

Assessment of Survival and Success of Patients with Avulsed Tooth Undergoing Tooth Replantation: A Retrospective Study

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Abstract:

Background: Tooth avulsion cases occurring because of these injuries require immediate treatment to restore and maintain their position and function in the jaws. Once the avulsed tooth is replanted, it requires stabilization by a process known as splinting of teeth along with natural teeth for support. Avoiding the complications forms the mainstay of treatment modalities for tooth avulsion cases.

Materials and Methods: Data were collected from 2005 to 2010 of 80 patients retrospectively, reporting to the outpatient department with a chief complaint of avulsion of the permanent tooth due to trauma and accidental injuries. Only those cases of permanent tooth avulsion were included for the study for whom follow-up details of a minimum of 1 year was available. Assessment of the cases was done based on the extraoral time between the avulsion and replantation and based on the type of transporting media. Chi-square test was used to measure the level of significance. $P < 0.001$ was considered as significant.

Results: We found that out of 80 cases of replantation, 48 showed successful results without any pathologic change or mobility at the end of 1-year follow-up. We observed that patients, in which extraoral time was minimal, had maximum number of successful replantation results on 1-year follow-up ($P > 0.001$). We also observed that only cases where milk was used as a transporting media showed maximum successful results as compared to other groups ($P > 0.001$).

Conclusion: From this study, we conclude that avulsed tooth should be replanted as soon as possible for a good prognosis. Replantation not only restores functional stability but also establishes the esthetics shortly following injury.

Key Words: Avulsion, injury, replantation

Introduction

Complete removal of a tooth from its socket is referred to as tooth avulsion. Approximately, <3% of all dental injuries are the cases of tooth avulsion.¹⁻³ In children, as the root is incompletely formed and also as the bone resistance to tooth displacement is less, avulsion cases are more common in deciduous dentition as compared to permanent dentition.^{1,3} Fights and sports injuries form the primary and main etiologic agents for tooth avulsion cases.⁴ Avoiding the complications forms the mainstay of treatment modalities for tooth avulsion cases. These main complications, which can arise, are the damaging or negative changes in the pulp tissue. Damage to the vascular supply of the pulpal tissue and fibers of the periodontal ligament usually occur following tooth avulsion.⁵

Normal physiologic phenomenon occurring after any injury to the body is the inflammation. In tooth avulsion and replantation cases, these changes cause reorganizing changes in the periodontal tissues. The healing process in the replantation cases depends largely on the time duration between avulsion and replantation and the media, in which tooth was kept before replanting in the socket.^{6,7}

Establishment of original blood supply of the avulsed tooth in almost impossible, but under certain conditions and certain favorable circumstances, the establishment of vascular supply again is possible. Two conditions arise in tooth avulsion cases; if avulsed tooth has fully formed an apex, and if the apex of the tooth is incompletely formed. In open apex cases, treatment should focus on reforming the lost vascular supply of the tooth. In cases when it is not possible to restore the vascular supply, treatment should aim on eliminating the harmful bacteria and their products from the pulpal space.⁵

Once the avulsed tooth is replanted, it requires stabilization by a process known as splinting of teeth along with natural teeth for support. Data of previous studies there are chances of greater chances of ankylosis in transplanted and replanted cases where rigid splinting was done for long term period.⁶ One

of the most common unfavorable outcomes of replanted cases is the tooth ankylosis. To avoid this, removal of any remaining periodontal ligament should be done because these acts as stimulant for initiation of further inflammatory processes.⁵

Therefore, this study was undertaken to evaluate the survival and success rate of replanted tooth cases to assess various prognostic factors responsible for the better outcome of such cases.

Materials and Methods

We collected data from 2005 to 2010 of 80 patients retrospectively, reporting to the outpatient department with the chief complaint of avulsion of the permanent tooth due to trauma and accidental injuries. Only those cases of permanent tooth avulsion were included for the study for whom follow-up details of a minimum of 1 year was available. Root canal of the avulsed tooth was performed by a registered endodontist, and after completion of the root canal therapy, the tooth was replanted in the socket and was splinted with the support of the adjacent teeth. Roots of the avulsed tooth were cleaned gently and dried to remove any remnants and remains of the periodontal ligament.

