A Graduation Project Submitted To The College Of Dentistry In Partial Fulfillment Of The Requirement For The Degree Of Bachelor In Dental And Oral Surgery (B.D.S)

The management protocol for avulsion permanent tooth

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قال الله تعالى :
وَأَن لَّيْسَ لِلْإِنسَٰنِ إِلَّا مَا سَعَىٰ ٣٩
وَأَنَّ سَعْيَهُۥ سَوْفَ يُرَىٰ ٤٠ ثُمَّ يُجْزَىٰهُ
ٱلْجَزَآءَ ٱلْأَوْفَىٰ ٤١
سورة النجم

شكر وتقدير

الحمد والشكر لله أولاً وأخراً ...
أقدم شكري وأمتناني إلى جميع من اعانوني وساعدوني في الوصول الى هذه النقطة بفضلهم وجهدهم على الأراء القيمة التي ابدوها لي وخصوصًا مشرف البحث الدكتور الفاضل اسامة غازي والى الهيئة التدريسية في الكلية عمومًا .. راجيًا من الله ان اكون قد اصبت اكثر مما اخطأت وأن يُستفاد مما بذلتُ من جهودٍ ، أملاً ان اكون قد اعطيت الموضوع بعض حقه ، وأسأل الله ان يعلمنا ما ينفعنا ، وينفعنا بما علمنا .. والله ولي التوفيق .

❖ اهداء خاص :

إلى الفراشات من النساء اللاتي أضطهدن من سلطة مجتمعية متخلفة،

أو افكاراً رجعية تحارب الحرية الشخصية فحرمن من حقهن بالتحليق في فضاء العلم،

أنا أؤمن بكن جداً. مع خالص الحب و المودة

Contains :

Abstract

Traumatic dental injuries occur very frequently in children and adults due to various etiological factors such as falling, accident, sports injuries etc .It is one of the few emergencies in dentistry.

The success of treatment depends on the viability of the periodontal ligament cell and its root surface of the tooth. Effective treatment percentage decrease along with the exposure of the teeth extra orally. The storage medium of the avulsed tooth play a prime factor affecting the prognosis .

Proper diagnosis and treatment planning is a must for a favourable result of the treatment

Introduction

Traumatic Dental injuries (TDIs) pose a major public dental health problem. These injuries have the tendency to occur at any phase early or late and the treatment continues for a long duration. Their prevalence in permanent .dentition is around 33% for adults and 25% for children. (1) The most serious is the avulsion of permanent teeth, seen frequently in seven to ten years age group. The periodontal ligament (PDL) being loosely structured around the erupting tooth at this time provides minimal resistance to an extrusive force. (2),(3)..

A favourable prognosis depends on

- emergency intervention at the site of accident or the time immediately following avulsion.

(4),(5) Avulsion of permanent teeth is one of the few emergency situations in dentistry(6) ..It involves separation of the tooth from the socket resulting in attachment damage.

(7) In certain areas bone gets directly attached to the root surface. This is called replacement resorption or osseous replacement.(8) This process is usually progressive and irreversible in nature concluding in ankylosis.(7) The bacteria from the necrotic pulp evoke an inflammatory reaction in the PDL causing bone and root substance destruction. This whole chain of events is called inflammatory root resorption.

10,11 Thus the treatment objectives are directed towards limiting the resultant inflammation post avulsion. The maintenance of normal PDL cell physiology and morphology is of prime concern

Storage media for avulsed teeth

The ideal storage medium should be able to maintain the periodontal ligament cells so they can undergo mitosis to form clones of damaged fibroblasts of PDL which will cover the damaged surfaces of the root. The medium should also preserve the functional capacities of PDL cells. 12,13,14,15 Numerous media have been investigated for storing avulsed teeth. Tap water is the least desirable because it has a very low pH and osmolality. The periodontal ligament cells will burst and die in the hypotonic environment. 16

