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REVIEW ARTICLE

MANAGEMENT OF AVULSION

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Abstract

Tooth avulsion is a condition in which tooth is completely displaced out from its socket commonly due to trauma. Whenever a tooth is avulsed, dental pulp cells, periodontal ligament cells, cementum, gingiva and alveolar bone are all damaged but the ultimate challenge in the management of avulsion is to smaintain the vitality of periodontal cells which in turn dictates the treatment outcomes. Dental trauma claims to be one of the few situations where dentists are called upon to make unscheduled diagnostic and treatment decisions. Replantation of the teeth should be done immediately after avulsion in order to achieve the best treatment outcome. Due to various reasons, replantation of the avulsed teeth is not always possible immediately. Thus, an appropriate protocol of managing the avulsed teeth should be followed based on the presenting clinical situation. The extent of damage to tooth and supporting structures, emergency treatment and follow‑up period plays a vital role in the prognosis of avulsed tooth. Thus, all factors need to be addressed effectively and efficiently for a better prognosis of the replanted teeth.

Introduction:-

Tooth avulsion is a condition in which tooth is completely displaced out from its socket commonly due to trauma. Traumatic dental injuries are very common in children and almost 85% of the injuries involve orofacial region (Locker, 2007). The peak age at which avulsion is common is between 7-9 years of age (Al-jame et al., 2007). The incidence of avulsion injury does not vary by gender in preschool children, while it is more commonly seen in males than females in adolescence age group (Hicks et al., 2016). Whenever a tooth is avulsed, dental pulp cells, periodontal ligament cells, cementum, gingiva and alveolar bone are all damaged but the ultimate challenge in the management of avulsion is to maintain the vitality of periodontal cells which in turn dictates the treatment outcomes (Barrett and Kenny, 1997). Dental trauma claims to be one of the few situations where dentists are called upon to make unscheduled diagnostic and treatment decisions (Tezel et al., 2013). Thus, a thorough knowledge about avulsion and its management is necessary to attain favorable results.

The main treatment objective is to preserve the periodontal fibres and minimize the risk of infection which may occur as a consequence of injury (Trope, 2002). Attachment damage which occurs during avulsion is inevitable but additional damage which is caused by drying of the avulsed tooth during extra alveolar time should be minimized. In cases of tooth with open apex, revascularization of the pulp is a good option which helps in attaining complete root growth (Leelavathi et al., 2016).

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Emergency Management:
Immediate replantation of the avulsed permanent teeth is always the best treatment choice at the place of accident (Trope, 2002). In cases wherein the replantation is not possible due to various reasons, transport media can be used for transportation of avulsed teeth (Tezel et al., 2013).

When a tooth is avulsed, firstly it should be made sure that the tooth that is avulsed is a permanent tooth. This is essential because if it is a primary tooth, it should not be replanted. Following instructions should be followed at the site of injury (Tezel et al., 2013)

1. Firstly, the child has to be kept calm following the injury.
2. The avulsed tooth has to be found and handled only by the crown portion as touching the root portion might damage the cells on the root surface.
3. If the tooth is dirty, it should be washed briefly (maximum 10 seconds) under cold running water. Child/Guardian should be encouraged to replant the tooth and once the tooth is back in place, the child should be asked to bite on a handkerchief to hold it in position.
4. If replantation of the tooth back to its position is not possible due to various reasons, the avulsed tooth should be placed in a suitable transport medium and should be carried to the emergency dental clinic along with the patient. There are various natural and synthetic transport medium available for transportation of avulsed tooth. A systematic review by Adnan et al., states that natural products are more effective in maintaining the periodontal ligament cell viability when compared to the synthetic products and have further stated that milk is the most recommended storage medium based on the periodontal cell viability and practical considerations (Adnan et al., 2018). This data was supported by a literature review by Poi et al., which stated that the pasteurized whole milk was frequently recommended with a good prognosis when compared to other storage medium like saline, saliva or water that are readily available (Poi et al., 2013). International Association of Dental Traumatology advocates the use of Hank's Balanced Salt Solution for storage of avulsed tooth and in case of unavailability, milk can be used as a storage media (Flores et al., 2007).
5. If the patient is conscious, the avulsed tooth can be carried to a dental clinic in the patients' mouth by storing or keeping it inside the buccal or labial vestibule. In case of very young patient, there are chances of the child swallowing the tooth. In such cases, the patient should be requested to spit in a container and the avulsed tooth should be placed in that container. Storage of avulsed tooth in water should be avoided.
6. Immediate treatment should be sought following avulsion.