The tooth was held with the help of forceps and tweezers and access opening was done. Following in, canal preparation was done following increasing diameter of the instruments with shortening of 1 mm for every single level increase in diameter. After canal preparation, finally canal was filled till the tip with the obturating material. Depending on the transporting media in which tooth was kept immediately after avulsion to the point of reporting to physician or the dentist, the patients were divided into three groups.

- Group I: Milk as transporting media
- Group II: Saliva as transporting media
- Group III: Any another media (water, tissue paper, etc.).

Depending on the time interval between the tooth avulsion and reporting to the clinician, the patients were divided as follow:

- Group I: Within 30 min
- Group II: 30 min - 2 h
- Group III: More than 2 h.

Only permanent tooth with completely formed root and the apex were included for the study. Care was taken to remove the pulpal tissue completely without removing any remnants.

After the completion of root canal therapy, replantation of the tooth into the socket was done. To stabilize and fix the tooth into the socket, the splinting procedure was done with the adjacent teeth. A non-rigid type of splint was used, and splinting was done for 2-3 week time. Radiograph was taken after replantation for comparing with the follow-up cases. Archwire was used for splinting purposes using composite resin materials.

Patients were advised to maintain the oral hygiene strictly. Chlorhexidine mouthwashes were prescribed, and patients were instructed for a regular check-up. Oral antibiotic therapy of amoxicillin and booster of anti-tetanus was given to the patient as a prophylactic measure. Repeat radiographic examination was done at the time of periodic follow-up of the patient to rule out any pathologic changes taking place.

Assessment of healing of replanted tooth

On the basis of 1-year follow-up, the results were categorized as follows:

- Group A: Failure of replantation due to inflammatory and periapical pathologies
- Group B: Failure of replantation due to external resorption
- Group C: Failure of replantation due to ankylosis
- Group D: Successfully stabilized replanted tooth without any pathologic change.

Assessment of follow-up results was done by radiographs and clinical examination. Results after the follow-up period of 1-year were taken as the standard for comparing the different groups. All the patients were divided into four groups on the basis of their follow-up results. Group A comprised cases which failed and showed mobility due to periapical inflammation and pathology. Group B included cases which showed mobility of exfoliated due to root resorption. Group C included cases in which replantation failed to ankylosis of the tooth with the bone. Moreover, Group D included successful replanted cases which did not show any pathological sign on follow-up.

All the data and the tables were analyzed by SPSS software. Chi-square test was used to measure the level of significance. $P < 0.001$ was considered as significant. Figures 1-6 describes the treatment protocol followed in one of the cases of replantation with 1-year follow-up.

Results

Out of total of 80 patients of replantation of avulsed tooth, 48 patients showed success after 1-year follow-up (Table 1).



Figure 1: Pre-operative photograph.



Figure 2: Avulsed teeth.

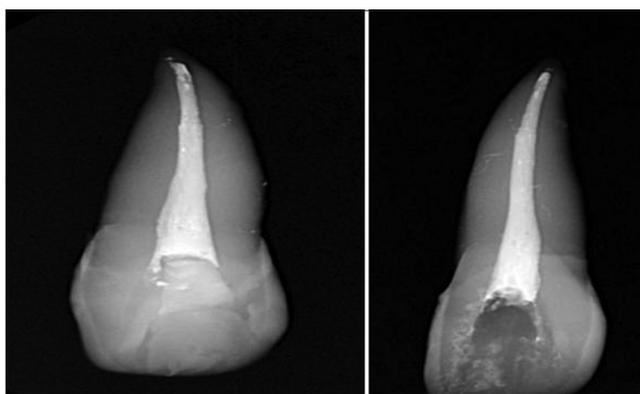


Figure 3: Extraoral obturation done.



Figure 4: Immediate photograph after replantation and splinting.

In 40 cases, the patients reported with in avulsed tooth stored in the milk, whereas 25 patients reported to the clinician with avulsed tooth in saliva (Table 2).

Following the accident/injury, 50 patients reported to the clinicians within ½ h of the injury while 30 patients took more than ½ h in reporting to the clinician (Table 3).

Discussion

Since the past few years, the total number of cases involving injuries to the orodental region has increased significantly.



Figure 5: Photograph of replantation after 1-year follow-up.



Figure 6: Radiograph of replantation after 1-year follow-up.

