

ORIGINAL RESEARCH ARTICLE

MANAGEMENT OF TRAUMATIZED ANTERIOR TEETH AT A TERTIARY CARE CENTER OF NEPAL

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ABSTRACT

Background: Immediate treatment of an injured tooth is the most significant factor for preserving pulp vitality. Treatment provided immediately after traumatic dental injury significantly improves the prognosis of a traumatized tooth by reducing the risk of complications. Similarly, proper treatment can lead to satisfactory outcomes. The objective of this study was to evaluate the type of treatments provided to the patients with dental trauma and the time elapsed between dental injury and arrival for treatment.

Methods: A retrospective study was conducted including 170 patients (128 males and 42 females) who received treatment for traumatic dental injury during a period between January 2016 and December 2019. The time elapsed between dental trauma and treatment, and the clinical treatments provided were recorded from a review of past records. Data analysis was performed using descriptive statistical methods.

Results: The time elapsed between trauma and treatment was found to range from 1 to 75 hours. (Average time 14.7 hours). An early arrival for treatment of dental trauma within 24 hours was observed among most of the patients (76.46%) in this study. The most commonly provided treatment was composite resin restoration (38.78%). Likewise, the second most frequently provided treatment was root canal treatment (29.08%). Overall splinting was provided in 44 teeth (12.18%), while repositioning along with splinting was performed in 43 teeth (11.91%).

Conclusions: On the basis of the results of this study it can be concluded that, most of the patients with traumatic dental injuries arrived for treatment early and restoration was the most common treatment provided followed by root canal treatment.

INTRODUCTION

Traumatic dental injuries (TDIs) varies in severity from simple infarction injury to avulsion injury. According to International Association of Dental Traumatology (IADT), trauma to the oral region comprises 5% of all TDIs. ¹⁻³ Prevalence of TDIs is high worldwide with almost one-third of adults experiencing trauma to the permanent dentition. ² Hence, TDIs are a well-known public dental health problem. ^{2, 4, 5}

Immediate treatment of a tooth with TDIs is the most important factor for protection of pulp vitality, and has a significant influence on the prognosis of such injuries. ⁶ Therefore, treatment of TDIs should be performed as soon as possible after injury. ³ However, TDIs are still neglected even though it is common worldwide. ⁷ Low rates of treatment of TDIs are found worldwide, with only one-third of patients coming for treatment within 24 hours of TDIs. ⁸ Additionally, treatment of TDIs is expensive, and time consuming, which involves multiple visits. ^{3,4}

One of the most important factors affecting prognosis after TDIs is time elapsed before treatment. ^{4, 6, 9, 10} TDIs commonly

present as an emergency, which requires timely management. The method of treatment has a significant effect on healing and prognosis of a traumatized tooth and varies according to the nature of injury. ¹¹ Since the type of treatment is significantly related to prognosis, a management plan which provides the best possible treatment should be carefully chosen. The objective of this study was to analyse the type of treatments provided to the patients with TDIs and the time elapsed between dental injury and arrival for treatment.

METHODS

This retrospective study was conducted at the Department of Conservative Dentistry and Endodontics, School of Dental Sciences, Chitwan Medical College, Bharatpur, Nepal. A total of 170 patients (128 males and 42 females) who received treatment for TDIs during a period between January 2016 and December 2019 (for a period of 4 years) were evaluated in this study.

The time elapsed between dental trauma and treatment,

and the clinical treatments provided were recorded from a review of past records. Purposive sampling technique was used to collect the data. The study was conducted with ethical approval of the Institutional Review Committee No. (Ethical Clearance No: CMC-IRC/077/078-021). Data analysis was performed using Microsoft Excel 2016 which included descriptive statistics (frequency distribution and percentage).

RESULTS

A total of 170 patients, who received treatment for TDIs were included in this study of which 128 were males and 42 were females. Male to female ratio was 3.04:1. The mean age of the patients was 27.19 years (age range=14-68 years). Most of the patients treated belonged to the young age-groups (16-30 years). The distributions of patient's age are shown in Table 1.