- The patient can place the avulsed tooth under the tongue or in buccal mucosa, making saliva as the transport media. The osmolality of saliva (17mOsm) is much lower than physiological osmolality (60-70m Osm) thus causing cell lysis due to hypotonicity. In addition, it is laden with micro-organisms which can infect the root and cause necrosis. It is used for short duration, around an hour, as longer duration can damage the PDL cells. 17,18,19,20 Though physiologic saline solutions have osmolality (280mOsm) compatible with PDL cells, they lack the essential nutrients required by the PDL cells for their metabolic function. 16

Milk has been indicated by the American Association of Endodontists as the second best solution for transport of avulsed teeth after HBSS.

- According to literature it had the following benefits:
  1- The physiological properties like pH (6.5-6.8) and osmolality (250mOsm) are compatible with PDL cells. 15
  2- The presence of nutrients like aminoacids, carbohydrates, vitamins and growth factors.
  3- Pasteurisation makes it free of bacteria (17).

In addition, milk has a short supportive time of only 1-3 hours 15 Hank's Balanced Salt Solution (HBSS) is a standard saline solution used to support the growth of many cell types in research. It contains metabolites necessary to maintain normal metabolism of cells. (16) HBSS is pH balanced (7.2), has an osmolality of 320mOsm/kg which provides an ideal osmotic pressure for PDL cells, biocompatible and is non-toxic in nature. (14), It is available in a container-Emergency Tooth Preserving System (ETPS), invented by Paul Krasner, which serves as both an optimal storage and transport media.

FIRST AID FOR AVULSED TEETH AT THE PLACE OF ACCIDENT

Dentists should be prepared to give appropriate advice to the public about first aid for avulsed teeth.2,11, . In addition to increasing the public awareness by mass media campaigns or other means of communi- cation, parents, guardians and teachers should receive information on how to proceed following these severe and unexpected injuries. Also, instructions may be given by telephone to people at the emergency site. Immediate replantation of the avulsed tooth is the best treatment at the place of the accident. If for some reason this cannot be carried out, there are alternatives such as using different types of storage media.

- If a tooth is avulsed, make sure it is a permanent tooth (primary teeth should not be replanted) and follow these recommended instructions:

1. Keep the patient calm.

2. Find the tooth and pick it up by the crown (the white part). Avoid touching the root. Attempt to place it back immediately into the jaw.

3. If the tooth is dirty, rinse it gently in milk, saline or in the patient's saliva and replant or return it to its original position in the jaw.

4. It is important to encourage the patient/guardian/teacher/other person to replant the tooth immediately at the emergency site.

5. Once the tooth has been returned to its original position in the jaw, the patient should bite on gauze, a handkerchief or a napkin to hold it in place.

6. If replantation at the accident site is not possible, or when replantation of the avulsed tooth is not feasible (an unconscious patient), place the tooth, as soon as possible, in a storage or transport medium that is immediately available at the emergency site.

*This should be done quickly to avoid dehydration of the root surface, which starts to happen in a matter of a few minutes. In descending order of preference, milk, HBSS, saliva (after spitting into a glass for instance), or saline are suitable and convenient storage mediums. Although water is a poor medium, it is better than leaving the tooth to air-dry.

7. The tooth can then be brought with the patient to the emergency clinic . And See a dentist or dental professional immediately

MANAGEMENT IN DENTAL OFFICE EMERGENCY VISIT:

Diagnosis and treatment planning

The position of an already replanted tooth should be assessed and a complete history taken to assess the outcome. If the tooth is outside the mouth, the storage medium should be evaluated.

Clinical examination

A thorough clinical examination of the socket and the surrounding soft tissues is done. Alveolar fractures can be suspected if there is movement of multiple teeth together or a segment of bone. Radiographs should be taken in three vertical angulations to ascertain horizontal root fracture in adjacent teeth. Remaining teeth should be examined and soft tissue lacerations noted.28

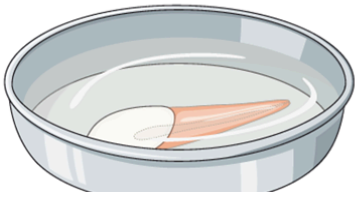
Preparation of root .
It depends on the maturity of the root and the dry time of the tooth before it was placed in storage medium. The point where the chances of survival of PDL cells become remote is considered to be 60 minutes.

