ISSN 2515-8260 Volume 09, Issue 07, 2022

AUTOTRANSPLANTATION OF TOOTH

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Abstract: Teeth have been autotransplanted for many years, although with different degrees of success. However with recent advances and several documentations and cases, it has become a viable and successful line of treatment especially in cases of edentulism, cases of trauma resulting in the loss of teeth, pathologies and so on. It is a little-used method that, if used by a multidisciplinary team, might be the best course of action for patients. Autotransplantation has proven to be a useful therapeutic alternative, particularly for adolescents. It offers a biological and affordable alternative to traditional tooth replacement. This article aims to throw light on the history, indications, surgical methods and follow up of these cases and provides a comprehensive review of autotransplantation.

Keywords: Autotransplantation, Donor, Orthodontics, Receipient site, Transplant.

Introduction: Orthodontic treatment is becoming more and more popular especially among teenagers as esthetics play an important role for them. For orthodontists, missing teeth pose a challenge since they must determine whether the gap should be filled or should be prepped and closed orthodontically. Combining orthodontic therapy with autotransplantation lessens tooth mobility while also lowers the number of lost

teeth. Numerous studies have shown that autotransplanted teeth with full roots have satisfactory survival rates[1].

Autotransplanted teeth erupt amicably with a change in the alveolar bone with the help of the periodontal ligament. In order to provide the patient with a genuine masticatory function and a response to biologic stimuli, transplanted teeth regain their proprioceptive function and normal periodontal healing capacity[2].

Autotransplantation is the procedure of moving erupted, implanted, impacted tooth from one location to another of the same individual, either into a medically prepared socket or to an extraction site. It is when a donor tooth with normal morphology that fits the recipient location is available, autotransplantation is justified as it does not worsen the occlusion. It is a seldom used method that, when performed by a multidisciplinary team, may be a great way to treat people who have damaged or missing teeth.

History**:** Since ancient times, human teeth have been autotransplanted. Although tooth transplantation has been practised for hundreds, if not thousands of years, it wasn't until the 18th century that the procedure gained widespread acceptance. John Hunter, a renowned transplant researcher, documented a case of a successful and promising tooth allo transplant in London in 1772 [3].Outcomes of the majority of these cases were unsatisfactory. In the 1950s, successful autotransplantation when clinically carried for the first time showed that transplanted immature third molars successfully replaced carious first molars[4]. Slagsvold and Bjercke published the case series of the very first autotransplantation involving the developing premolars to the anterior maxilla. Reportedly 34 were teeth replaced with premolars between May 1959 and January 1970, with the teeth being followed up for an average of 6.2 years[5].

Indications and Contraindications

Indications	Contraindications
1. Children with accidental loss of tooth in which implants are contraindicated due to continuing bone growth.	Medically compromised patient.
2. Therapeutically extracted maxillary premolars can be moved to the location of mandibular second premolar.	Insufficient alveolar bone support.
3. In ectopically positioned, autotransplantation may offer a more expedient course of therapy.	Pulp regeneration potential (Radiographically >1mm apex opening)
4. Chance of development of severe dental caries, endodontic issues or juvenile periodontitis in the first or second molars	Root formation less than 1/2.

Evaluation- both clinically and radiographically, diagnosis, treatment planning, a surgical operation, potential endodontic therapy, restorative treatment, follow up and management of complications are all steps in the autotransplantation process[9].

Clinical considerations

Source of transplant*:* Any tooth in the dentition of the patient may be suitable for transplantation, historically third molars were often utilized. Third molars worked effectively as replacements for those that had been maliciously damaged. Additionally, they are acceptable for usage throughout puberty due to their root growth, which lasts until the late teens and early 20s.

Easily accessible as transplants are premolars, especially given that the orthodontic treatment plan frequently calls for their extraction. Additionally, their anatomy typically lends itself more favorably to mesial replacement. Due to their ideal shape, size, and single root canal configuration, mandibular first premolars are the teeth of choice for transplanting to the maxillary incisor area**.**

In severe situations, impacted canines have been surgically relocated, and lower incisors have been utilized to restore upper lateral incisors[8].

Size of transplant*:* Mesiodistal evaluation is simple to carry out. The labiolingual breadth of a donor root and its configuration within the bony alveolar walls are often difficult to ascertain. Occlusal radiographs are typically indicated for such evaluations.

Small size of the premolar makes it a better choice than a third molar, depending on the available space. On the other side, the last tooth in the arch gives easy access for removing it keeping in mind that the root remains undamaged and healthy during relocation[8].

Timing of transplant: Development of the tooth is traumatic if it is surgically altered in the bud stage of development. The development of postoperative roots is frequently hindered or may have morphological abnormalities. There should never be any doubt about the necessity of revascularization[9]. If transplantation is done just before crown formation is complete, Slagsvold and Bjercke discovered that calcification of enamel

may suffer. On the other side, as the root apex approaches closure, the chance of a positive prognosis decreases[10].

It is believed that allowing for sufficient growth before transplantation reduces the loss of root length. process. The best time to transplant growing teeth is when the donor tooth roots are three- to four-fifths complete, taking into account both healing of the dental pulp and root growth[11]. However, the depth required at the recipient site increases with the length of the root at the time of surgical intervention. Hale shared the opinion of many writers that the best time for transplantation was when the root formed to a depth of 3-5 mm[12].The genetic potential of a well managed transplant can occasionally result in a response that is above and beyond what is anticipated[12].While we largely concur with the notion put forward by Hale, particularly in terms of goals and treatment, depending on time, the growing tooth possesses the potential of apical bony displacement and root extension[13].