Table 1: Distribution of Age Groups

| Age Group | Frequency (%) |
|-----------|---------------|
| 11-15 | 6 (3.52) |
| 16-20 | 42 (24.7) |
| 21-25 | 44 (25.88) |
| 26-30 | 31 (18.23) |
| 31-35 | 19 (11.17) |
| 36-40 | 9 (5.29) |
| 41-45 | 8 (4.7) |
| 46-50 | 4 (2.35) |
| 51-55 | 5 (2.94) |
| 56-60 | 1 (0.58) |
| 66-70 | 1 (0.58) |
| Total | 170 |

The time elapsed between trauma and treatment and the types of treatment provided was included in the analysis. Time period between trauma and treatment was found to range from 1 h to 75 hrs. The average time of attendance after trauma was 14.7hours (Table 2).

Table 2: Distribution of Time elapsed between trauma and treatment

| Time Duration (Hours) | Frequency (%) |
|-----------------------|---------------|
| 1-5 | 77 (45.29) |
| 6-10 | 20 (11.76) |
| 11-15 | 16 (9.41) |
| 16-20 | 8 (4.7) |
| 21-25 | 12 (7.05) |
| 26-30 | 7 (4.11) |
| 31-35 | 8 (4.7) |
| 36-40 | 8 (4.7) |
| 41-45 | 5 (2.94) |
| 46-50 | 3 (1.76) |
| 51-55 | 1 (0.58) |
| 56-60 | 4 (2.35) |
| 71-75 | 1 (0.58) |
| Total | 170 |

Upon further analysis of the time elapsed between injury and treatment it was found that 29 patients (17.05%) arrived for treatment less than 2 hours of injury. Similarly, 101 patients (59.41%) arrived within 2-24 hours of injury and 40 patients (23.52%) arrived more than 24 hours after trauma. An early arrival for treatment of TDIs was observed among most of the patients studied (within 24 hours 130 patients (76.46%)).

A total of 361 traumatized permanent teeth were evaluated in this study. The most frequently treated tooth was maxillary left central incisor. The distribution of teeth and treatment provided is shown in Table 3.

The most commonly provided treatment was composite resin restoration (38.78%). Likewise, the second most frequently provided treatment was root canal treatment (RCT) (29.08%). A total of 9 teeth (2.49%) with root fractures were treated by flexible splinting, whereas 35 teeth (9.69%) were splinted for subluxation injury. Similarly, 13 teeth (3.6%) were repositioned and splinted for lateral luxation injury and repositioning and splinting of 24 teeth (6.64%) for extrusion injury was provided. Likewise, 6 teeth (1.66%) with intrusion injury were all treated by surgical repositioning and splinting.

Overall splinting only was provided in 44 teeth (12.18%), while repositioning along with splinting was performed in 43 teeth (11.91%). All of them were splinted using stainless-steel wire resin-based composite. In this study, only few patients (14; 8.23%) were advised only for follow-up without any treatment.

DISCUSSION

Severity and type of trauma, stage of root development, condition of the dental pulp, time duration between injury and treatment and the method of treatment are some of the factors that have a significant influence on the prognosis of the traumatized tooth.^{4, 6, 10-12}

Delay in seeking or providing treatment after trauma can significantly affect the prognosis of a traumatized tooth. It has been found that effective treatment within the first 24 hours after trauma decreases the risk of pulp necrosis (PN).¹³ Upon analysis of time elapsed between trauma and treatment, it was observed that most of the patients (76.46%) arrived early for treatment within 24 hours of trauma. This may be because of the place of study being conducted. Patients who came for treatment of TDIs within 24 hours of trauma was high, since this study was conducted in a tertiary care centre. Similarly, few patients (17.05%) came for treatment within 2 hours of injury and rest of them (23.52%) delayed seeking treatment by more than 24 hours. Many patients with TDIs have a tendency of delaying treatment until the appearance of symptoms.

