



MANAGEMENT OF AN AVULSED PERMANENT TOOTH – A CASE REPORT, 6 MONTHS FOLLOW UP

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Abstract: This paper is a case-report about the management of Ellis Class V(Avulsion) fracture, highly common in age group of 8 – 9 years. Avulsion injury being the dental emergency requires immediate dental management. In recent years, research findings have shown the possibility of complete healing under favorable conditions: this case report highlights the methods replanting the tooth according to the criteria required by the guideline such as the extra oral time, duration of root canal therapy after re-implantation, and the extra-oral dry time. All this set of criteria may lead to a slower progression of the phenomenon of resorption with a better prognosis over time; however, there is a high risk of complications such as external root resorption which lies in late replantation. Nowadays with use of proper techniques, even teeth that are replanted after a delay can be saved. The dentist remains the key person in the case of dental trauma, namely, dental avulsion as his role is the management of the emergency situations. The objective of this case study is to present a successful management of an avulsed permanent incisors, replanted and remained with no complications for over a period of 6 months.

Index Terms – Avulsion, Trauma, Incisor.

I. INTRODUCTION

Tooth Avulsion (Ellis Class V) is a dental emergency. It is a dental trauma that corresponds to the complete displacement of the tooth out of the alveolar bone socket(1). Avulsion of permanent teeth varies from 0.5% to 16% of all traumatic injuries, as it is one of the rare and serious dental injuries. The young population is the most affected and the maxillary central incisors are the teeth most often involved due to their exposed position in the dental arch. (2)The risk of infection and root resorption can occur at any time after avulsion and dental replantation, which may influence the treatment outcome and survival rate including the prognosis of the teeth involved. Besides, the consequences of dental avulsion are countless; they differ from patient to patient and may be related to the individuals' quality of life, psychological, and social problems, as well as the costs of treatment. In case of tooth avulsion, most periodontal ligament cells left on the root surface are due to the tearing of the periodontal ligament; these cells must be hydrated to maintain the durability of the tooth while reducing the phenomenon of resorption and allowing healing. However, when the extraoral time increases, leaving the periodontal ligament dry, inflammatory resorption occurs.(2) The incidence of an external root resorption (inflammatory/replacement) remains high even in a correct management of replantation of the tooth. However, several criteria can lead to slow progression and a better prognosis over time if they are well respected. The aim of this case report is to present a successful replantation of an avulsed permanent maxillary incisors. No sign of resorption and ankylosis were seen over a period of months.

2. Case Report:

A 11 year old boy along with his mother reported to the opd with a complain of dislodged upper front tooth since one day (24 hours) due to fall from a bicycle. After the fall he noticed bleeding from the upper lip and maxillary left central incisor area and an avulsed tooth on ground. He also started experiencing pain and swelling in maxillary front region of the jaw. The patient was examined for extraoral signs of injury, including swelling and asymmetry of the face. There were lacerations over the upper lip along with swelling. Intraoral examination revealed missing upper left central incisor with no bleeding (as the patient had reported after 1 full day) along with the tooth in a container filled with water.



Fig 1a: extraoral examination



Fig 1b: intraoral examination



Fig 1c: Avulsed 21 soiled with mud

A radiograph of the avulsed site was taken to check of any alveolar bone fractures and also one radiograph of the avulsed teeth was taken to check for apical closure of the avulsed tooth. Followed by through irrigation of the site with betadine



fig 2a : The alveolus in 21 region



fig 2b: Radiograph showing the apex of 21

The tooth which was immersed into plain water (storage medium) which is hypotonic which further affects the viability of periodontal ligament. After a thorough clinical and radiographic examination a diagnosis of avulsed tooth with closed apex with questionable prognosis on reimplantation was made.

