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**Replantation of an Avulsed-Tooth by Using
Trepanation: A Case Report**

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Abstract

Tooth avulsion is one of the common types of orofacial and dental trauma that frequently occurs in sports and requires prompt management and a good treatment plan to achieve satisfactory outcomes. The aim of this case report is to present an overview of the tooth replantation using a trepanation procedure that has not been previously discussed in any formal publication. A clinical case concerning the management of tooth avulsion applying trepanation principles is narratively described along with a follow-up on the periodontal tissue condition after 2 years of treatment. The findings revealed the absence of inflammatory resorption, the most severe form of resorption typically seen within the initial 2 years following the replantation of an avulsed tooth. Nonetheless, caution should still be exercised regarding signs of surface root resorption, which although more favorable than inflammatory resorption and replacement resorption, should not be overlooked. Trepanation has demonstrated its ability to prevent inflammatory resorption for a minimum of 2 years post-replantation with no indication of ankylosis observed. Further investigation into trepanation is warranted to delve into the potential advantages of this procedure.

Introduction

There are several concerns addressed by the sports medicine team, one of which is orofacial and dental trauma that poses an increased risk in “contact sports” [1]. According to research in the US, at least 60% of individuals have experienced dental trauma while participating in sports activities [2]. Tooth avulsion has been highlighted as a type of dental trauma prevalent among children and adolescents engaging in sports activities [3]. Based on a survey, dental fractures and avulsions are among the most frequently encountered cases of orofacial and dental trauma, as seen in the Brazilian professional soccer league in 2007, where half of the 38 teams participated in the survey did not have a dentist as part of the sports medicine team [4].

Replantation is a procedure used to address avulsed teeth cases and should be performed promptly. A successful outcome will depend on various factors such as the tooth's duration outside the socket and the condition of the periodontal ligament [5]. Root resorption, commonly observed post-replantation, is associated with the tooth's root and periodontal ligament condition, significantly impacting the prognosis and longevity of the tooth [6].

This case report aims to provide an overview of the replantation for an avulsed tooth using trepanation procedure. Trepanation, a procedure not traditionally recommended in modern dental theories for endodontic treatment or avulsed tooth management, has been employed in Indonesia despite a lack of formal reports from Indonesian researchers specifically publishing on its application in dentistry. This article is expected to be the first scientific publication in dentistry discussing one of the clinical cases of trepanation, opening up possibilities for further exploration by other researchers on the benefits of such action.

Case Presentation

A 13-year-old boy fell while playing soccer on June 17, 2022, resulting in avulsion of the upper left central incisor. The tooth was initially lost but was found by him the next day, lying on the ground of soccer field. The retrieved tooth was then cleaned at home with water without antiseptic and soaked in a container of drinking water. On June 19, 2022, he came to the clinic with his parents to request replantation.

During the examination, the patient's overall health was not currently affected by any specific systemic illnesses. The wounds and bruises appeared to be improving compared to the picture taken by the parents shortly after the accident occurred (Fig. 1). Replantation was carried out at the request of the patient and the parents because they were not yet willing to use dentures as advised by another dentist they consulted with the day after the accident.

Replantation was carried out taking into account the



Figure 1: The image taken by the parents shortly after the accident occurred



Figure 2: Front and back view of the replanted tooth with trepanation canal on the palatal aspect

young age of the patient who felt uncomfortable using dentures. The replanted tooth was expected to last as long as possible until the patient could accept using dentures. Due to the delay since the accident, replantation was performed immediately without referring the patient to get a periapical radiograph first as there was no radiography equipment available at the clinic.

The tooth crown and root were cleaned using ultrasonic scaling and root canal cleaning procedures were performed. The tooth was then washed with 0.2% Chlorhexidine and rinsed with 0.9% NaCl. After administering local anaesthesia, curettage in the socket area was performed accompanied by irrigation using 0.9% NaCl. The cleaned tooth was then placed back into the socket. Once in the correct position, the tooth was splinted to the upper left lateral incisor using composite. Considering the delayed replantation case, the tooth's root canal was left open following trepanation principles to prevent the risk of suppurative swelling that could occur in a non-vital tooth. Trepanation allowed for the drainage of gas and fluids that could potentially occur in that condition. Metronidazole was prescribed for a 5-day course. The patient and parents agreed that if swelling or pain symptoms occur later on, the tooth can be extracted again to make a denture. The patient was instructed to maintain oral hygiene, including brushing the palatal surface of the replanted tooth to prevent the trepanation canal from becoming blocked.