Various studies have shown that dentin provides significant resistance to bacterial penetration in teeth with vital pulp.^{9, 14} Immediate treatment of a crown fractured tooth is, therefore, the most important factor for preserving pulp vitality irrespective of whether it is uncomplicated or complicated. Crown fracture has a low risk of PN when proper treatment is provided.¹⁰ However,

Table 3: Distribution of teeth according to treatment provided

| Type of tooth | 13 | 12 | 11 | 21 | 22 | 23 | 33 | 32 | 31 | 41 | 42 | 43 | Total |
|--------------------------|----|----|----|-----|----|----|----|----|----|----|----|----|-------|
| Restoration | 6 | 12 | 36 | 36 | 19 | 9 | 1 | 6 | 5 | 4 | 4 | 2 | 140 |
| Pulp Capping | 1 | 1 | 5 | 9 | 5 | 1 | - | 1 | 1 | - | 1 | - | 25 |
| Pulpotomy | - | - | 1 | 2 | - | - | - | - | - | - | - | - | 3 |
| Root Canal Treatment | 1 | 16 | 29 | 26 | 15 | 2 | 2 | 4 | 3 | 3 | 3 | 1 | 105 |
| Splinting: Root Fracture | - | 1 | 2 | 4 | 1 | - | - | - | 1 | - | - | - | 9 |
| Splinting: Subluxation | - | 4 | 4 | 8 | 4 | 1 | - | 3 | 5 | 3 | 3 | - | 35 |
| Re&Sp: Lateral Luxation | - | - | 4 | 4 | 2 | 1 | - | - | 1 | 1 | - | - | 13 |
| Re&Sp: Intrusion | - | 1 | 2 | 2 | - | 1 | - | - | - | - | - | - | 6 |
| Re&Sp: Extrusion | - | 1 | 10 | 8 | 2 | - | - | 1 | 1 | 1 | - | - | 24 |
| Replantation | - | - | - | 1 | - | - | - | - | - | - | - | - | 1 |
| Total | 8 | 36 | 93 | 100 | 48 | 15 | 3 | 15 | 17 | 12 | 11 | 3 | 361 |

** Re&Sp= Repositioning and Splinting.

crown fractures can act as a pathway for bacterial penetration into the dental pulp through the open dentinal tubules when left untreated. This can considerably increase the risk of PN.¹⁵ Prevention of bacterial penetration into the exposed dentinal tubules is a significant factor for long-term prognosis of a tooth with crown fracture. Hence, crown fracture and enamel infarctions should be sealed and restored as soon as possible.¹⁵

Although PN is rare in teeth with uncomplicated crown fractures; teeth without adequate dentin coverage of the exposed dentin have increased chances of PN.¹² Untreated enamel and dentin fracture creates a passage for bacterial infiltration into the dental pulp leading to PN. Since PN is significantly high in untreated enamel and dentin fracture, coverage of the exposed dentin is essential.¹⁶

Similarly, bacterial contamination through open dentinal tubules that are left untreated for more than 24 hours can lead to PN.¹⁶ Thus, dentin covering procedures should be carried out as soon as possible, since prognosis depends on time before treatment. Exposed dentin should be treated within 24 hours to stop bacterial infiltration into the dentinal tubules.¹⁷ Early sealing of the exposed dentinal tubules also helps to alleviate patient discomfort associated with sensitivity of the exposed dentin. The most commonly provided treatment was composite resin restoration (38.78%) in this study. This may be due to relatively early arrival for treatment by most of the patients. Additionally, crown fractures comprise of most of the TDIs in the permanent dentition.^{6,10} Composite resin restoration was also found to be the second most common treatment in a recent study.⁶

A study found emergency treatment received and time interval between injury and treatment as additional factors that affected pulp survival after complicated crown fracture.¹⁸ Time elapsed since pulp exposure and its extent are important factors in the treatment planning of complicated crown fracture.¹⁹ In case of TDIs with pulp exposures, early treatment is essential to preserve the health of the dental pulp. Another important factor that determines the prognosis of a tooth with pulp exposure is prevention of bacterial contamination of the pulp.¹⁴ Therefore, exposed pulp should be sealed and infected pulp should be removed as early as possible for a favourable prognosis.^{9,20}

Pulp exposures due to complicated TDIs can be managed by conservative pulp therapies such as pulp capping (PC), pulpotomy and pulpectomy.¹⁹ Although PC and pulpotomy has excellent prognosis; even after delayed treatment,^{16,19} teeth with complicated tooth fracture should be treated within 24 hours.¹⁷ In this study, only few teeth (6.92%) were found to be treated with PC. Pulpotomy is considered to be better than PC. Pulp exposures of a large size with duration of more than an hour are better managed by pulpotomy.¹⁹ However, very few teeth (0.83%) were found to be managed by pulpotomy in this study.