Owing to the extraoral time it is important that the necessary treatment is provided at the earliest, so in cases of avulsion it requires a team effort, whereby each and every operator will be performing their individual tasks simultaneously to minimize the extra-oral dry time of avulsed teeth. The management of avulsion involves differs from any other case as it involves only 2 phases namely -

1. Preparatory phase
2. Endodontic phase and
3. Surgical phase.

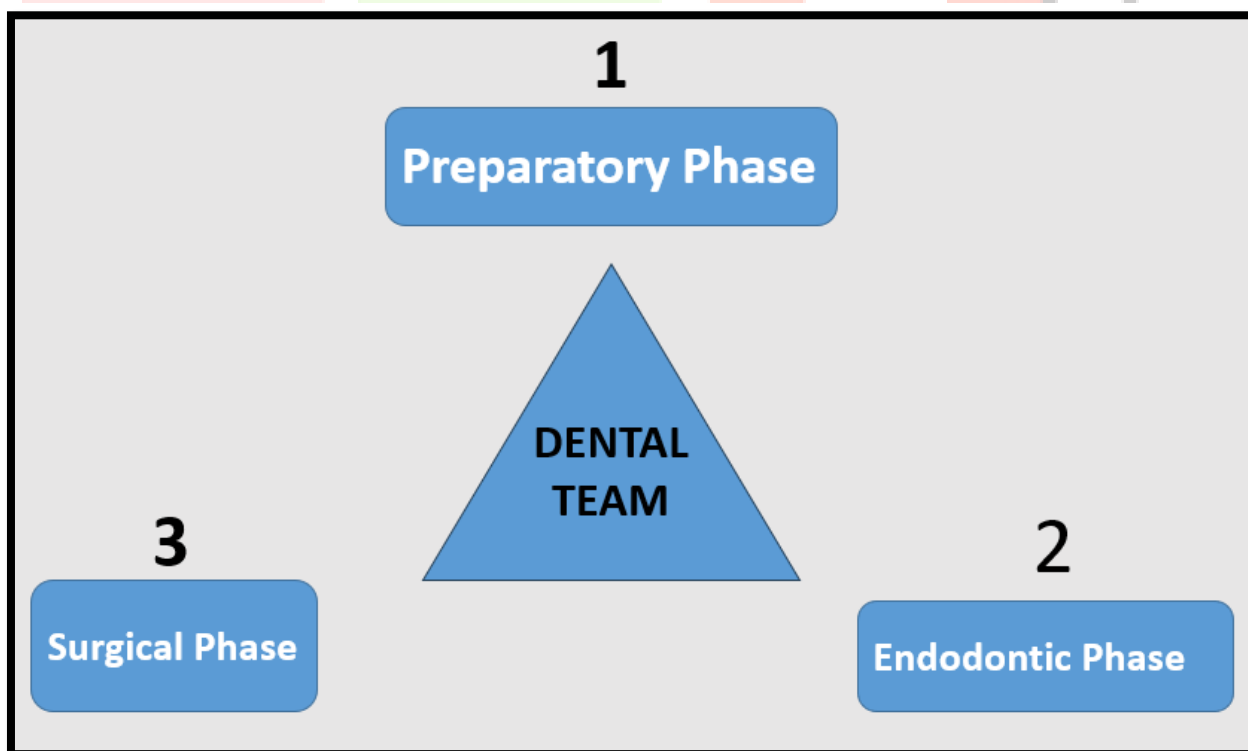


Fig 3: Formation of dental team

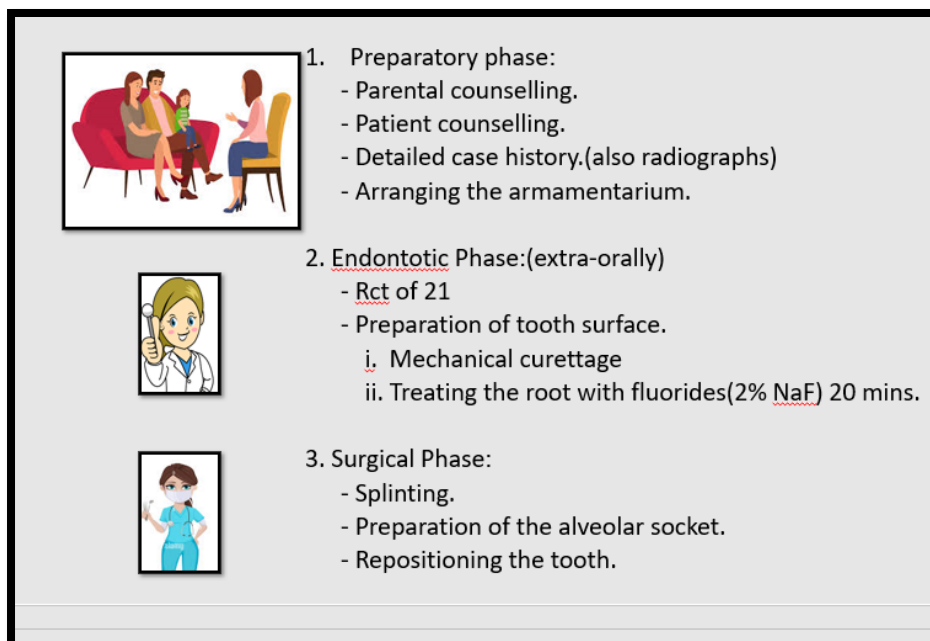


Fig 4: Division of work amongst the team of 3 operators

OPERATOR 1: In the current case under the preparatory phase, tetanus prophylaxis was advised and then owing to the extra-oral time the prognosis of the tooth was explained to the parents and chances of replacement resorption was thoroughly explained. Also behaviour modification of the child was done and once the child is motivated then the radiographs are recorded necessary for the treatment.



Fig 5: Preparatory Phase

OPERATOR 2: Meanwhile the 2nd operator will perform the extra-oral RCT(since tooth was muddy) of the avulsed tooth, which will be followed by preparation of root surface of the tooth thus minimising the chance of replacement resorption.

