AUTOTRANSPLANTATION OF AN UNERUPTED WISDOM TOOTH IMMEDIATELY AFTER REMOVAL OF GROSSLY DESTROYED PERMANENT MANDIBULAR FIRST MOLAR. A CASE REPORT

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Abstract

The rapidly evolving implantation and alveolar ridge reconstruction techniques opened a new era in modern dentistry, where tooth loss is no longer a problem. However, none of the modern technologies in implant dentistry have the potential to adapt to the growth and development changes of a child’s jaw. Therefore, patients at young ages appear as a restriction for implantation and as a particular challenge for a dentist willing to restore the missing teeth. Thus, dental autotransplantation is an alternative treatment for replacing the lost teeth when suitable donor teeth are available. A case report is presented, in which the non-restorable tooth was replaced by autotransplantation of the impacted tooth. This article illustrates the option of using impacted teeth as a viable reservoir for autotransplantation in young patients with non-restorable permanent tooth.

Keywords: autotransplantation, impacted tooth, oral rehabilitation, biodentin, platelet rich fibrin.

1. INTRODUCTION

Tooth transplantation is defined as surgical transposition of a vital endodontically treated tooth from its site of origin, transplanted to another natural or surgically prepared socket [1,2].

Abulcassis described this sort of surgical intervention in endodontics at its inception in 1050 B.C., however, Ambroise Pare was the first dentist to perform such an endodontic surgery (tooth bud transplantation) in 1564 and record it in literature with detailed description. The molar transplantation technique was first described in 1956 and, since then, guidelines for this surgical technique remained almost the same. Newer techniques have been advocated for improving the prognosis and success of transplantation techniques, such as two-stage transplantation and prototyping [3,4]. Tooth transplantation can be of autogenous, homogenous or heterogeneous type [5-7].

The tooth transplantation technique is of utmost importance, being indicated when the tooth is congenitally missing, in cases of tooth loss due to trauma, grossly decayed tooth, atypical tooth resorption, fracture of tooth root, endodontically failed cases indicated for tooth extractions, periodontal compromised tooth, etc. This technique is an excellent and conservative alternative approach for oral rehabilitation in young patients, as well as in patients with economic constraints [8-10].

Third molar transplantation is useful and indicated in the following conditions [11-15]:

- Extensively carious first permanent molar with compromised tooth structure in adolescent patients
- Adolescent patients having excellent chances of developing third molars with incomplete root formation.
- Missing first molar tooth in cases of severe juvenile periodontitis.

The success rate of third molar auto-transplantation recorded in literature was over 50% [16]. A higher success rate can be achieved with careful and proper treatment planning, along with a meticulous surgical technique [17]. Auto-transplantation performed in very young patients prevents alveolar bone resorption, thus
allowing continued osseous development around the transplanted tooth. It also permits transmission of proprioceptive stimulus in the transplanted tooth [18]. Most frequently, transplanted teeth have one-third to three-quarter root formation, although transplantation of teeth with complete root formation is also well documented [19]. Transplantation of teeth with complete root formation also documents a high success rate and, hence, may be a viable alternative option in the absence of ideal donor teeth [20].

Patients with a suitable donor tooth and recipient site are perquisites. Patient cooperation, understanding and comprehension are also of utmost significance to achieve remarkable results. Sufficient alveolar bone support with healthy surrounding soft tissues must be present at recipient site to achieve adequate stability of the transplanted tooth. There should be no infection or inflammation at recipient site. Position of donor tooth should allow atraumatic extraction, as much as this is possible. Teeth with abnormal root morphology or procedure requiring tooth sectioning are not indicated. Donor teeth may have open or closed root apices. Furthermore, teeth with open apex may remain vital and allow complete root development following transplantation, without further need for endodontic therapy, however, a tooth with complete root formation will require root canal treatment following transplantation [21].

The purpose of this article is to present a case with successful autotransplantation of impacted mandibular third molar teeth with incomplete root formation following extraction of mandibular first molar with compromised coronal tooth structure.

2. CASE REPORT

A young 19 year-old male patient reported to our department with chief complaint of broken tooth structure in lower right back tooth region and difficulty in chewing food since one week. Upon clinical examination, extensively destroyed coronal portion of lower right first molar (46) and clinically missing lower right third molar (48) were noted (Fig. 1).

Fig. 1.