Corrective Therapy:
Management of avulsed tooth with open apex:
In cases of tooth with an open apex that has already been replanted in to the socket, the area should be cleaned with a water spray, chlorhexidine or saline. The tooth should not be removed from the socket and the lacerations in the gingiva should be sutured if present. The positioning of the tooth has to be verified clinically and radiographically following which a flexible splint should be placed for duration of two weeks. In cases of tooth placed in special storage media with extra oral dry time less than 60 minutes, the root surface should be examined for contamination and if contaminated, the root surface should be cleaned with saline and then placed in saline solution (Flores et al., 2007). International association of dental traumatology recommends the use of minocycline hydrochloride microspheres on the root surface before placing the tooth within the socket (Flores et al., 2007). In contrast, a study done by Ma and Sae-Lim showed no significant effect with the use of application of minocycline on the root surface prior to reimplantation (Ma and Sae-Lim, 2003). Alveolar socket wall should be examined for fracture, and if a fracture is present, repositioning of the fracture should be done following which, tooth has to be replanted slowly with slight digital pressure. In cases of avulsed immature permanent tooth with extra oral dry time longer than 60 minutes, the long term prognosis after replantation is very poor. Any attached necrotic soft tissues should be removed using gauze. Root canal treatment should be done prior to replantation through the open apex. The tooth should be immersed in 2% sodium fluoride for duration of 20 minutes before replantation. Shulman et al., conducted a study in 1968 to evaluate the beneficial effect of sodium fluoride when used to treat the root surface of an avulsed tooth and a decrease in rate of osseous replacement was observed in replanted teeth of Cebus monkeys (Shulman et al., 1986). A similar study was conducted by Coccia in humans and he demonstrated a 50% reduction in the rate of progression of root surface resorption following reimplantation (Coccia, 1980).

Management of avulsed tooth with closed apex:
In cases of avulsed tooth with closed apex that has been replanted in to the socket, the area should be cleaned with a water spray, Chlorhexidine or saline. The tooth should not be removed from the socket and the lacerations in the

gingiva should be sutured if present. The positioning of the tooth has to be verified clinically and radiographically following which a semi rigid splint should be placed for duration of two weeks. Root canal treatment should be started within 7 – 10 days of replantation before the splint is removed (Flores et al., 2007). In cases wherein the tooth was placed in special storage media with extra oral dry time less than 60 minutes, the root surface should be examined for contamination and cleaned with saline and then placed in saline solution. Alveolar socket wall should be examined for fracture, and may need repositioning of the fracture and it should be done with a suitable instrument following which tooth has to be replanted slowly with slight digital pressure. Root canal treatment should be started within 7 – 10 days of replantation before the splinting is removed. In cases of avulsed mature permanent tooth with extra oral dry time longer than 60 minutes, the long term prognosis of replanted tooth is poor. The negative effect of a drying period upon periodontal healing is significant compared to its effect on pulpal healing. Thus, in a study conducted by Andreasen et al., it was found that a drying period between 5-20 minutes resulted in 24% periodontal healing, whereas pulpal healing was 36% (Andreasen et al., 1995). With increased extra alveolar time there are high chances of the periodontal ligament cells to be necrotic and it is not expected to heal (Flores et al., 2007). Andreasen JO conducted a study in 1980 to determine the effect of removal of coagulum from the socket prior to reimplantation of avulsed tooth and he reported that there was no significant difference in the pulpal or periodontal healing with or without the removal of coagulum (Andreasen, 1980). In a study done by Barrett EJ and Kenny DJ in 1997, they recommend the removal of coagulum from the socket only when the coagulum hinders the complete seating of the tooth within the socket (Barrett and Kenny, 1997). Matsson et al conducted a study in 1987 to evaluate the effect of socket irrigation using saline and they reported that there was an increased chance of ankylosis when the coagulum was retained in the socket and hence they recommend the removal of coagulum from the socket prior to reimplantation (Matsson et al., 1987). International Association of Dental Traumatology recommends the removal of coagulum from the socket prior to reimplantation (Flores et al., 2007). The major goal of performing a delayed replantation is to promote the growth of alveolar bone which encapsulates the replanted tooth. The expected ultimate outcome of delayed replantation is ankylosis and root resorption. If ankylosis occurs in children of age below 15 and the infra-position of the tooth crown is more than 1 mm, it is always advisable to carry out decoronation of the tooth to preserve alveolar ridge contour (Flores et al., 2007). Any attached necrotic soft tissues should be removed using gauze. The tooth should be immersed in 2% sodium fluoride for duration of 20 minutes before replantation. Root canal treatment can be done either prior to replantation or it can be done 7-10 days post replantation.