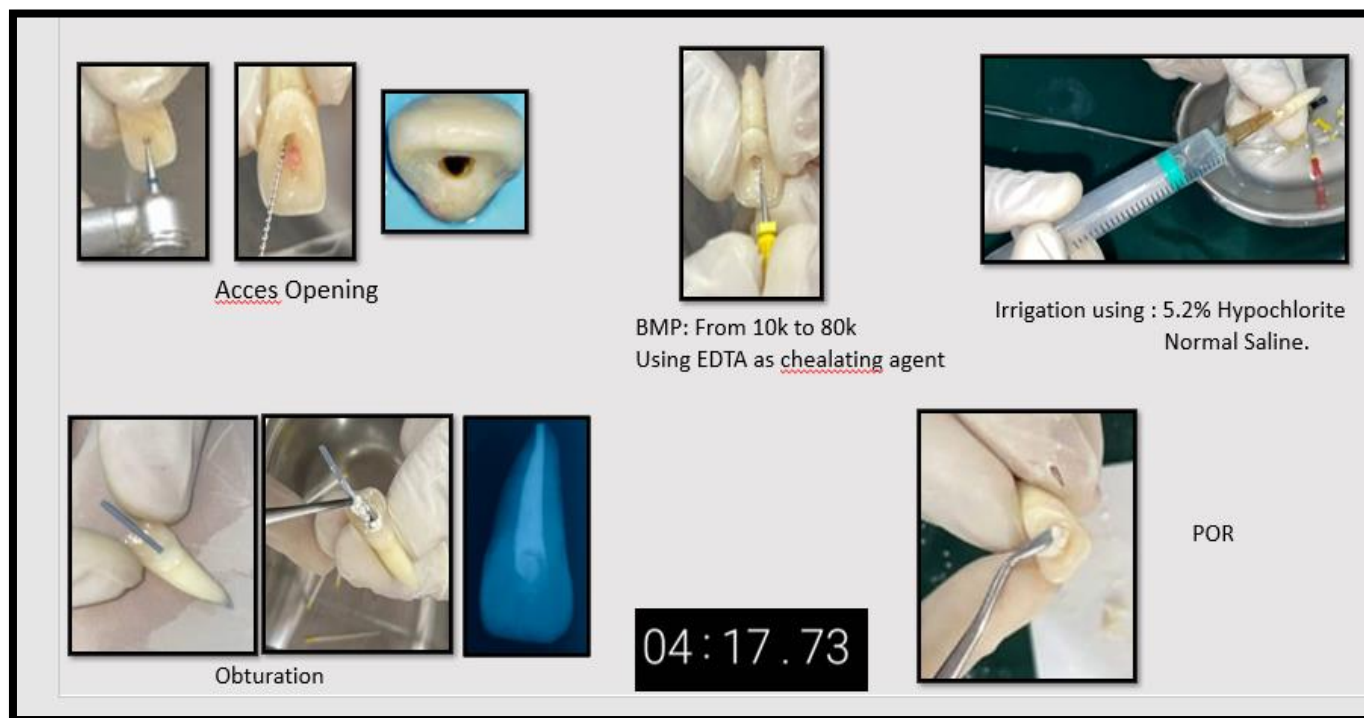


Fig: 6 Extraoral Root-canal Treatment

The preparation of root surface can be done using either chemical(20mg Doxycycline or mechanical curettage, followed by immersion of the tooth into fluoride(0.8% SnF₂) or (2% NaF)solution for 20 mins(3)