Tooth With A Closed Apex : -

a) Tooth has already been replanted prior to coming to the dental office. The area is cleaned using water, saline or chlorhexidine and normal position of tooth verified both clinically and radiographically. Endodontic treatment is initiated 7-10 days after replantation and calcium hydroxide to be used as an intracanal medicament until obturation. 6

b) Tooth with extraoral dry time of less than 60 min

Root should be cleaned with a stream of saline and placed in the socket gently. 15-20 min is considered the optimal time upto which the viability of PDL cells remains high. Endodontic treatment is initiated at the second visit which is 7-10 days after the emergency visit.Calcium hydroxide is considered the drug of choice in preventing and treating inflammatory root resorption.



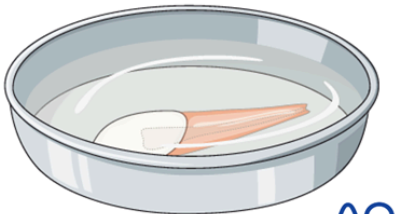
c) Extraoral dry time longer than 60 min

- The periodontal ligament is not expected to survive and the root is prepared to be as resistant to resorption as possible. The tooth is soaked in acid for 5 min to remove all necrotic tissue including the PDL to prevent the initiation of inflammatory response.It is then placed in 2% sodium fluoride for 20 min and replanted.
- Endodontic treatment can be performed extraorally prior to replantation or 7- 10 days later as in other cases

Tooth With An Open Apex :-

a)Tooth has already been replanted in the mouth before reaching the dental clinic
Wash the area with saline, water or chlorhexidine, do not extract the tooth and verify the position.6

b) Extraoral dry time is less than 60 min.



The tooth is replanted with the goal of revascularisation of the tooth pulp. The tooth is cleaned with a stream of saline and soaked in doxycycline for 5 min or covered with minocycline hydrochloride crystals.
The tooth is treated similar as a closed apex tooth, i.e, it is gently rinsed and replanted. In these patients, endodontic treatment is not initiated until signs of pathosis occur. The patient is recalled every 3-4 weeks for vitality testing to check for revascularisation.

c) Extraoral dry time more than 60 min –

The periodontal ligament becomes necrotic and healing is not expected to occur. Replacement resorption will ensue progressively leading to ankylosis of the tooth.

Splinting

Splinting of a replanted tooth to stable adjacent teeth is suggested unanimously in the guidelines and ac- cepted by clinicians. Splinting provides stabilization for replanted teeth through the initial healing period and allows some movement. Allowing some movement of the replanted tooth is accepted as it has been shown in studies using non-human primates that prolonged rigid splinting of teeth leads to extensive dentoalveolar ankylosis

SYSTEMIC ANTIBIOTICS

avulsed tooth often becomes contaminated by bacteria from the oral cavity, the storage medium, or the environment in which the avulsion occurred. Therefore, the use of systemic antibiotics after avulsion and replantation has been recommended to prevent infection-related reactions and to decrease the occurrence of inflammatory root resorption. Additionally, the patient's medical status or concomitant injuries may warrant antibiotic coverage. In all cases, appropriate dosage for the patient's age and weight should be calculated. Amoxicillin or peni- cillin remain the first choices due to their effectiveness on oral flora and low incidence of side effects. Alternative antibiotics should be considered for patients with an allergy to penicillin.

- The effectiveness of tetracycline administered immediately after avulsion and replantation has been demonstrated in animal models.Specifically, doxycycline is an appropriate antibiotic to use because of its antimicrobial, anti-inflammatory and anti-resorptive effects. However, the risk of discoloration of permanent teeth must be considered before systemic administration of a tetracycline in young patients. Tetracycline or doxycycline are generally not recommended for patients under 12 years of age.

