentage of improvement in all areas at 90% and above. Some areas came short of this ideal figure: for example, the importance of extra-

alveolar time and storage medium. This suggests that we need to discover another way or simpler language in delivering the information. Such a modification is now in progress.

School teachers' knowledge of teeth that are knocked out and basic information on replantation and first aid for such dental emergencies were increased in all five areas measured. The highest level of improvement was seen in areas of general knowledge and how to clean an avulsed tooth. An acceptable level was observed regarding the use of a suitable storage media. In future lectures we should put more emphasis on information about the differences between primary and permanent teeth and why only permanent teeth should be replanted. When informing people about the use of different storage media, there is a risk that the importance of immediate replantation slips into the background. Our results indicate this tendency and this should also be taken into consideration when preparing future lectures and information materials. For instance, people need to know that teeth that are avulsed should be considered for immediate replantation at the site of the injury in order to maximize prognosis.

Although the lecture is an efficient way of giving information, it is exclusive and expensive, requiring many lectures to reach out to all teachers in society. A specialist can certainly answer all questions and lead a discussion, but other categories of staff could preferably be trained to present such information. Kahabuka et al. (24) used a consensus conference in which a teacher and parent were included in a group together with dentists to increase knowledge of dental trauma. Based on their findings, the authors recommended the use of guidelines. It is important to determine the most cost-efficient means to inform the public about tooth avulsion and dental first aid. To our knowledge, no studies exist on measuring efficient ways of informing target groups in society about tooth avulsion and dental first aid. Thus, this is an important subject matter for future research. Problem-based learning and interactive learning have both shown good results but are difficult to use. To reach many individuals distribution of information brochures and compact discs/digital versatile discs to schools would be an excellent way to inform key persons, i.e. children, teachers and parents. Furthermore, TV is an effective medium to spread information to the public. The possibility of multiple interactive media is an intriguing way to enable effective teaching and learning for the future. Such programs are now in preparation in Kuwait. Informing teachers in a school is important before such a campaign is directed to the children. With knowledge gained, the teachers can give correct guidance to children in school.

## Conclusion

In many cases avulsed permanent teeth in school children can be saved by replantation if school teachers learn what to do when a tooth is knocked out of its socket. A lecture followed by discussion seems to be an efficient method to increase the knowledge about dental trauma and how it can be treated. With this knowledge, school

teachers can play an important role in preparing and guiding children and parents when tooth avulsion has occurred under trauma.

### Acknowledgement

The authors are grateful to all the teachers that took part in this study. We also want to thank the school leaders and Ministry of Education for giving approval to our study. This study was financed by grant no DS02 /03 from the Research Administration, Kuwait University.