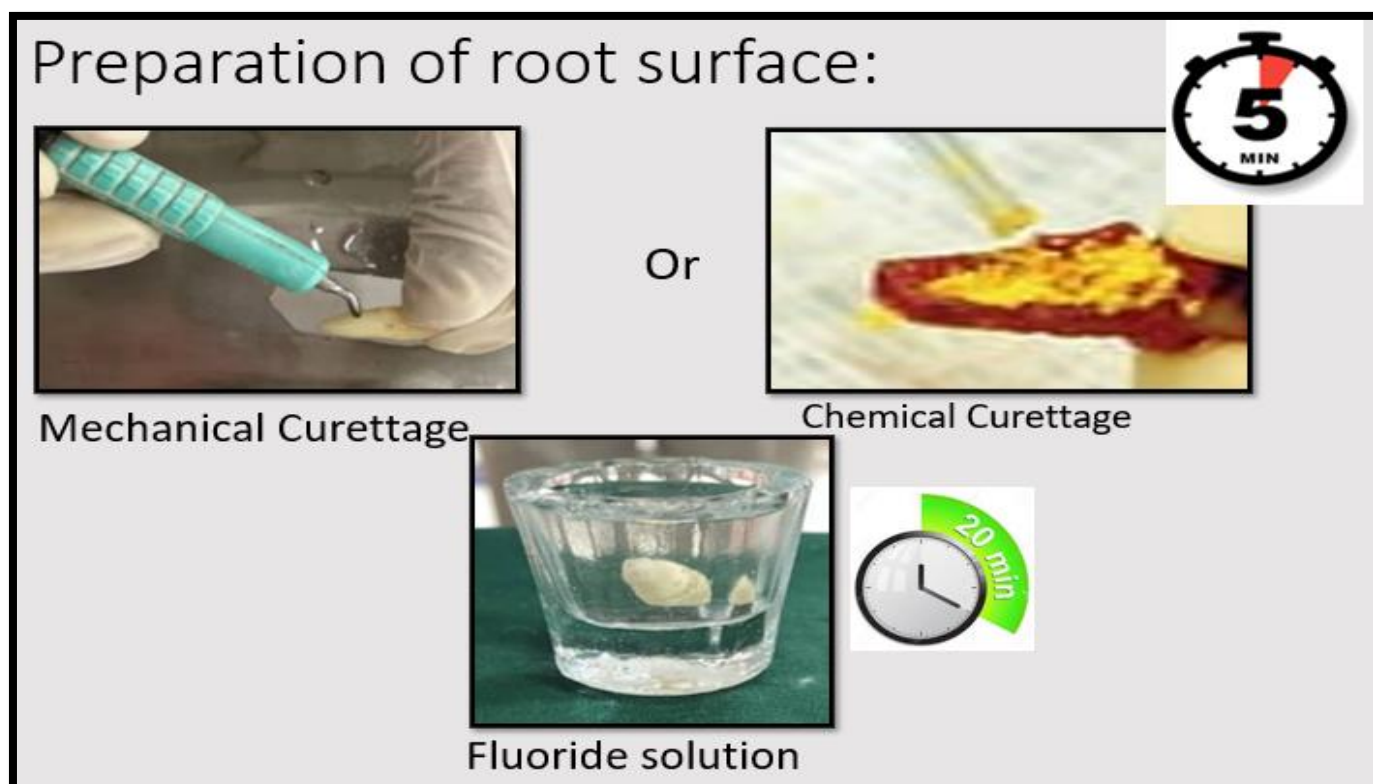


Fig: 7 Preparation of root surface

OPERATOR 3:

While the other two operators are doing the extra oral part the third operator will start to prepare the splint (passive flexible) using 2 ligature wires tightly intertwined with each other using two artery forceps

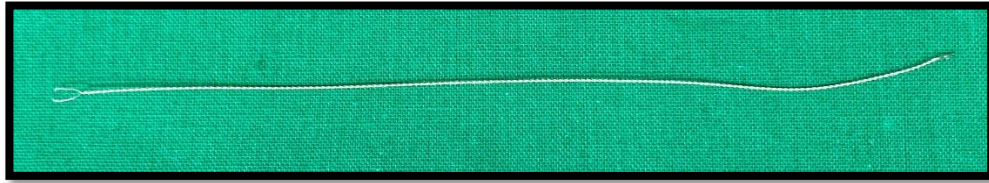


Fig: 8 Passive flexible splint

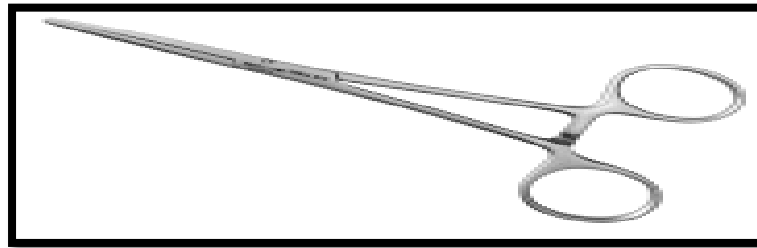


Fig 9: Artery forceps

Care should be taken that splint wire should be applied on maximum teeth to get maximum strength using flowable composite.



Fig 10: fixation of the splint wire from 16 to 26

After fixation of the splint wire the avulsed tooth will be removed and preparation of the socket should be done as the socket is full of blood clot which will make the position of the tooth in socket difficult. So through curettage of the socket using bone curette should be done followed by betadine irrigation.



Figure 11: Preparation of the extraction socket

Once the preparation of the socket and tooth is completed, the next step is placement of the tooth in the socket. Once the placement is done it should be confirmed using radiograph.