TETANUS

Although most people receive tetanus immunization and boosters, it can- not be assumed that this is always the case.Refer the patient to a physician for evaluation of the need for a tetanus booster.

Periodontal healing after replantion of avulsed tooth

❖ **Healing with normal PDL:**

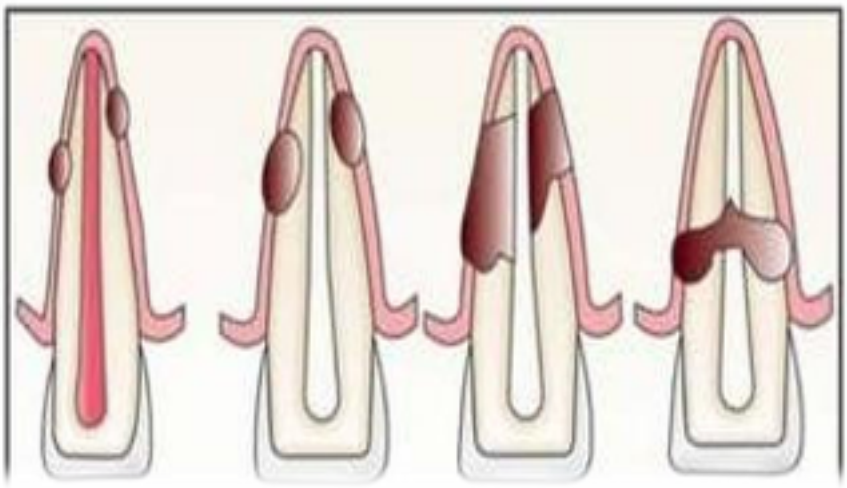
- Histologically this is characterized by complete regeneration of PDL
- 2 to 4 weeks to complete
- Occur if inner most cell layers along the root surfaceare vital
- Radiographically there is normal PDL space without signs of root resorption.

❖ **Healing with Surface Resorption**

- Characterized by localized areas along the root surface, which show superficial resorption lacunae repaired by new cementum
- Localized areas of damage to PDL or cementum, which is healed by PDL derived cells
- Clinically the tooth is in normal position and a normal percussion tone can be heard.

❖ **Healing with Ankylosis**

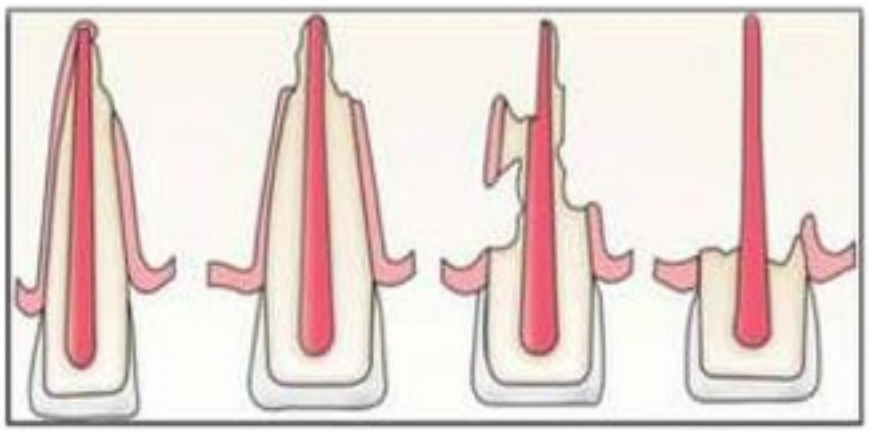
- Replacement resorption
- Ankylosis represents a fusion of the alveolar bone and the root surface
- Etiology of replacement resorption is related to the absence of vital PDL cover on the root surface
- Progressive replacement resorption.