Adjunctive treatment:

Patient instructions:

Patients must be instructed to follow soft diet up to two weeks post replantation. Patients should be advised to brush their teeth using soft bristled tooth brush after every meal to maintain the oral hygiene (Flores et al., 2007). 0.1% chlorhexidine mouth wash should be used by the patient to rinse the mouth twice daily for duration of 7 days post replantation.

Administration of systemic antibiotics:

The first choice of antibiotic to be given following replantation is tetracycline. Depending on the age and weight of the patient, appropriate dose of doxycycline should be given twice daily for a duration of 7 days (Flores et al., 2007). Discoloration of tooth can be seen when tetracycline is prescribed to young patients, thus care must be taken while prescribing antibiotics to young patient and penicillin can be used as alternative to tetracycline in such cases.

Follow up:

Patient has to be recalled at 1, 3, 6 and 12 months following replantation of the avulsed tooth to determine the outcome (Flores et al., 2007). Post twelve months, patient has to be kept under annual follow up.

Prevention:

Awareness:

Most of the avulsed teeth are lost due to the ignorance regarding first aid procedure to be provided. Parents, school teachers, and physical educators are often the first to discern visually the incident, with deficient oral workforce in the emergency department, physicians, and nurses are the first responders providing primary treatment (Dali et al., 2014). Physicians and nurses of emergency department are often the first line of qualified health-care providers attending the patient in person or parent's query over phone reporting immediately following the dental avulsion (Iyer et al., 2017). Prompt action by them becomes the decisive factor in survival and prognosis of the tooth. With 100% response rate, the findings of a survey conducted by Iyer et al showed fair knowledge among physicians and nurses about first aid in dental avulsion (Iyer et al., 2017). These results were harmonious with the study involving

emergency department physicians by Trivedy et al but contrasting to the results obtained by Pani et al reporting the lowest awareness about dental trauma first aid (Trivedy et al., 2012; Pani et al., 2015).

Any dental practitioner should always be prepared to provide proper advice regarding the first aid of avulsed teeth to general public. Apart from spreading awareness about traumatic dental injuries among the population through means of mass media and campaigns, teachers and parents should be made aware of and should be imparted information on how to proceed following avulsion of permanent teeth. Also, if needed, people at the emergency site should be given instructions regarding the first aid of avulsed teeth over the phone.

Specific protection:
The incidence and intensity of traumatic dental injuries can be majorly reduced by the use of orofacial protectors which include face shields, helmets and mouth guards (ADA, 2006). ADA has estimated that more than half of the injuries seen in high school football players not using any orofacial protectors, were in and around the mouth and most of these injuries could have been prevented with the use of orofacial protectors during the play (Ranali, 2000). A study by Huang et al revealed that the highest incidence of sports related traumatic dental injuries were seen in males in the age bracket of 15 – 18 years and it was seen more commonly seen in athletes who were less professional (Huang et al., 2009; Glendor, 2009). The Association of Sports Dentistry strongly recommends the use of custom fabricated mouth guard in all collision and contact sports (Policy, 2016).

Conclusion:-

Management of avulsion should be done with utmost care as it can traumatize the individual both physically as well as emotionally. Major role of the dental practitioner is to re implant the teeth and achieve best treatment outcome. It should be always kept in mind that the prognosis of the treatment is largely dependent on the viability of the periodontal ligament cells. As seen in various studies, knowledge about the avulsion of the teeth is very minimal among the population. More emphasis should be given on educating the parents, caretakers and school teachers regarding the avulsion of teeth and the basic steps in management. This can be achieved by conducting educational programs. Mass media also plays a major role in bringing awareness among people (Leelavathi et al., 2016).

Replantation of the teeth should be done immediately after avulsion in order to achieve the best treatment outcome. Due to various reasons, replantation of the avulsed teeth is not always possible immediately. Thus, an appropriate protocol of managing the avulsed teeth should be followed based on the presenting clinical situation for a good prognosis (Flores et al., 2007).

An avulsed tooth that is maintained until growth is completed should be considered a successful outcome because tooth loss before the growth completion often leads to loss of the alveolar bone as well as further resorption of the bone in the site (Sardana et al., 2014). This circumstance greatly compromises options for the missing teeth and may involve extensive as well as expensive procedures, such as bone augmentation and grafting. Preserving the root preserves the alveolar bone and is advantageous for implant replacement when the patient has completed growth. Hence, after the growth is completed other treatment options like dental implants or fixed partial dentures can be considered.

The extent of damage to tooth and supporting structures, emergency treatment and follow‑up period plays a vital role in the prognosis of avulsed tooth (Tezel et al., 2013). Thus, all factors need to be addressed effectively and efficiently for a better prognosis of the replanted teeth.

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