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Tooth Autotransplantation: An Alternative Treatment Option for Impacted Teeth

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ABSTRACT

Aim: To assess autotransplantation as a viable treatment option for impacted teeth.

Introduction: Tooth autotransplantation (AT) is a procedure that involves the surgical removal of a tooth from one position in the mouth and repositioning it to a different location within the same patient. This technique is particularly beneficial for growing patients when orthodontic retraction, dental implants, or fixed bridges are not appropriate options. This method helps maintain the function of the periodontal ligament and preserves alveolar bone integrity, allowing for continued bone growth.

Methodology: This case report describes the management of a 12-year-old patient with a horizontally impacted permanent maxillary left central incisor. The tooth was deeply positioned in the alveolus, close to the floor of the nasal cavity. Orthodontic consultation revealed that the root was severely dilacerated (90 degrees) at the middle third and lacked adequate bone support, making surgical extraction the preferred treatment plan. The impacted tooth was surgically extracted and repositioned to its original location. The bone defect was filled with platelet-rich fibrin (PRF), and the tooth was stabilized with a fiber splint for one week. Afterward, a regenerative endodontic procedure was performed using a platelet-rich fibrin clot and mineral trioxide aggregate (MTA) to restore the tooth's pulp vitality and encourage continued root development. Clinical and radiographic evaluations were conducted at 1, 3, and 6 months, with the six-month radiographs showing periapical healing and new bone formation.

Conclusion: Autotransplantation may be considered an alternative to implants or prosthetic rehabilitation for juvenile patients with ectopically impacted teeth..

KEYWORDS: Autotransplantation, ectopically impacted tooth, platelet-rich fibrin

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INTRODUCTION

The management of missing teeth as a result of dental trauma, tooth impaction, or associated with hypodontia in children and adolescents presents a clinical challenge for the dental team. [1,2] In a developing patient, a removable partial denture may be provided after an extraction. However, this option is rarely used today due to challenges with patient compliance, hygiene maintenance, and the progressive thinning of the alveolar ridge.[3] Fixed prostheses and implants are generally unsuitable for children because their growth phase and incomplete alveolar bone development make such treatments inappropriate.[4]

The outcome of orthodontic traction was uncertain, and attempting it would have required substantial time and consistent cooperation from the patient and their guardians. Both the patient and their parents were also concerned about potential discomfort during the lengthy treatment process. Furthermore, the bone intended to guide the traction was compromised, prompting the decision to proceed with autotransplantation of the impacted tooth.[5]

One of the options that is regaining popularity is dental auto-transplantation.[6] Dental auto-transplantation refers to ‘transplantation of an unerupted or erupted tooth in the same individual, from one site to another extraction site or a new

surgically prepared socket." [7]

Swedish dental surgeon Vidman first described autogenic transplantation in 1915.[8] This technique is particularly beneficial for growing patients when orthodontic retraction, dental implants, or fixed bridges are not appropriate options. [9,10] This method helps maintain the function of the periodontal ligament and preserves alveolar bone integrity, allowing for continued bone growth.[11]

Tooth autotransplantation offers several advantages, including preserving periodontal ligament function and maintaining alveolar bone integrity, which supports continued bone growth.[11] However, it is a highly technique-sensitive procedure.[12] Furthermore, there is a risk of complications, including root resorption, ankylosis, and fractures during the extraction of the impacted tooth.[13]

Successful autotransplantation largely depends on proper case selection, surgical expertise, and interdisciplinary collaboration to ensure the best functional and aesthetic results.[14]

This case report demonstrates the successful auto-transplantation of an impacted immature central incisor into its alveolar socket, followed by effective splint placement for stabilization. The outcome of this case highlights the efficacy of auto-transplantation in young patients, emphasizing its potential for maintaining alveolar bone integrity and promoting continued root development.

CASE REPORT

A 12-year-old male patient reported to the Department of Pediatric and Preventive Dentistry with a complaint of an unerupted upper left central incisor. The patient's parents noted that, despite the normal eruption of his other permanent teeth, the upper left central incisor had not appeared as expected. Although the patient did not experience any pain or discomfort in the affected area, the delayed eruption raised concerns regarding the potential impact on his smile aesthetics and overall oral function. He had no significant medical history and is in good general health, with no chronic illnesses, systemic conditions, or history of hospitalizations. Intraoral examination revealed that the patient is in the mixed dentition phase, with a missing permanent maxillary left central incisor and an over-retained upper left deciduous central incisor (Fig 1).