❖ **Healing with Inflammatory Resorption**

- Characterized by bowl shaped resorption cavities in cementum and dentin associated with inflammatory changes in the adjacent periodontal space.

- Clinically the replanted tooth is loose, extruded and sensitive to percussion with dull tone.



PATIENT INSTRUCTIONS

Patient compliance with follow-up visits and home care contributes to satisfactory healing following an injury.2, 20 , Both patients and parents or guardians of young patients should be advised regarding care of the replanted tooth for optimal healing and prevention of further injury.

- **They should be advised to:**

1. Avoid participation in contact sports.
2. Maintain a soft diet for up to 2 weeks, according to the tolerance of the patient.
3. Brush their teeth with a soft toothbrush after each meal.
4. Use a chlorhexidine (0.12%) mouth rinse twice a day for 2 weeks.

ENDODONTIC CONSIDERATIONS

When endodontic treatment is indicated (teeth with closed apex),17, treat- ments hould be initiated within 2 weeks postreplantation. Endodontic treat- ment should always be undertaken after isolation with the dental dam. This may be achieved by placing the dental dam retainer on neighboring uninjured teeth to avoid further trauma to the injured tooth/teeth.

** Calcium hydroxide is recommended as an intracanal medicament for up to 1 month followed by root canal filling. If a corticosteroid or corticosteroid/antibiotic mixture is chosen to be used as an anti-inflammatory and anti-resorptive intracanal medicament, it should be placed immediately or shortly after replantation and left in situ for at least 6 weeks. Medicaments should be carefully applied to the root canal system with care to avoid placement in the crown of the tooth. Some medicaments have been shown to discolor teeth, leading to patient dissatisfaction.

**In teeth with open apices, spontaneous pulp space revascularization may occur. Thus, root canal treatment should be avoided unless there is clinical or radiographic evidence of pulp necrosis and infection of the root canal system on follow-up examinations.

**The risk of infection-related (inflam- matory) root resorption should be weighed against the chances of obtain- ing pulp space revascularization. Such resorption is very rapid in children.

** In cases where pulp necrosis and infection of the root canal system are diagnosed, root canal treatment, apexification or pulp space revascularization/ revitalization should be performed. In cases where ankylosis is expected and decoronation is anticipated, proper consideration of the intracanal materials used and their duration is indicated.

FOLLOW-UP PROCEDURES

Clinical control

Replanted teeth should be monitored clinically and radiographically at 2 weeks (when the splint is removed), 4 weeks, 3 months, 6 months, one year, and yearly thereafter for at least five years.2,6-9, Clinical and radiographic examination will provide information to determine the outcome. Evaluation may include the findings described below

- For open apex teeth where spontaneous pulp space revascularization is possible, clinical and radiographic reviews should be more frequent owing to the risk of infection-related (inflammatory) resorption and the rapid loss of the tooth and supporting bone when this is not identified quickly. Evi- dence of root and/or bone resorption anywhere around the circumference of the root should be interpreted as infection-related (inflammatory) resorp- tion.

- Radiographic absence of periodontal ligament space, the replacement of root structure by bone, together with a metallic sound to percussion, should be interpreted as ankylosis-related (replacement) resorption. It is worth noting that the two types of resorption may occur concurrently