### References

- Cvek M, Granath L-E, Hollender L. Treatment of non vital permanent incisors with calcium hydroxide. III. Variation of occurrence of ankylosis of reimplanted teeth with duration of extra alveolar period and storage environment. *Odontol Revy* 1974;25:43–56.
- Andreasen JO. The effect of extra-alveolar storage and storage media upon periodontal and pulpal healing after replantation of mature permanent incisors in monkeys. *Int J Oral Surg* 1981;10:43–53.
- Blomlöf L, Andersson L, Lindskog S, Hedström K-G, Hammarström L. Periodontal healing of replanted monkey teeth prevented from drying. *Acta Odontol Scand* 1983;41:117–123.
- Andersson L, Bodin I, Sörensen S. Progression of root resorption following replantation of human teeth after extended extra-oral storage. *Endod Dent Traumatol* 1989;5:38–47.
- Andersson L, Bodin I. Avulsed human teeth replanted within 15 minutes – a long-term clinical follow-up study. *Endod Dent Traumatol* 1990;6:37–42.
- Andreasen JO, Andreasen FM. Textbook and color atlas of traumatic injuries to teeth, 3rd edn. Copenhagen: Munksgaard; 1994.
- Heimdahl A, Von Konow L, Lundquist G. Replantation of avulsed teeth after long extra-alveolar periods. *Int J Oral Surg* 1983;12:413–7.
- Blomlöf L. Milk and saliva as possible storage media for traumatically exarticulated teeth prior to replantation. (Thesis) *swed Dent J Suppl* 1981;8:1–26.
- Trope M. Clinical management of the avulsed tooth. *Dent Clin North Am* 1995;39:93–112.
- Sigalal E, Regan JD, Kramer PR, Witherspoon DE, Operman LA. Survival of human periodontal ligament cells in media proposed for transport of avulsed teeth. *Dent Traumatol* 2004;20:21–8.
- Blomlöf L, Lindskog S, Andersson L, Hedström K-G, Hammarström L. Storage of experimentally avulsed teeth in milk prior to replantation. *J Dent Res* 1983;62:912–6.
- Barrett EJ, Kenny DJ. Avulsed permanent teeth: a review of the literature and treatment guidelines. *Endod Dent Traumatol* 1997;13:153–63.
- Hamilton FA, Hill FJ, Mackie IC. Investigation of lay knowledge of the management of avulsed permanent incisors. *Endod Dent Traumatol* 1997;13:19–23.
- Holan G, Shmueli Y. Knowledge of physicians in hospital emergency rooms in Israel on their role in cases of avulsion of permanent incisors. *Int J Paediatr Dent* 2003;13:13–9.
- Newman L, Crawford PJM. Dental injuries: first aid knowledge of Southampton teachers of physical education. *Endod Dent Traumatol* 1991;7:255–8.
- Pacheco LF, Filho PFG, Letra A, Menezes R, Villoria GEM, Ferreira SM. Evaluation of the knowledge of the treatment of avulsions in elementary school teachers in Rio de Janeiro, Brazil. *Dent Traumatol* 2003;19:76–8.
- Raphael SL, Gregory PJ. Parental awareness of the emergency management of avulsed teeth in children. *Aust Dent J* 1990;35:130–3.
- Sae-Lim V, Lim LP. Dental trauma management awareness of Singapore pre-school teachers. *Dent Traumatol* 2001;17: 71–6.
- Stokes AN, Anderson HK, Cowan TM. Lay and professional knowledge of methods for emergency management of avulsed teeth. *Endod Dent Traumatol* 1992;8:160–2.
- Chan AWK, Wong TKS, Cheung GSP. Lay knowledge of physical education teachers about the emergency management of dental trauma in Hong Kong. *Dent Traumatol* 2001;17:77–85.
- Walker A, Brancheley J. It's knockout: survey of management of avulsed teeth. *Accid Emerg Nurs* 2000;8:66–70.
- Andersson A, Al-Asfour A, Al-Jame Q. Knowledge of first aid measures of avulsion and replantation of teeth. An interview study of 221 Kuwaiti school children. *Dent Traumatol* 2006;22:57–65.
- Kahabuka FK, Willemsen W, van't Hof M, Burgersdijk R. The effect of a single educational input given to school teachers on patient's correct handling after dental trauma. *S Afr Dent J* 2001;56:284–7.
- Kahabuka FK, Ntabaye MK, van't Hof M, Plasscharet A. Testing consensus conference method by discussing the management of traumatic dental injuries in Tanzania. *East Afr Med J* 2000;77:552–7.

### Appendix

#### School teachers' knowledge of tooth avulsion and replantation

##### 1. General knowledge of teeth and tooth avulsion

Do you know how the tooth is normally kept in its position in the jaw so it will not fall out when you chew?

Do you think a tooth can be completely knocked out?

If the tooth is knocked out by accident, do you think it can be put back so you can chew and smile with it just like you did before the accident?

To achieve a full score of 3, knowledge about each of the three principles below has to be demonstrated.

- Know that a tooth is attached to the bone by fibers.
- Know that a tooth can be knocked out completely.
- Know that an avulsed tooth can be replanted, heal successfully and function again normally.