Fig 1: Pre-operative intraoral picture showing missing 21 and Over-retained 61

RADIOGRAPHIC FINDINGS

On initial radiographic evaluation, an orthopantomogram (OPG) and periapical radiographs were obtained. These revealed an impacted permanent maxillary left central incisor alongside an over-retained deciduous central incisor (Fig 2). However, due to the complexity of the tooth's position and the necessity of evaluating its relationship with surrounding anatomical structures, a Cone Beam Computed Tomography (CBCT) scan was advised. Cone beam computed tomography (CBCT) confirmed the presence of a horizontally impacted maxillary left central incisor (Fig 3A and 3B). The tooth was deeply embedded in the alveolus, positioned close to the floor of the nasal cavity. The tooth was oriented in the labiopalatal direction and there is a breach in the continuity of the labial and palatal cortical plate. Orthodontic consultation revealed that the root was severely dilacerated (90 degree) at the middle third and lacked adequate bone support, making surgical extraction an adequate treatment plan.

Fig 2: Impacted central incisor and Over-retained 61 seen.

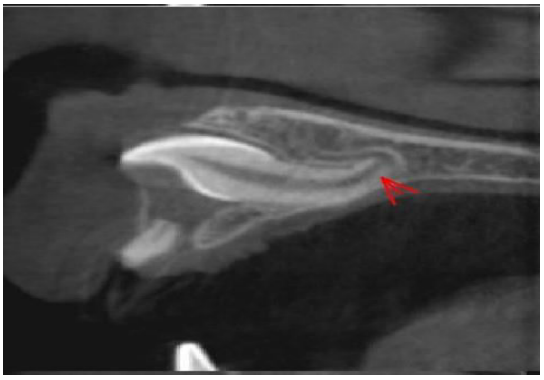

Fig 3A

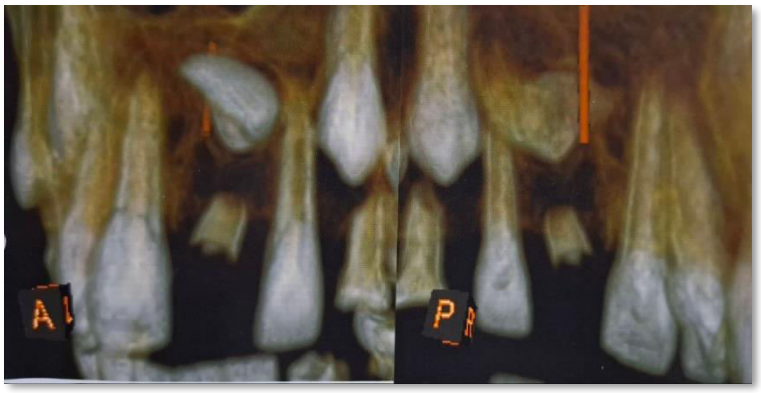

Fig 3B

TREATMENT PLAN

The following treatment plan was devised:

Surgical extraction of the impacted tooth.

Repositioning of the tooth in its original location.

Bone defect management using platelet-rich fibrin (PRF).

Stabilization of the tooth with a fiber splint.

Regenerative endodontic procedure to restore pulp vitality and promote continued root development.

Fig 4: Equipment required for the procedure.

Procedure:

The treatment was carried out in multiple phases. The emergency phase involved the extraction of the over-retained deciduous maxillary left central incisor under local anesthesia. In the surgical phase, an incision was made using a No. 12 surgical blade, followed by careful flap elevation with a periosteal elevator. The impacted tooth was surgically exposed and extracted with minimal trauma. Following the extraction, the tooth was immediately placed in the patient's saliva to maintain hydration and viability. A platelet-rich fibrin (PRF) membrane was prepared by drawing 12 mL of whole blood from the patient's right antecubital vein, which was centrifuged at 3000 rpm for 10 minutes. The PRF clot was compressed between two gauzes to form a membrane and was used to fill the bone defect at the surgical site. The extracted tooth was repositioned into its original location, a fiber splint was applied to stabilize the tooth for four weeks, and sutures were placed to secure the site. The patient was prescribed antibiotics and analgesics and was advised to maintain good oral hygiene. Sutures were removed seven days post-surgery.

Two weeks post-surgery, an access cavity was prepared in the repositioned tooth. The root canal was irrigated with 2.5% sodium hypochlorite and saline and then dried with sterile paper points. A mixture of ciprofloxacin and metronidazole in distilled water was used as an intracanal medicament, while minocycline was excluded to prevent tooth discoloration. The antibiotic mixture was placed into the canal using an endodontic plugger and sealed with a temporary filling material. After 11 days, the medicament was removed using hand instruments, and the canal was re-irrigated with sodium hypochlorite. A PRF membrane was prepared and inserted into the canal up to the cementoenamel junction to act as an apical barrier. Mineral trioxide aggregate (MTA) was mixed and placed over the PRF clot. A moist cotton pellet was placed over the MTA, and the tooth was provisionally restored with a temporary filling. Later, the provisional restoration was replaced with a permanent composite resin restoration.