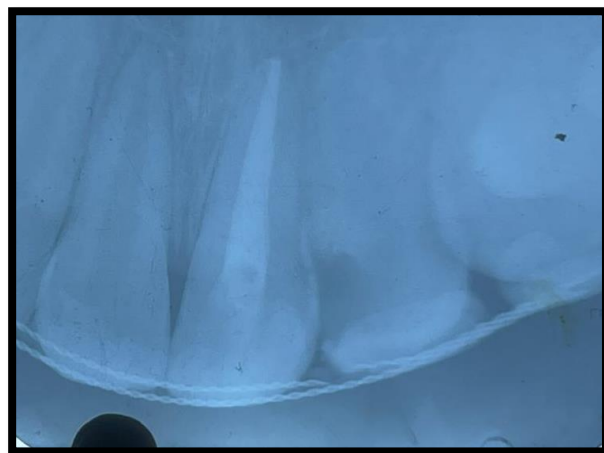
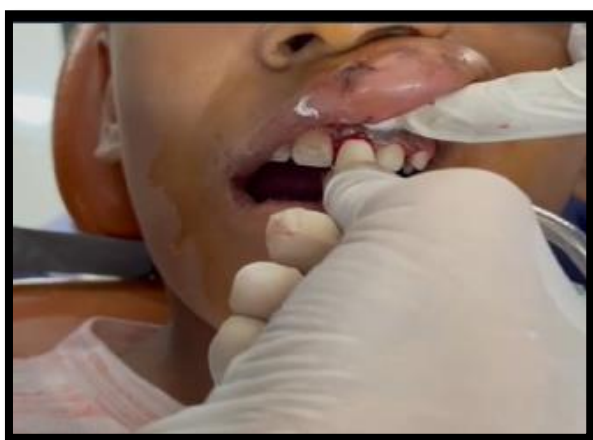


Fig 12a: clinical placement of the avulsed tooth

Fig 12b: Radiographic evaluation for placement of avulsed tooth.

Once the confirmation regarding the placement is made then bond it with the splint wire



Fig 13: Final placement of avulsed tooth in the arch

Once the tooth is placed within the socket patient should be instructed to follow a few post operative instructions and pharmacological instructions.

Post-Operative Instructions: –

- Diet counselling- Patient was advised to maintain a soft diet for two weeks
- Oral hygiene measures – Advice to use soft bristled toothbrush and 0.12% chlorhexidine mouthwash.
- Avoid Sports till the treatment is complete.

Pharmacological instructions:

- Tab. Amoxclav 375 mg. b.i.d. for 5 days.
- Tab. Brufen 200 mg. s.o.s

In this case the patient further required further treatment with other teeth, which was completed in the successive appointments.

Follow up visits were planned in accordance with the IADT guidelines(4)

1st visit “: 24 hours

2nd visit: 1 week

3rd visit: 21 days/ 3 weeks

4th visit: 3 months.

And further visits will be conducted every 6 months for 5 years.

On every visit there will be clinical as well as radiographic evaluation will be made for the avulsed tooth, pulp-testing will be done with the adjacent tooth. Also extra-oral and intra-oral pictured will be recorded.

1 week follow up:

PT: heat test
11- no response.
22- no response.

1 week follow up

21 days follow up:

PT: heat test
11- response obtained.
22- response obtained.

Day 21st follow up

3 months follow up:



6 month follow up:



3.DISCUSSION:

- Dental avulsion is a complete displacement of a tooth from the socket and it is one of the most traumatic dental injury which exposes the cells of periodontal ligament to the external environment as well as the disruption of the blood supply to the pulp.
- Avulsion of permanent teeth seen in 0.5% to 3% of all dental injuries(3)(Zurcher A, Filippi A)
- Maxillary central incisors most commonly affected teeth.(5)(Andreasen JO, Andreasen FM)