These traumas are most commonly affect teeth in the anterior region since they are more prone to injury.⁸ Tooth avulsion cases occurring because of these injuries require immediate treatment to restore and maintain their position and function in the jaws. Most of the clinicians to whom such cases are reported, generally lack complete knowledge about the treatment protocol of handling such cases. If the clinicians are aware of the correct treatment procedure, it will improve the prognosis of such cases to a significant level.⁹

Treatment of such avulsion cases imposes a diagnostic challenge for the clinician. Only choice of treatment left for immediate restoration is the replantation of the avulsed tooth. At the same time, this procedure depends on a number of prognostics factors such as time gap between avulsion and replantation and media in which tooth was kept after avulsion and before replantation.¹⁰

In our retrospective study, we found that out of 80 cases of replantation, 48 showed successful results without any pathologic change or mobility at the end of 1-year follow-up (Table 1). Karayilmaz *et al.*¹¹ in their analysis of replantation of avulsed tooth following dental injuries also found a significant number of successful cases. In their study, more than 50% of the patients reported with loss of the avulsed tooth due to panic

created because of injury. In our study, we excluded those cases in which the avulsed tooth was lost. About 17% of the cases failed due to subsequent inflammation and pathologic changes in the periapical region. 15% cases exfoliated due to external resorption while ankylosis was seen in 6 patients (Table 1).

Particular consideration is given to the amount of extraoral time between avulsion and replantation as a prognostic factor. On the basis of this criterion, we divided all the patients into three groups (Table 3). We observed that patients in which extraoral time was minimal had maximum number of successful replantation results on 1-year follow-up ($P > 0.001$). While in patients having extraoral time more than ½ h had a significant amount of failure cases of replantation ($P > 0.001$). Different studies quote different results regarding this. Kinoshita *et al.*¹² and Tzigkounakis *et al.*¹³ also studied replantation cases and postulated the ideal time to be between 30 min and 3½ h. Petrovic *et al.*¹⁴ and Karayilmaz *et al.*¹¹ reported this time extending up to 9 h in cases which showed a positive result of replantation.

However, in most of the cases, immediate replantation is not always practically possible. In such cases, the avulsed tooth should be kept in an ideal media to maintain the viability of the cells till replantation is done. We also compared the follow-up results of the patients depending on the type of media used for

carrying the avulsed tooth (Table 2). We observed that only cases where milk was used as a transporting media showed maximum successful results ($P > 0.001$). However, in cases in which saliva or any other media was used showed a significant number of failure cases. Gomes *et al.* also stressed on using milk as an emergency transporting media as it is easily available at all times. He also advocated of avoiding use of saliva as transporting media for longer duration as it adversely affects the periodontal ligament cell's viability due to its low osmolality.¹⁵

Careful and regular monitoring of the replanted tooth should be done as such cases are always at the risk of certain complications such as ankylosis, periapical infection, and root resorption. In our study also, we saw certain amount of replantation failure cases do to same reasons. Clinician/dentist should inform the patient and the persons accompanying the patients about the treatment protocol and the possible risk factors associated with it. Special emphasize should be given on saving and restoring the avulsed tooth. If due to some reasons, it is not possible, only then other restorative treatments should be done.

Conclusion

From this study, we conclude that avulsed tooth should be replanted as soon as possible for good prognosis. Milk should be preferred over other practically accessible mediums for transporting the avulsed tooth. Replantation not only restores functional stability but also establishes the aesthetics shortly following injury. Future research directing toward tissue engineering and stem cells are required to give a new direction in the field of replantation and for improving the prognosis of such cases.

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Table 1: Follow-up results of the patients accessed after 1 year.

Groups	Number of patients (%)	Chi-square value
A: Failure of replantation due to inflammatory and periapical pathologies	14 (17.5)	2.426
B: Failure of replantation due to external resorption	12 (15)	
C: Failure of replantation due to ankylosis	6 (7.5)	
D: Successfully stabilized replanted tooth without any pathologic change	48 (60)	

$P > 0.001$ (significant)

Table 2: Patients with successful replantation grouped on the basis of transporting media.

Group: Transport media	Number of patients	Number of patients with successful replantation	Chi-square value
I: Milk	40	30	2.866
II: Saliva	25	12	
III: Any other	15	6	

$P > 0.001$ (significant)

Table 3: Patients with successful replantation grouped on the basis of transporting media.

Group: Transport media	Number of patients	Number of patients with successful replantation	Chi-square value
I: Within 30 min	50	34	2.866
II: 30 min - 2 h	23	12	
III: More than 2 h	7	2	

$P > 0.001$ (significant)

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