The patient also gave history of intermittent pus discharge from the soft tissue w.r.t 46 tooth. Radiographic examination was suggestive of periapical bone loss at mesial and distal root of 46 and mesio-angularly impacted 48 tooth. No significant difference was noted in mesio-distal dimension of both teeth (46 & 48) at point of maximum convexity. However, roots of third molar (48) were comparatively shorter than those of first molar (46) (Fig. 2).

Fig. 2.

Based on clinical and radiographic findings, diagnosis of pulp necrosis, chronic apical abscess was made, in relation to 46. The digital Orthopantamogram (Veraviewpocs, J. Morita; Kyoto, Japan) was done to evaluate complete dentition (Fig. 3).
Treatment options included extraction of the indicated tooth (46), followed by prosthetic rehabilitation (fixed partial denture / implant supported prosthesis) or post placement in one / both roots of 46, followed by core build-up. However, due to financial constraints, the patient did not accept the proposed treatment options. On careful re-evaluation, the third molar autotransplantation was proposed to rehabilitate his oral health. Autogenous tooth transplantation was feasible in our case because of the young age (19 years), no contributory systemic condition and presence of suitable third molars with incomplete root formation being observed. Bone grafting was also included in the treatment plan, due to significant periapical bone loss and difference in root length. The patient was informed on the treatment plan and informed consent was taken from him and his next of kins. Prophylactic antibiotics (amoxicillin 500 mg) were administered.

Modified Ward’s incision was done and the muco-periosteal flap was raised. The third molar (48) was exposed, the surrounding bone was guttered on buccal, and the distal aspect and tooth was luxate. The third molar was left in toto in its original socket (Fig. 4). The first molar (46) was extracted (Fig. 5) and the granulation tissue was curetted from its socket (Fig. 6). The third molar (48) was then carefully extracted in toto with periotomes and placed into the recipient site (46), to check for its adaptation - which was found satisfactory.
Tooth 48 was then kept in Hank’s Balanced Salt Solution (HBSS) (Fig. 7), retro-preparation and root end filling being performed with Biodentin (Septodont, Saint-Maur-des-Fossés, France) (Fig. 8).

Fig 7.  

Fig 8.  

The allograft material mixed with Platelet rich fibrin (PRF) (Fig. 9) was packed into the extraction socket. The third molar was then transplanted into the recipient site and stabilized, after which a resorbable Guided Tissue Regeneration (GTR) membrane was placed (Fig. 10).

Fig 9.  

Fig 10.  

Flaps were sutured in the 46 and 48 regions, using 3-0 silk. Splinting of tooth (46) was performed using both figure-of-eight wiring and composite splinting. The immediate post-operative radiography (IOPA) revealed an adequate positioning of 48 in socket of 46 (Fig. 11). To improve the initial stability of the transplanted tooth, a surgical cement dressing of Coe-Pak (De Trey/Denstply, Konstanz, Germany) was placed on the buccal and lingual aspects wrt 45 to 47 region.

Fig 11.  

Antibiotic (Amoxicillin 500 mg TID) and analgesics (diclofenac sodium 50 mg TID) were prescribed for 05 days. Periodontal dressing and sutures were removed after one week. Post-surgical course was uneventful, and root canal treatment was initiated after 2 weeks using magnifying loupes (4.2x magnification, Amtec, India), under rubber dam isolation. Following access cavity preparation, the working length was determined and confirmed radiographically. The canals were shaped and cleaned up to a
size of 30 K files (DentsplyMaillefer, Ballaigues, Switzerland) for the mesiobuccal and mesio-lingual area, while distally up to a size of 40 (DentsplyMaillefer, Ballaigues, Switzerland), by the standardised technique. Throughout the shaping and cleaning procedure, the root canals were irrigated with 3% sodium hypochlorite (Novo Dental Product Pvt Ltd, Mumbai, India) and saline. The tooth was then temporized using Cavit G (3M, ESPE, Germany).

Calcium hydroxide paste (Kalsin, Aktu, Turkey) was placed for 2 weeks, followed by temporization with Cavit G (3M, ESPE, Germany). Obturation of root canals was done by cold lateral compaction of gutta-percha (GP) (DentsplyMaillefer), using sealapex (Kerr Corp., Glendora, CA, USA) root canal sealer (Fig. 12). Digital OPG (Veraviewpocs, J. Morita; Kyoto, Japan) was taken (Fig. 13).