The condition of the recipient site is also important. In cases of edentulism or prolonged edentulism the alveolar bone height is nonexistent or underdeveloped.

It becomes crucial to maintain deciduous teeth in certain cases. Pathologic conditions should not be present if replacement of deciduous teeth is intended. Delaying extraction till the time of transplantation is preferable since the crypt serves as the foundation for transplantation. Periodontal integrity is our top priority while choosing a recipient location.

Alveolar support, attached keratinized tissue covering it to provide appropriate coverage or approximation is required at the transplant site[8].

Prior to surgery, deficits in the mesiodistal space must be corrected, either through orthodontics or by proximal stripping[8]. The recipient site should be free of chronic inflammation. Costich advises using bone pieces to fill up "dead space" if the transplant is too tiny. Even if this method isn't always effective. It can be kept prepared if their use is anticipated[14].The maxillary sinus has a tendency to restrict the socket size that may be formed and, consequently, the outcome of the arch[8].

Surgical Procedure: A recent study by Jakobsen states that the success of a transplant does not depend on the surgeon's experience[15].The results of a prior research by Schwartz et al, which claimed that the surgeon's experience improved treatment outcomes, are at odds with this[16].Keeping patient’s psychological status and cooperation into consideration, surgery can be performed under local anaesthesia or

general anaesthesia, the later being preferable with nasal intubation. It should be kept in mind to prevent any equipment from coming into close proximity with the donor root's surface. The layer of bone in close contact with the periodontal ligament should be averted with an elevator. The recipient socket can be prepared with the help of rotary instruments, piezosurgical instruments as well. Donor tooth is removed from the crypt only when the recipient socket is prepared. Swiftly and immediately the donor should be transferred to the receiving socket. The placement of the transplant at the marginal gingiva or elsewhere depends on the root development. The likelihood of complications from periodontal repair is decreased by flexible splinting with sutures for stabilization[17,18].The patient is instructed to use chlorhexidine gel on the surgical site and take non-steroidal ant inflammatory medications for two to three days until the splinting and stitches are removed two weeks following the surgery.

Splinting: Flexible splinting for 7–10 days is done since it allows the transplant to move functionally. It has been hypothesized that this motion will enhance periodontal ligament bone repair and increase in cellular activity[19]. Splinting appears to be beneficial although not essential in most of the situations[20].The transplanted tooth can be stabilized using suture on the occlusal surface; however, in traumatic cases when stability is questioned, for 1-2 weeks, bonded wires may be utilized for fixing. when incisors are replaced with premolars[21].

Post Surgical Orthodontics

In a case study including adult patients receiving autotransplantation along with orthodontic therapy, orthodontic pressures were delivered through the archwire post splint placement. Edgewise appliances with 0.018-0.025 inch slots and 0.016-0.022 inch improved super-elastic nickel titanium alloy wires (ISWs; L and Tomy International Inc., Tokyo, Japan's H1 Titan) were used for alignment. Four weeks following the transplant, splinting is removed and the transplanted teeth's alignment will start.

Patients who have had developing premolars autotransplanted to replace maxillary central incisors require post surgical orthodontics. Anchorage control must be augmented if a donor premolar is chosen mainly based on the ideal stage of root

development rather than orthodontic considerations. Use of post surgical orthodontics are:-

1. To fill the gap in the dental arch after removing the donor premolar
2. Correct alignment of premolar in the arch
3. Even leveling of gingival margins
4. Rectifying a concurrent malocclusion

TADs or Class II correctors of the Herbst type may be useful to facilitate predetermined tooth movements. The transplanted premolar's orthodontic alignment should optimally resume when the post-surgical healing phase comes to an end. If premolars from donors were implanted sooner it is recommended to wait until the premolar root is $3/4^{th}$ developed because it may have an impact on how their hard tissues develop. After surgery, it is typically advised to wait three to six months to ensure uninterrupted rehabilitation if the premolar is transplanted at $3/4^{th}$ of the root length[22]

Follow up: Pulp obliteration and tooth eruption (for donors) are usual indicators to assess after growing teeth have been transplanted and placed subgingivally or equigingivally to continue their eruption. In developing teeth that have been transplanted, the pulp is frequently obliterated. It does not indicate the absence of pulp vitality and does not call for endodontic treatment. At least for the first year following surgery, routine clinical and radiological exams are required. Examination of the surgical site is of utmost importance after the removal of suture at 2,6,12,18 and 24 months. The follow-up sessions are arranged every month until recovery is certain in situations of doubtful healing. An evaluation of mobility, percussion sound and eruption is part of the clinical examination. Radiographs are taken periapically of the transplanted premolar as a part of the radiological assessment to track the repair of the bone at the root formation, pulp obliteration of the transplanted premolar, the recipient location, and indications of many forms of resorption. Several months following surgery, one can anticipate the new alveolar bone to develop horizontally[23,24].It has been documented that the labial cortical plate can regenerate even in areas where there was a large amount of bone loss at the time of surgery[25,26].

Conclusion: Autotransplantation enables for tooth movement to the opposing jaw as well as to separate or contralateral sides of the same dental arch. In addition to

replacing teeth, it also possesses the ability of formation of new bone and the restoration of the normal alveolar process. Following surgery, the transplanted teeth's healing and root development needs to be periodically monitored in order to spot potential failure early on. When a suitable candidate is found, autotransplantation in conjunction with orthodontic therapy should be contemplated of as the initial therapeutic option for a missing tooth in presence of a suitable donor tooth.

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