

Autotransplantation of Tooth: Alternative Treatment Option

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Abstract:

The surgical transfer of a tooth from one place in the mouth to another within the same person is known as an autogenous tooth transplant. A natural tooth is used to replace a missing tooth instead of a prosthesis or an osseointegrated implant, which is a great alternative for rehabilitation of young patients with growing alveolar bone. Tooth autotransplantation exhibits a number of advantages compared to other treatment options (i.e., dental implants or fixed partial prostheses), such as greater resistance to occlusal loading, maintenance of the periodontal ligament (PDL) and surrounding bone, and potential for better esthetics. Present review of literature aim to discuss autotransplantation of tooth in detail.

Keywords: Autotransplantation of tooth, Transposition, Tooth replacement

Introduction: One of the major challenges for dentist everywhere is early tooth loss. Early tooth loss can be caused by a variety of reasons, including endodontic origin disorders, caries, and shattered (irreparable) teeth. Extraction without replacement and extraction with replacement

utilizing an implant-supported crown, a fixed dental prosthesis, or a removable dental prosthesis are two of the many treatment options available to manage early tooth loss.¹

The surgical transfer in one person of a critical or endodontically treated tooth from its original location in the mouth to another site has improved and produced better results as a result of advances in scientific knowledge and technology.² The oldest accounts of tooth transplanting concern Egyptian slaves who were compelled to give their pharaohs their teeth.³ However, due to issues with histocompatibility, autotransplantation finally took the place of allotransplantation of a tooth from one person to another. Due to less histocompatibility issues, this method appears to be superior to allotransplantation. Auto transplantation has historically been viewed with scepticism due to a lack of knowledge on the subject and the subpar clinical outcomes of recorded cases. Poor clinical methodology and a lack of grasp of the underlying basic principles were to blame for these disappointing findings.⁴ The belief that auto-transplantation can only be successful when developing, immature teeth are transplanted has been another obstacle to the technique's acceptance. Survival rates are used to determine whether autotransplantation was successful, with or without root filling.⁵

The first thorough study on autologous tooth transplantation was published in 1954 by M.L. Hale.⁵ The remarkable success rates recorded in research over the past ten years are proof of the advancement in the science of autotransplantation. The trials show that for carefully chosen patients, autotransplantation is a practical option for tooth replacement.⁶

The use of autotransplantation is advised in cases of traumatic tooth loss, malignancies, congenitally absent teeth, teeth with a poor prognosis, and abnormal tooth development.⁷ In addition to improving functional adaptability and alveolar ridge preservation, this surgery is also reasonably priced.⁸ Present review of literature aim to discuss autotransplantation of tooth in detail.

Indication of Autotransplantation of Tooth⁹⁻¹²

- Tooth loss due to excessive carious invasion is the most common indication for autotransplantation, especially mandibular first molars which often get grossly decayed due to eruption at early age.
- When dental implants are placed in adolescent patients, they do not erupt along with adjacent teeth and result in infraocclusion with functional and esthetic problems.
- Other conditions in which transplantation can be considered include:

- Tooth agenesis
- Traumatic tooth loss (auto transplantation of the developing mandibular second premolar to the place of avulsed maxillary incisors)
- Atopic eruption of canines
- Uncontrolled root resorption
- Large endodontic lesions and other endodontic issues
- Cervical root fractures
- Localized juvenile periodontitis
- After jaw reconstruction surgeries

Contraindication of Autotransplantation of Tooth⁹⁻¹²

- Patient with cardiac anomalies
- Poor oral hygiene
- Lack of self-motivation
- Insufficient alveolar bone support
- Lack of root development

Clinical Procedure

Patient selection: Selected patient must have a satisfactory degree of dental hygiene, be in excellent health, be able to adhere to postoperative instructions, and be accessible for follow-up appointments. Most importantly, the patients must have a suitable recipient site and donor tooth.¹²

Smoking must be avoided, as this will reduce the vascularity and wound healing potential post-transplantation. Uncontrolled diabetes is also a significant contraindication.

Pre-operative evaluation - The processes in the autotransplantation process include diagnosis, treatment planning, a surgical procedure, possible endodontic therapy, restorative treatment, follow-up, and care of problems, both clinically and radiographically.¹³

Selection of recipient site: Acute infection and persistent inflammation should not exist at the recipient location. Success requirements must include adequate bone support. There must be enough alveolar bone support in all directions and enough connected keratinized tissue to guarantee stability of the transplanted tooth and prevent infection from entering through the mouth.¹⁴

Extensive clinical and radiographic evaluation should come before the autotransplantation, followed by thorough treatment planning. An orthodontic space creation procedure will be required before the transplant if the mesiodistal recipient space is insufficient for the donor tooth. When the buccolingual bone is too narrow, the recipient site may undergo a green-stick fracture or autogenous bonegraft.^{15,16}

Criteria for donor tooth: Premolars, canines, incisors, and third molars are the ones that are most frequently utilised. The autotransplantation of third molars or impacted canines was the focus of early investigations; but, by the late 1950s, data on the autotransplantation of additional teeth started to emerge.¹²