The patient was monitored at 1,3-, and 6 months post-procedure. At the 1-month follow-up, the patient reported no pain or discomfort, and radiographic imaging showed early signs of bone healing. At the 3-month follow-up, progressive bone regeneration and periapical healing were noted. The tooth remained stable, and no signs of infection were present. At the 6-month follow-up, radiographic evaluation confirmed significant bone formation and complete periapical healing. The tooth exhibited normal physiological mobility, indicating successful integration and stability. Auto-transplantation of an impacted immature central incisor, followed by regenerative endodontic treatment, proved to be an effective approach for this case. The use of PRF enhanced bone healing and tissue regeneration, contributing to successful long-term outcomes. Regular follow-up and interdisciplinary collaboration were crucial in ensuring the stability and functional integration of the repositioned tooth. This case highlights the potential of modern regenerative techniques in managing complex dental impactions and restoring aesthetics and function in young patients.

Fig 5A: Extraction of 61

Fig 5B: Extracted 61

Fig 6: Surgical incision

Fig 7: Reflection of the flap which exposed the crown of the impacted tooth

Fig 8A: Extraction of impacted tooth

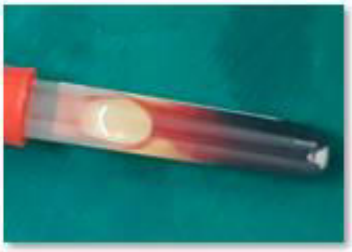

Fig 8B: Extracted maxillary central incisor with curved root tip

Fig 9A, 9B: Platelet-rich fibrin

Fig 10: Placement of PRF

Fig 11: Tooth repositioning

Fig 12: Splinting and Suture

Fig 13: Access cavity

Fig 14: Fibre splint

Fig 15: MTA placement

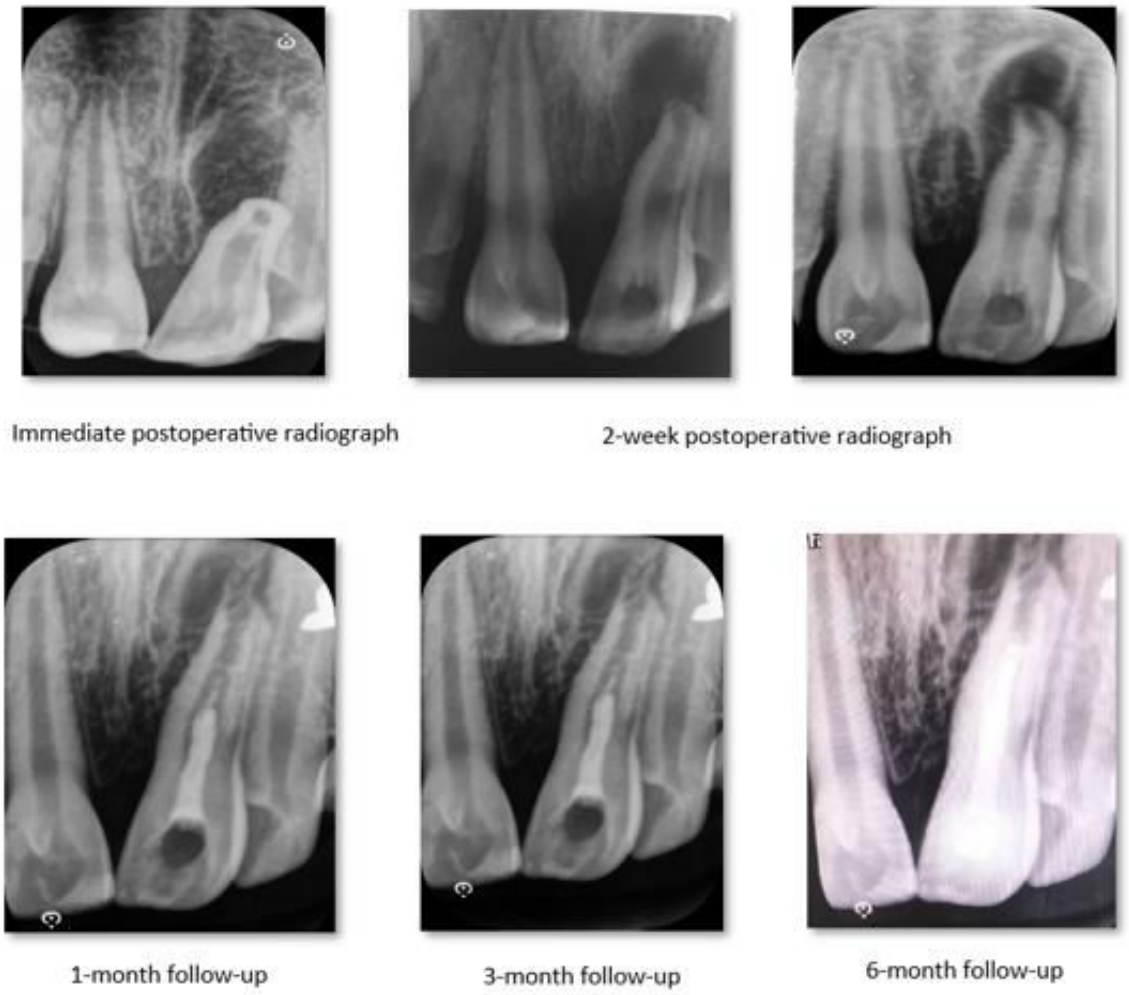

Fig 16: Radiographic evaluation 1,3 and 6 months.

DISCUSSION:

Tooth loss or impaction is a common outcome of oral diseases and dental injuries.[15] Permanent maxillary incisor impaction can result from various factors, including pathological obstructions such as supernumerary teeth, cysts, and odontomas.[1] Other causes may involve tooth malformation, ectopic eruption, ankylosis, endocrine disorders, bone diseases, or physical barriers like mucosal tissue.[2] These issues can significantly impact speech, occlusion, aesthetics, and social interactions.[20]

While several treatment methods are available for replacing missing or impacted teeth, managing such cases in younger patients presents unique challenges due to the ongoing development of their jaw bones. [9,10] Traditional options like orthodontic treatment, removable dentures, fixed partial dentures, and dental implants may not always be suitable for children.[13]

Tooth autotransplantation, which involves replacing a lost tooth with another healthy tooth from the same individual, offers a promising alternative.[13] This approach has demonstrated high success and survival rates across different age groups, including both children and adults.[17] A key element in ensuring successful autotransplantation is maintaining the integrity of the periodontal ligament (PDL) tissue and supporting pulpal recovery. To minimize harm to the PDL, it is crucial to keep the extraoral time of the donor tooth as short as possible. [21] In this case, transplantation was performed immediately following extraction.