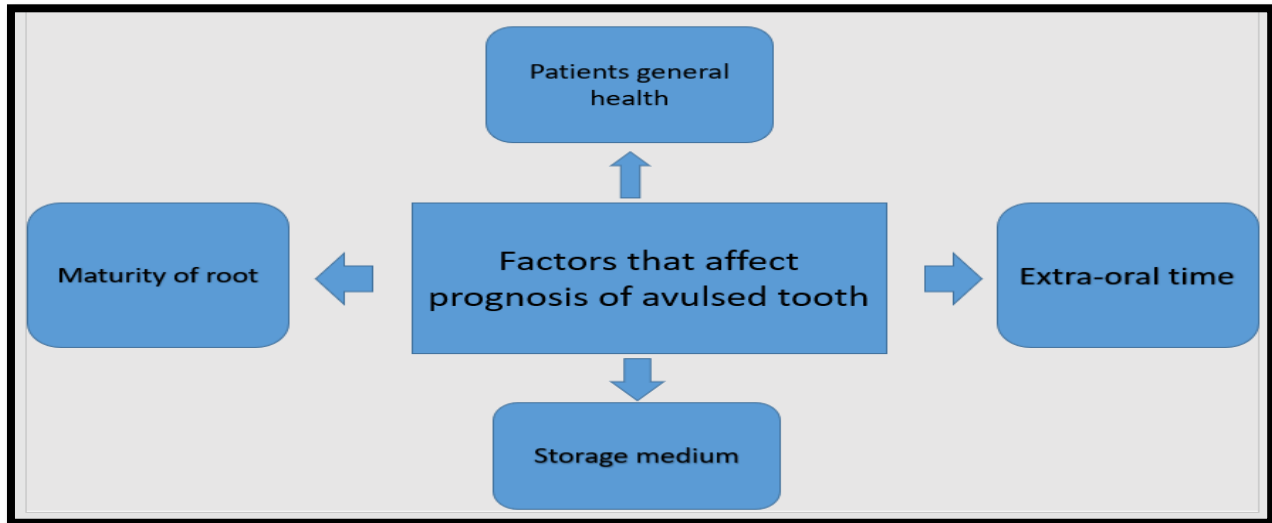


Fig: 14 Factors affecting the prognosis of avulsed tooth

There are namely 4 factors affecting the prognosis of the avulsed tooth

Patient's general health: its important to evaluate the overall health of patient, the extent of trauma depends upon the anatomical location. The sites where vessels and nerves emerge are of major importance in traumatology, as they pose structural weak points that influence fracture lines. In the area of the anterior skull base the following foramina are concerned(6)

- The foramina of the cribriform plate where the olfactory fibres emerge.
- The pathway of the anterior and posterior ethmoid arteries.
- The optic canal.
- The superior orbital fissure with the nerve responsible for oculomotor functions, that however plays only a direct role in extreme injuries.
- The infra- und supraorbital foramen with its respective portions of the trigeminal nerve. Fractures affecting those foramina indicate surgery based on clinically apparent hyp- or anesthesia.

In the context of Le Fort II and III fractures, the cribriform plate might be injured because of fractures in the area of the ethmoid bone leading to a possible CSF leak. The frontal and sphenoid bones may also be affected.(7)

Once there is a history of any kind of loss of consciousness of event amnesia there a neuro-call must be taken

2. Extra-oral dry time:

The extra-oral dry time signifies the viability of the periodontal fibers. The most crucial factor for the success of reimplanted tooth is the maintenance of PDL cell viability. The risk of failure increases significantly with an extra-oral dry time of more than 15 min. An extra-oral dry time of 60 min is considered the point where survival of the root periodontal cells is unlikely. (8)

3. Storage media:

Moist storage appears to be a more productive approach to optimize PDL cell survival. However, no medium is ideal. Commercial storage media are expensive, not easily available and have a limited shelf life. Coconut water followed by milk have, shown to be a more promising storage medium than others is easily available, economical, has more shelf life and extended storage time.(8)

4. Maturity of tooth: Teeth with incomplete apexes which are replanted in less than 60 minutes after the avulsion may recover because of pulp revascularization. However, this healing process did not occur in several times because the apical tissue is highly susceptible to bacterial contamination (9). Cvek et al. (10) reported that in teeth with open apexes, to avoid the contamination of the root surface could promote pulp revascularization.