The donor tooth must be placed such that its removal will be as painless as feasible. It is possible to consider donors for teeth with open or closed apices. The transplant tooth's root development stage is crucial, though. When the root development is between one-half and two-thirds, success rates are at their highest.^{18,19}

Timing: Exarticulated teeth that are immediately replanted are known to have a favourable prognosis, whereas teeth that are transplanted into recipient beds that have already been prepared exhibit a high rate of root resorption. The tooth from the receiving site should ideally be extracted on the same day that the donor tooth is taken out for transplantation. In cases when tooth from recipient site must be extracted earlier due to toothache or other reasons, transplantation should be scheduled within a month. The later donor tooth will be transplanted, the less support it will have as resorption of the bone would occur at the recipient site.²⁰

Surgical procedure: Local anaesthetic is first applied to the inferior alveolar nerve block (for the mandible) or the posterior superior alveolar nerve block before the surgery begins (for the maxilla). Triangular flap is raised and divided in the event of complete third molar retention or impaction to provide access to the operational field. The periodontal ligament is preserved by using an intrasulcular incision if the donor third molar is fully erupted.^{21, 22}

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 position of the donor tooth within the recipient area should provide a biological width similar to those at the area of naturally erupted tooth. Autotransplanted tooth should also be out of occlusion, so that masticatory loads could not disturb the periodontal healing processes

after transplantation. Gingival flap should be correctly closed around the transplanted tooth to ensure the success of the operation. The integration of the donor tooth within recipient socket largely depends on the absence of bacterial invasion of the blood clot formed between the root and the socket. To manage this in some cases it is necessary to obtain correct position and secure soft-tissue flap before placing donor tooth into recipient site. Replaced tooth should be stabilized after placement. X-ray control of recipient site should be provided before surgery, as well as before and after splinting of donor tooth.^{23,24}

Transplanted tooth should be out of occlusion to eliminate impact of destabilizing loads through the occlusal contacts with antagonist tooth. It is preferably to use more flexible splint for transplanted tooth fixation, rather than rigid one. Flexible splint fixation supports further pulp revascularization. The surrounding soft tissues could be sutured with absorbable or non-absorbable sutures.²⁵

Postoperative care: A surgical dressing is applied to protect the graft against infection during the first 2-3 days of wound healing. Following surgery, this dressing is removed after approximately 3- 4 days. In the first week post-operation, it is necessary to provide instructions regarding oral hygiene and diet. Following suture removal, a follow-up appointment is usually scheduled for after 7-10 days. 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.²⁶

Advantages	Disadvantages	
Preparation of adjacent teeth is not needed	Due to the transplant's infraocclusal position, further procedures, such as orthodontic and/or prosthodontic care, may be required	
Cost-effectiveness		
Normally functioning periodontium		
Suitable option for adolescent patients (continue to erupt with ongoing vertical facial growth)		Poor dental hygiene might result in attachment loss, which makes treatment fail
Normal proprioception and thermal feedback Can be moved orthodontically		Restored tooth cannot be used
Preserves alveolar bone volume (even in the event of failure, the autotransplant can be replaced with an osseointegrated implant when facial growth is complete)		Endodontic treatment would be necessary if the pulpal tissues failed to heal
A better alternative to removable or fixed prostheses		

Recommendations suggested for a successful autotransplantation: By adhering to a few basic biological principles, the success percentage of autotransplantation can be boosted:²⁸

- Medically healthy patient
- Donor tooth with normal morphology that matches the recipient site without complicating the occlusion
- One-half to three-quarters root formation with underdeveloped root apex (over 1 mm wide open apex)
- Atraumatic extraction technique preserving Hertwig's epithelial root sheath, periodontal ligament and the apical portion of the developing tooth bud
- Keeping extraoral time for the donor tooth to an absolute minimum (preferably less than one minute)
- Transplanted tooth is placed into a fresh socket, rather than an artificially prepared socket
- Avoid trauma post-transplantation and maintain excellent oral hygiene

Success of tooth autotransplantation: The main goals of tooth transplantation are the absence of ankylosis and the survival of PDL. Over the previous ten years, high success rates of autotransplantation ranging from 74% to 100% have been observed.²⁸ Cohen et al. (1995) found 98-99% survival rates over 5 years and 80-87% over 10 years with transplanted anterior teeth with closed apices.³

Andreasen (2007)²⁹ found 95 and 98% long-term survival rates for incomplete and complete root formation of 370 transplanted premolars observed over 13 years.

Chronic root resorption is the most frequent reason for autotransplant failure. From most frequent to least frequent, inflammatory resorption, replacement resorption (ankylosis), marginal periodontitis, apical periodontitis, caries, and trauma are the reported causes of tooth loss after transplantation.³⁰ Replacement resorption might not be noticeable for three to four months following transplantation, whereas inflammatory resorption might be noticeable after three to four weeks. When the donor tooth is extracted painlessly and moved right away to the recipient location, the incidence of both forms of resorption can be reduced while reducing the chance of damaging the periodontal ligament.^{31,32}

Conclusion: For some clinical circumstances, tooth auto-transplantation might be thought of as an alternate method of oral rehabilitation especially in young patients. Even if auto-transplantation hasn't been proven to be a reliable alternative to conventional tooth replacement, further research and clinical trials are necessary to provide predictable long-term outcomes.

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