Six days after the replantation with trepanation was completed, the patient was asked to return for observation and to evaluate whether antibiotics needed to be prescribed again. He didn't complain of anything. There was no percussion sensitivity or pain experienced. The patient only received prophylactic scaling with an emphasis on promptly visiting if there are any complaints because no more antibiotics are being taken. If swelling and pain occur, the patient was reminded that the tooth can be extracted



Figure 3: Front view of the tooth after 24 months of replantation



Figure 4: Periapical radiography after 24 months of replantation



Figure 5: Front teeth appearance after crown reshaping with composite.



Figure 6: Palatal view of the tooth where the trepanation canal can still be found.

again as explained and agreed upon initially.

Two months after the replantation, the patient returned but to request the extraction of one loose primary tooth. There were still no complaints about the replanted tooth. The patient's confidence grew stronger to avoid having the tooth extracted again in the near future to be replaced with a dental prosthesis. Several photos were then taken for documentation (Fig. 2).

Due to school activities and extracurricular involvements, the patient returned for a dental check-up 14 months after the replantation procedure. The replanted tooth was separated from the upper left lateral incisor by removing the composite that was initially attached to both teeth. Ten months later, the patient returned again without any complaints, showing no percussion sensitivity or mobility in the replanted tooth (Fig. 3). This indicates that during 24 months post-replantation, the patient had never experienced any swelling, loose teeth, or pain, even while eating. Subsequently, the patient was advised to undergo a periapical radiography to confirm the absence of any abscess concerns from the delayed replantation procedure (Fig. 4), during which the tooth was left on the ground around soccer field without proper sterilization.

Knowing that there was no percussion sensitivity, mobility, gingival recession, and no periapical abscess seen on the radiograph, the patient still wanted to keep the tooth for as long as possible. Five days after the periapical radiograph was taken, the tooth crown was reshaped using composite (Fig. 5) to match the upper right central incisor because the tooth was desired by the patient to be retained even longer. The trepanation was still left as it was (Fig. 6) until a decision is made on the next steps through discussions with the patient and parents.

Scaling was performed again to reduce plaque accumulation found around the cervical area of the teeth to maintain periodontal tissue health. A common concern in replantation cases is root resorption. Oral cavity cleanliness must be properly maintained to reduce the risk of inflammation. Having the appropriate treatment plan for non-vital teeth that undergo replantation is another crucial aspect to consider in managing root resorption. The alveolar bone around the replanted tooth, which still appeared to embrace the root on radiography, is very likely one of the reasons why there was no mobility. Trepanation may have also assisted in preventing the formation of a periapical abscess, which commonly occurs in non-vital teeth, where the abscess would lead to alveolar bone resorption and eventually cause the tooth to become loose. During the patient's visit for scaling and reshaping the crown of the tooth, information was also obtained from the parents that the patient has had a habit of mouth breathing since

childhood due to having allergies that frequently congest the nose.

Discussion

Tooth replantation is the process of repositioning an avulsed tooth back into its original place within the oral cavity [7]. It is recommended to perform replantation as soon as possible to increase the success rate in the treatment of avulsed teeth, even though the prognosis remains uncertain [8,9]. The periodontal ligament cells are expected to still be viable and capable of regeneration if replantation occurs within 30 minutes of the tooth avulsion [10]. However, immediate replantation can sometimes be challenging due to various reasons, such as patients needing to address injuries in other parts of the body first. A general recommendation for cases where patients have difficulty reaching a dentist immediately after avulsion is to store the tooth in an isotonic solution like milk. It is not advisable to soak the avulsed tooth in drinking water as its low osmolality can damage the periodontal ligament [8,11].

In our case, the patient visited two days after the accident for replantation. The tooth had been left on the ground at a soccer field for one day, causing it to dry out and potentially become contaminated. It was also revealed that the tooth was soaked in drinking water by the patient's parents. The delayed replantation, along with the tooth's susceptibility to contamination and prolonged suboptimal storage, raised concerns about the possibility of infection after the replantation.