To achieve a score of 2 knowledge of two of the above principles has to be demonstrated.

To achieve a score of 1 some knowledge of the above principles has to be demonstrated but less than three.

2. Special knowledge of avulsion and replantation

In this part of the interview questions are presented in four important areas of knowledge: primary teeth, how to clean a tooth before replantation, extra-alveolar time and storage method and media.

a. Replantation of primary teeth

Do you think primary (baby, temporary) teeth should be put back in after they were knocked out?

If the answer is no, give the reason why?

Do you think permanent (the teeth you have for the rest of your life) teeth should be put back in after they were knocked out?

*To achieve a full score of 3 the teacher has to know all of the following information:*

- Primary teeth should not be replanted.
- The reason for not replanting a primary tooth is the risk of injury to the underlying permanent tooth germ.
- Permanent teeth should be replanted whenever possible.

*To achieve a score of 2 knowledge of two of the above principles has to be demonstrated.*

*To achieve a score of 1 one of the above principles has to be demonstrated.*

b. How to clean the tooth before replantation?

If the tooth has fallen on the ground and is dirty, what would you do?

If you have to clean the tooth first, how do you clean it?

Do you clean the tooth even if it is not dirty?

How do you hold the tooth while cleaning it?

Is it important to rub away all the dirt?

*To achieve a full score of three the teacher has to know all of the following information:*

- A dirty tooth should be rinsed in water (not in an antiseptic solution).
- A tooth should be held by its crown and touching of the root surface should be avoided.
- Rubbing the root should be avoided.

*To achieve a score of 2 knowledge of two of the above principles has to be demonstrated.*

*To achieve a score of 1 one of the above principles has to be demonstrated.*

c. Extra-oral time

When should the tooth be put back in if it was knocked out of the mouth? (Choose the best alternative)

- Immediately
- As soon as the bleeding has stopped
- During the first hour
- Within the first 6 h
- When visiting the dentist

Why?

Do you think a tooth can be out of a person's mouth for a longer time if stored in another way than dry storage?

*To achieve a full score of 3 the teacher has to know all the following information:*

- A tooth should be replanted as soon as possible.
- The reason is that the root cells (periodontal membrane) will be injured by dry storage.
- A tooth can be stored for longer periods if stored in a suitable storage medium.

*To achieve a score of 2 knowledge of two of the above principles has to be demonstrated.*

*To achieve a score of 1 one of the above principles has to be demonstrated.*

d. Storage method and media

1. What should you do if you cannot (or choose not to) put the tooth back in your mouth?

2. How should you transport the tooth on the way to the dentist?

3. Have you heard about any other way of storing a tooth that has been knocked out before it is put back in its socket?

4. Mark desirable and undesirable ways of storing a tooth that has been knocked out while you are on your way to the dentist (show a list of suggestions below).

Wrap the tooth in paper	Yes	no
Wrap the tooth in a handkerchief	Yes	no
Wrap the tooth in gauze or cotton	Yes	no
Wrap the tooth in cellophane	Yes	no
Put the tooth in water	Yes	no
Put the tooth in ice water	Yes	no
Place the tooth in a disinfecting solution	Yes	no
Place the tooth in the child's mouth	Yes	no
Place the tooth in the child's hand	Yes	no
Put the tooth in milk	Yes	no
Put the tooth in fruit juice	Yes	no
Put the tooth in saline solution	Yes	no
Put the tooth in Coca-Cola	Yes	no

*To achieve a full score of 3 the teacher has to know all of the following information:*

- *The tooth can be stored if it cannot be replanted.*
- *The tooth must not be stored in water.*
- *The tooth must not be stored dry.*
- *The correct answer to at least 12 of the 13 statements listed above*

*To achieve a score of 2 knowledge of at least two of questions 1–3 and the correct to at least 10 of the 13 statements listed above has to be demonstrated.*

*To achieve a score of 1 some knowledge has to be demonstrated.*

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.