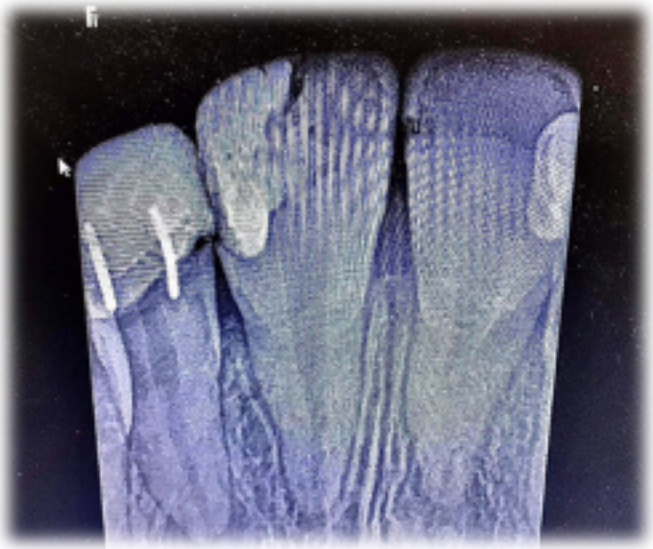
- For these reasons, replanted teeth with an open apex should be monitored clinically and radiographically at 2 weeks (when the splint is removed), 1, 2, 3, 6 months, one year, and yearly thereafter for at least five years.2,6,9

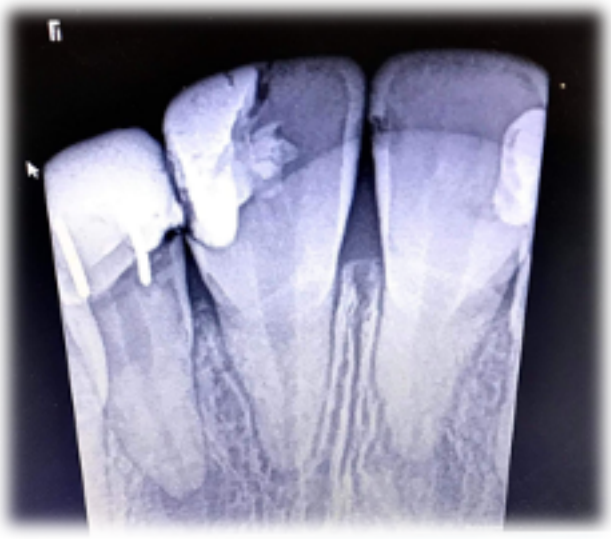
CLINICAL CASE PRESENTATION

Ali Riyad

Apatient with 16 yaer who came to the Panorama clinic in Diwaniyah had a fight and wrestling accident with his friends . He was hit by a box on his nose, which led to the front teeth (2 central incisor) coming out of their place And the patient fainted . the Teeth settled in his oral cavity

When the patient woke up, he restored the teeth to their place and At the same time, he went to the doctor . clinicly The doctor discovered that the teeth have mobility grade II and need a retainer for 3 month . ridiographically take periapical x-ray and opg





These are the pictures before installing the wire for splint

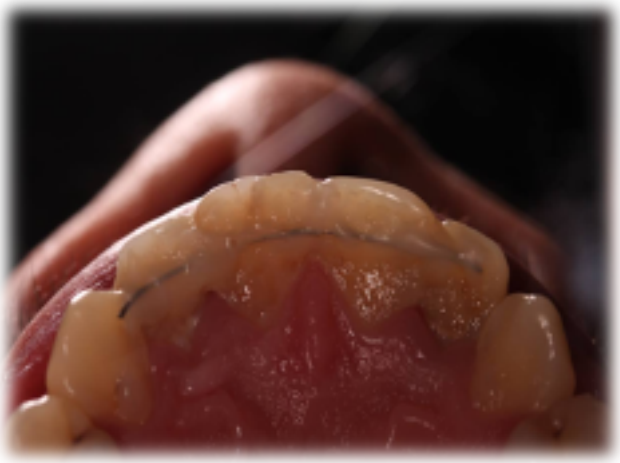
- The tooth is check for vitality found every thing is normal and the tooth is vital and the patient has pain and sensitivity After that, the splint was placed and we gave him instructions not to bite them or move them with your tongue and keep them out of occlusion .The patient must commit to follow up every two weeks for up to 3 months if the teeth become nonvital do RCT

❖ This periapical radiograph after splinting four incisors shows ..

-widening in pdl

-destructive in lamina dura

-periapical lesion



❖ This picture after 15 days from the accident, it shows the fixation of teeth with wire

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