Ultrasonic scaling on the tooth surface, applying cleaning procedures to the root canal, and using 0.2% Chlorhexidine followed by rinsing with 0.9% NaCl were efforts to free the tooth from contamination. Administering antibiotics and leaving the trepanation canal open were subsequent steps to anticipate potential infections that might lead to an abscess. Besides Metronidazole, which was expected to address anaerobic bacteria dominant in abscesses, trepanation would also allow oxygen to enter the root canal, making the environment more aerobic. In the event of an abscess occurring after replantation, trepanation is also intended to serve as a way for pus around the tooth to drain [12]. After positioning the tooth in the curetted socket and irrigating it with 0.9% NaCl to remove any blood clot, the tooth was then splinted to the upper left lateral incisor by using composite to prevent tooth mobility. Splinting was only performed on one tooth to avoid interfering with the patient's growth at that age.

Inflammatory resorption is a type of resorption that can cause a replanted tooth to become loose again in the shortest time compared to other types of resorption like replacement resorption. Inflammatory resorption can even lead to tooth mobility within a period not exceeding 2

years after replantation. Symptoms of this resorption may include pain, swelling, presence of an abscess, and fistula. Radiographic images will show alveolar bone undergoing resorption in this condition [13].

In our case, 2 years passed and the patient had never complained of any pain at all, including percussion sensitivity. There was no history of swelling or the appearance of abscesses and fistulas as could be found in other replantation cases. Although there seemed to be evidence of surface root resorption, the radiograph showed the alveolar bone still embracing the tooth root, unlike in cases of inflammation where the alveolar bone would appear to be moving away from the tooth. The apical third also did not show any signs of inflammatory resorption or replacement resorption (ankylosis). Surface root resorption is considered a more favorable type of resorption compared to inflammatory resorption and replacement resorption from the perspective of periodontal healing [6].

The absence of inflammation might be one of the reasons why there was no tooth mobility during our examination in this case, and the patient had reported that the tooth could be comfortably used. The planned trepanation as a preventive measure had shown results still relevant to its initial goal of addressing the possibility of infection and abscess. Two years had passed, and no inflammatory resorption, the most severe type of resorption often occurring within the first 2 years post-replantation, had occurred. However, as mentioned earlier, the prognosis of replantation remains uncertain. Although periodontal healing in cases of root surface resorption is considered favorable, the potential progression towards less favorable surface root resorption should still be taken into consideration. Despite the often poor prognosis, replantation is still recommended, especially in children and adolescents, to allow time for them to become more accustomed to using prosthetics or dentures [8]. The next steps in treatment will be discussed with the patient and parents.

Another issue that had caught our attention was the habit of mouth breathing in patients. Mouth breathing is a condition where more than 25% of the air passes through the mouth, which usually occurs when there are problems with the nose [14]. In addition to puberty and plaque accumulation on the teeth found in patients, the habit of mouth breathing is also one of the factors that can cause gingival overgrowth in patients [15]. Scaling had been performed while providing education about mouth breathing, which should not continue to be a habit, including when not experiencing allergies with symptoms of a nasal congestion. The dental and periodontal health, including the gums, of the patients were expected to improve in the future.

Case reports on trepanation may also be conducted by other dentists, especially in Bandung, Indonesia. The procedure of trepanation, although not officially discussed and recommended in any journal related to dentistry, has been practiced even up to the time this article was written at the Bandung City Dental and Oral Health Hospital, a government-owned facility [16]. This is to further explore scientifically a procedure not endorsed by any modern theory of dentistry but perceived to have benefits at least by dentists and patients in Bandung, Indonesia. Trepanation is a local wisdom that should be studied more deeply to provide additional insights and perspectives in the field of dentistry. Through scientific examination, the perceived shortcomings in the trepanation procedure are expected to be addressed, enhancing its benefits. Hypotheses regarding the use of oxygen-permeable membranes are one of the efforts towards achieving the goal of optimizing trepanation [12].

Conclusion

Initially, trepanation was performed solely as a precautionary measure due to concerns about the potential for abscess formation. This case was not initially intended for publication as the trepanation was considered a precautionary measure that we deemed the most efficient procedure during the observation period to ensure whether the replanted tooth was secure. Nevertheless, we concluded that trepanation has proven to prevent inflammatory resorption in this case for at least 2 years and no signs of ankylosis were observed. Surface root resorption is considered the most favorable outcome in resorption cases post-replantation as it still indicates periodontal healing. Further research on trepanation is anticipated, including measuring the level of oxygen that can enter the root canal of the trepanated tooth. Whether habits like mouth breathing or smoking can affect the supply of oxygen to the trepanated tooth is just one of many questions that can be explored regarding trepanation.

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