RCT is the choice of treatment in older patients with complete root formation.²⁰ Although, some studies have found success with partial pulpotomy procedures in old patients too. Conservative treatment by applying vital pulp therapies such as PC, pulpotomy and pulpectomy in teeth with complicated crown fracture and complete root development was also recommended by Jackson et al.¹⁶ In this study, the second most frequently provided treatment was RCT (29.08%), which may partially be because of late arrival for treatment of some patients (23.52%). This is similar to a recent study where RCT (28.6%) was found to be the most common treatment provided.⁶ This finding agrees with other studies where high rate of RCT were found even for tooth with uncomplicated crown fractures as a result of delayed treatment.^{6,10}

Root fractures are clinically challenging to manage. Management of a root fracture depends on the mobility and displacement of the coronal segment, stage of root development and location of the root fracture.²¹⁻²⁴ Therefore, it is divided into treatment of apical-third, middle-third and cervical-third. The objective of treatment in root fracture is to reposition and stabilize the coronal segment in its correct position. Proper repositioning and stabilization of the displaced coronal segment helps in healing and also reduces the risk of PN.²¹ However repositioning and splinting are decided by the degree of displacement and mobility of the coronal segment and is required only when the coronal segment is displaced and or mobile. According to IADT, RCT in a root-fractured tooth should only be initiated after the development of PN.¹

Generally, no treatment is required in apical-third root fractures

since the tooth are asymptomatic. Repositioning and splinting are also not required, as in most cases of apical-third root fractures the coronal fragment is neither displaced nor mobile. Similarly, RCT is not recommended in teeth with root fracture in the apical-third, since the pulp remains vital in most of the cases and a high success rate of healing has been found without endodontic treatment. However, when required RCT is limited to the coronal segment only, since the apical segment remains vital.²⁵

According to the IADT guidelines, repositioning of the displaced coronal segment and flexible splinting for a period of 4 weeks is recommended for middle-third root fracture with mobility of the coronal fragment. RCT of only the coronal segment is indicated in case of PN, as the apical fragment remains vital in majority of the cases. However, an apexification procedure using calcium hydroxide or mineral trioxide aggregate is suggested before obturation.²⁵ RCT of both the coronal and apical segment is needed in complete PN.

Although cervical-third root fractures have poor long-term prognosis, recent studies have shown them to have good chances of healing.²¹ Hence, extraction is not advocated for cervical-third root fractures. Cervical-third root fractures are clinically difficult to manage. Therefore, a longer splinting time period of 4 months is required because of the mobility of the coronal segment.¹ Repositioning and flexible splinting of the fractured coronal segment were performed on very few (2.49%) teeth with root fracture in this study. Root-fractured teeth are thought to have poor prognosis and hence, are often recommended for extraction. Although various complications are associated with them; they can be managed effectively by endodontic treatment.²⁴

The risk of PN is high in teeth with luxation injury as a result of damage to the neurovascular supply.¹⁵ However, RCT is recommended only after PN, except for mature teeth with intrusion injury. Although teeth with immature root have better prognosis after luxation injuries, mature teeth with adequate endodontic treatment also can have satisfactory long-term prognosis.

Concussion injury has a good prognosis with low rate of PN. No treatment is required for concussion injury. Similarly, the frequency of PN after subluxation injuries is also low. If required tooth with subluxation injury should be stabilized for 2 weeks using a flexible splint. In the present study few teeth (9.69%) were treated by splinting for subluxation injury. Teeth with lateral luxation should also be repositioned immediately and splinted. 3.6% teeth in this study, were repositioned and splinted for lateral luxation injury. Likewise, teeth with extrusion injury must be repositioned and splinted early to decrease the risk of PN. Repositioning and splinting of 6.64% teeth with extrusion injury was provided in the present study.