One of the most significant benefits of autotransplantation is the preservation of the periodontal ligament (PDL).[14] The survival and integrity of the PDL are critical not only for tooth mobility and proprioception but also for facilitating normal physiologic tooth movement. A functional PDL allows for continued alveolar bone remodeling and growth, which is especially important in growing patients.[12] In contrast to implants, which are ankylosed to the bone and do not adapt with growth, transplanted teeth can erupt in synchrony with adjacent teeth and maintain harmonious occlusion over time.[16]

Transplanted teeth can integrate well with adjacent teeth, promoting natural space closure, improved aesthetics, and reduced costs and treatment duration compared to dental implants.[18] This approach also supports the preservation and growth of both soft and hard tissues.[19] Repositioning a horizontally impacted tooth through autotransplantation into its natural location provides multiple benefits. These include the potential for future orthodontic movement, stimulation of alveolar bone development during eruption, regeneration of functional periodontal tissues, bone regeneration in deficient areas, enhancement of gingival architecture, and the psychological comfort of retaining a natural tooth.[22]

However, in the current case, the horizontally impacted permanent maxillary left central incisor was surgically extracted and auto-transplanted into its original position. Regenerative endodontic treatment was planned after autotransplantation to improve the prognosis. Six-month follow-up showed healing of the periodontal tissue and alveolar bone. Although the current case report had a successful follow-up of 6 months, long-term follow-up is required to use this treatment option in the horizontally impacted tooth

CONCLUSION

Horizontally impacted teeth with severe root dilaceration present a unique clinical challenge. Autotransplantation may be considered an alternative to implants or prosthetic rehabilitation for juvenile patients with ectopically impacted teeth. It permits tooth movement to distant or opposite sides of the same dental arch as well as to the opposite jaw. This procedure also offers potential benefits of re-establishment of normal alveolar process development, esthetics, functions, and arch integrity.

Declaration of patient consent:

All necessary patient consent has been obtained. Patients have agreed to the use of their images and clinical information, understanding that their names and initials will not be disclosed

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Conflicts of interest:

There are no conflicts of interest.

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