Splinting of avulsed tooth:

Splints are used to immobilize traumatized teeth that suffered damage in their structures of support, preventing their constant movement. Current IADT recommendations for splinting time and type for various types of injuries:(4)

Type of injury	Splinting time	Splinting type
Subluxation	2 weeks	Flexible splint
Extrusive luxation	2 weeks	Flexible splint
Lateral luxation	4 weeks	Flexible splint
Intrusive luxation	4 weeks	Flexible splint
Root fracture	4 weeks	Flexible splint
Root fracture (cervical 1/3)	4 months	Flexible splint
Avulsion	2 weeks	Flexible splint
Avulsion. Dry time >60 minutes	4 weeks	Flexible splint
Alveolar fracture	4 weeks	No recommendation

Fig 15: Duration for splinting based on type of injury

There are two types of splints 1) rigid and 2) flexible. The type of splint(rigid/flexible) to be used depends on the extent of trauma. The tables below show few of the indications for each type of the splint to be used. (11)

Type of splints		Indications	Contraindications	Advantages	Disadvantages
RIGID SPLINTS	Wire ligature splints	Mixed dentition	Generally avoided in case of availability of other methods	Useful for oral surgeons when other splinting methods are not available	Gingival irritation and inflammation
	Surgical suture	No neighboring teeth to which splint may be fixed	When other splinting methods would be better choice	Useful for oral surgeons as an alternative splint	Early suture loosening
	Arch bar splint	Jaw fractures	Dento-alveolar trauma where repair of PDL is expected	none	Gingival irritation and inflammation
	Acrylic splints	Luxation of tooth in combination with fracture of alveolar bone	Isolated dental trauma	Individual splint that can be made with direct and indirect technique	Direct method creates warm reaction
	Composite splint	When neighboring teeth are intact	Artificial crowns/ large fillings	Every dental office have it, Easy to apply	Tendency to split due to occlusal forces

Fig: 16a: Indications of rigid splints.

Type of splints		Indications	Contraindications	Advantages	Disadvantages	
SEMIRIGID/FLEXIBLE SPLINTS	Orthodontic brackets and arches	When injured tooth is intruded and must be repositioned later by orthodontic forces	When there is a doubt that orthodontic forces will disturb the healing process of injured tooth	Possibility of synchronizing movement of teeth	Tricky to use for non orthodontic specialist, possible irritation of the lips which can be avoided by applying the wax,	
	Wire - composite splints	All cases of traumatic injuries except for alveolar fracture	Artificial crowns/ large fillings	Easy to apply, most commonly available dento-alveolar splint	Problems with removing the splint	
	Fibre splints		Fishing line	Alveolar fracture	Easy to manipulate/apply Favorable healing outcomes	none
			Glass-ionomer fibre			More expensive in comparison with a wire composite splints
			Ribbon splints			
Kevlar fibre						
Titanium trauma splint			Reduce the quantity of composite material, easy to apply and remove	High cost		

Fig 16b: Indications of flexible splints

- In the case discussed above, splinting was done for 21 days with ligature wire bonded to the maxillary anterior teeth with a light cure flowable composite resin extending from 16 to 26. This was in accordance with the guidelines prescribed by IADT.(3)
- The splint was kept incisally so the tooth gets a upward pull.



Fig 17: Positioning of the splint wire (blue line - division of tooth in 3rds) (black line – position of splint wire.)

Possible complications secondary to replantation of avulsed tooth:

1. Inflammatory root resorption.
2. Replacement resorption.
3. Ankylosis of tooth.

4.CONCLUSION:

Replantation is the treatment of choice following avulsion. It not only satisfies the patient's functional and aesthetic concerns but also helps to maintain the surrounding bone for prosthetic rehabilitation.

Despite an extended extra-oral time, replantation of an avulsed tooth can have a favorable outcome if all the recommended guidelines and protocols are followed.

There is a need to educate children and parents regarding dental avulsion in schools.

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