Intrusion injury is one of the most severe TDIs. Management and thus prognosis of an intruded tooth significantly depends on the stage of root development, degree of intrusion and the type of treatment, which involves spontaneous re-eruption, orthodontic

repositioning and surgical repositioning.²⁶⁻²⁸

Spontaneous re-eruption is suggested in teeth with immature root and also in teeth with mature root of patients aged 12-17 years having intrusion of less than 3 mm. However, orthodontic or surgical repositioning is recommended in patients above 17 years of age with mature root and intrusion of more than 3 mm.²⁷ Spontaneous re-eruption of an intruded tooth is considered to be the most favourable treatment option as it results in fewer complications.²⁶⁻²⁸ Although surgical repositioning has least favourable outcome, it is less time consuming and is therefore, the treatment of choice in teeth with severe intrusion and complete root development.²⁶ Additionally, many studies have found no significant differences in complications between surgical repositioning and orthodontic extrusion.²⁶⁻²⁸ All of the teeth evaluated in this study, were permanent teeth with complete root formation. In this study, very few teeth (1.66%) with intrusion injury were repositioned and splinted. All of them were repositioned surgically and splinted.

The rate of complications is very high in teeth with intrusion injury. Therefore, intruded tooth with complete root development should be repositioned as soon as possible. Also, RCT should be started immediately after repositioning in mature tooth to prevent complications.¹

Avulsion is considered as the most serious of all TDIs, therefore, is an emergency which requires immediate management for increased success.²⁹ Immediate replantation and flexible splinting followed by RCT is the most effective treatment for an avulsed tooth. The current IADT guidelines recommend a functional flexible splint for a period of 1-2 weeks after replantation. Similarly, RCT of an avulsed and replanted mature tooth should be started immediately or within 7–10 days after replantation. Immediate replantation, early endodontic treatment and placement of intracanal medicaments helps to prevent and manage root resorption.²⁹ Only one tooth was found to be replanted and splinted in this study, however. This may be due to unavailability of the avulsed tooth that could be replanted.

Splinting is necessary for all teeth that have been replanted and or repositioned. It helps to stabilize a tooth with root fracture, luxation and avulsion injury. In this study, splinting only was provided in 12.18% teeth, whereas repositioning along with splinting was performed in 11.91% teeth. All splinting was done by using stainless-steel wire resin-based composite.

Management of TDIs requires a long-term follow-up and monitoring.¹¹ Clinical and radiographic follow-ups are important as it helps to evaluate success of treatment and early detection and treatment of complications.³⁰ In this study, 14 patients (8.23%) were advised only for follow-up without any treatment. A comparison between studies evaluating the type of treatment of TDIs is difficult due to differences in methodology. However, information obtained from these studies help to provide evidences for the management of TDIs and evaluate treatment of TDIs.⁵

This study was limited to patients receiving treatment for TDIs of anterior teeth involving the permanent dentition only. Follow-up of treated patients was also lacking. However, it provides an overview of TDIs regarding the most frequently provided treatment. Further investigations are needed to evaluate long-term prognosis and efficacy of the treatment provided. Future studies involving the follow-up of treated patients can be conducted.

Management of TDIs is challenging and difficult due to uncertain prognosis.^{1,29} A right treatment plan is essential for a good long-term prognosis. An evidence-based guideline should be followed for successful treatment of TDIs. Therefore, IADT advises the use of dental trauma guide for the management of TDIs in order to provide evidence-based treatment. The benefits of following guidelines for the management of TDIs was found in a recent study by Bucher et al., which demonstrated that traumatized teeth treated according to guidelines resulted in a more favourable outcomes and significantly lower complication rates.³⁰

The time period between trauma and treatment significantly affects the options of treatment.⁴ Although the best time for initiating the treatment of TDIs is immediately after trauma, many patients with mild injury and no symptoms do not seek treatment early. Patients lack of awareness about the treatment and complications of TDIs may be the reason for delays in seeking immediate treatment after TDIs.³ Therefore, there is a need to increase awareness about the benefits of immediate or early treatment of TDIs.

CONCLUSION

Within the limitations of this study, it can be concluded that since most of the patients with TDIs arrived for treatment early, restoration was the most common type of treatment provided followed by RCT to the patients with TDIs.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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