3. DISCUSSION

For a successful auto-transplantation, the donor tooth and the recipient site should be examined thoroughly, to ensure feasibility of root canal treatment of the donor tooth, as well as its adequate stability at recipient site. The recipient site should have an adequate bony support and sufficient surrounding soft tissues to achieve post-operative stability. To minimize damage to the periodontal ligament and cementum, and for a good prognosis, the tooth (#48) was atraumatically extracted. Teeth with anomalous morphology and marked root curvatures are not indicated for transplantation, due to an increased risk of damage of the periodontal ligament during extraction [22,23].

In literature, it has been documented that the transplanted teeth with incomplete root formation shows pulpal healing in 96% cases, however, transplanted teeth with complete root formation have shown a success rate of only 15%. The endodontic treatment is indicated within 1-2 weeks of auto-transplantation of teeth with complete root development, otherwise pulpal necrosis may result in inflammatory resorption [24].

Andreason et al. studied the incidences of pulpal healing in 370 premolar transplantations at various developmental stages and classified them into 7 stages. According to their study, a satisfactory pulpal healing occurred until stage 5 (complete root formation, apical foramen wide open). Considering the pulpal healing and the continued root development, the ideal timing for transplantation of the developing teeth is attained when the development of the donor tooth roots is three-fourths to four-fifths completed (i.e., at developmental stage 4 or 5, respectively) [25]. In our case, tooth development occurred in stage 6 (complete root formation, apical foramen half closed). As pulp healing was not expected, a root canal treatment was performed within 2 weeks after transplantation and calcium hydroxide dressing was placed for 2 weeks. This medication was expected to enhance bone healing, inhibit root resorption, provide an antimicrobial effect and thus stimulate the healing process [26,27].

The pathways of communication between the root canal system and its surrounding tissues...
should be sealed with an ideal endodontic repair material. We used Biodentin as an apical barrier as, when Biodentin comes in contact with dentin, it results in formation of a “Mineral Infiltration Zone,” the tag-like structures next to an interfacial layer, which enhances the adhesive properties. It has improved the physical properties, reduced the settling time to 12 min, and induced odontoblast-like cell differentiation and mineralization [28].

A resorbable barrier membrane was used to protect the adjacent soft tissues from cells impeding bone formation and, additionally, to provide mechanical stability to the graft materials [29]. The absence of a barrier membrane may result in apical migration of the junctional epithelium along the root surfaces [30].

Autologous platelet-rich fibrin (PRF) was used as a matrix. In 2001, Choukroun et al. introduced PRF, the second-era of platelet concentrates with no biochemical blood handling procedure for specialized use in oral and maxillofacial surgery [31,32]. Growth factors, such as platelet cytokines (PDGF, TGFb-1, IGF-1), are slowly released as the fibrin is reabsorbed, thus creating a favourable environment for healing [33]. PRF recruits cells to the site of the injury, induces cell differentiation, initiates vascular ingrowths, stimulates collagen production, controls the local inflammatory process and improves soft and hard tissue healing [31]. Considering these properties, PRF was used in the present case report as a biological internal matrix.

Periodontal healing occurs within 8 weeks after transplantation. X-rays reveal a continuous space around the root, the absence of root resorption and the presence of intact lamina dura [34].

Kim et al. studied the prognosis and causes of failures of 182 auto-transplanted teeth and found no statistical correlation for the extra-alveolar time of up to 25 minutes. The absence of external inflammatory resorption or ankyloses was also noted. No resorption was observed in our case, however, we kept the transplanted tooth in its original socket and also in a HBSS solution.

Auto-transplantation of the cryopreserved teeth has also been well documented in literature [35]. Special care, facility and expertise are required to avoid damage of the periodontal ligament and dental pulp [23]. It is hoped that the teeth extracted for orthodontic purposes, third molars, and impacted and supernumerary teeth can be used for future auto-transplantation by preserving them with this method. However, considering the stage of development of the method and the cost for the patient in time, these areas should be further improved before this method may become a routine clinical treatment [10].

4. CONCLUSIONS

Whenever non-restorable teeth need to be extracted or tooth agenesis is evident, other treatment alternatives, such as tooth transplantation, should be considered, instead of immediately replacing the teeth with fixed, removable, or implant-supported prostheses. Supernumerary teeth and impacted teeth should be considered as a reservoir for transplants.

References