




## AUTOGENOUS DENTAL TRANSPLANT - LITERATURE REVIEW

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### ABSTRACT

Dental transplantation is an oral rehabilitation option for individuals who have suffered early loss of natural teeth due to trauma or various diseases. In young patients, in addition to not having indications for implants because they have not completed their craniofacial development, the common options offered in dental offices, such as fixed or partial removable prostheses, are also expensive and difficult to access socioeconomically. Because the third molar has a late development and is often indicated for extraction, it is the best option for transplantation. When healthy, it is transplanted into the alveolus where the loss occurred. This can be done in one or two stages and with the use of postoperative retention to better adapt the tooth to the alveolus. Given the above, the present study aims to conduct a literature review on autogenous dental transplantation as a treatment option for patients who have suffered early loss of a dental organ. The research was conducted through websites such as Google Scholar, Scielo, and PubMed with content available from 2008 to 2022. It is concluded that transplantation is a low-cost oral rehabilitation option, thus avoiding the wear of adjacent teeth for the use of fixed prostheses. Patient cooperation is extremely important for the success of autologous dental transplantation.

**Keywords:** Transplantation. Tooth. Molar. Autologous.

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## INTRODUCTION

Dental transplantation is the replacement of a missing or lost tooth with a transplanted tooth, usually a third molar. This type of autologous transplant was first documented by Hale, and to this day, the principles of this surgical technique are practically the same, and it is a clinical procedure that has been successfully performed in oral rehabilitation (PEIXOTO A, et al., 2013).

These transplants have been performed for over 40 years in Scandinavian countries, allowing for a high success rate in the population of these countries, and are routine procedures with well-established protocols in dental services (SANTOS L. C. S, et al., 2013).

The recipient site must have sufficient bone to ensure good support in all dimensions as well as sufficient keratinized gum to allow stabilization of the transplant. The region must be free of infection and/or chronic inflammation. (CLOKIE CM, et al., 2004)

Rehabilitation using osseointegrated implants and prostheses is highly sought after in cases of missing teeth, however, some factors such as the patient's age and high cost may limit these procedures. Alternatives such as autogenous dental transplantation may then be considered, as this is a more accessible procedure due to its low cost (MILLORO et al., 2016)

## OBJECTIVES

### General Objective

To review the literature on autogenous transplants as a treatment option for patients who have suffered early loss of the dental organ and their success rates with clinical and radiographic monitoring.

### Specific Objectives

- a) To analyze which patients are most suitable for autotransplantation;
- b) To verify the most common types of complications;
- c) To report the advantages of transplantation to aid in orthodontic treatment;

## METHODOLOGY AND STRATEGY

To conduct the literature review, search engines such as Google Scholar, Scielo,



and PubMed were used, and the methodology was based on studies reported in the literature. Thirty articles were selected for reading and case analysis.

Despite the great advances in Dentistry, with a consequent decrease in the indications for tooth extraction due to periodontal disease and caries, the practice of removing teeth that can be treated conservatively is still routine in places where the socioeconomic condition is unfavorable. Possible treatments for a lost tooth are generally prosthetic rehabilitation, implants, and orthodontics, although they are treatments that generally depend on financial condition. Thus, dental transplantation emerges as a treatment option for all social classes, being called by some researchers “biological prosthesis”. (PEIXOTO A, et al., 2013).

With the appropriate case selection and technique, autogenous dental transplantation can be a viable treatment modality. The authors present several cases of transplantation and suggest that the procedure be considered an adjunct in orthodontic treatment planning. It is believed that its appropriate use can simplify or eliminate prosthetic requirements, reduce the complexity of many orthodontic treatment plans, and convert certain cases previously considered inoperable into routine. (WM NORTE, S KONIGSBERG).

## **DEVELOPMENT**

Autogenous dental transplantation, also known as autotransplantation, is a clinical procedure that has been studied as an excellent option for the treatment of patients who have suffered early tooth loss due to atypical eruption, root fractures, trauma from accidents, extensive carious lesions, root resorption, tumors, juvenile periodontitis or iatrogenic diseases.

It is a good alternative for oral rehabilitation when the patient has lost a tooth and is indicated for third molar extraction.

The main reason for the success of this technique is the late development of third molars in the other teeth. (Garn et al. 1962; Gravely et al. 1965; Nicodemo, 1967; Marzola, 1988; Andreassen, 1992).

Autologous dental transplantation is a surgical procedure in which a healthy tooth is moved from one alveolus and reinserted into another, whether the tooth is vital or has even been treated endodontically. It will provide rehabilitation for missing teeth without the need to wear down adjacent teeth.



Missing teeth can influence changes in tooth positioning, bone resorption, joint changes, aesthetic problems, and, mainly, the patient's malocclusion. The first treatment options for oral rehabilitation, when early tooth loss occurs, are the installation of implants and/or the creation of prostheses: PPR, fixed or total. However, implants are expensive and prostheses cause discomfort to the patient, in addition to having additional costs with laboratory steps, thus leading to the disadvantage of these procedures.

Implants do not They can be performed on young patients who are in the growth phase, since the implant is a piece that needs to be completely fixed and, as the patient in the growth phase undergoes changes in the bones of his/her face, the implant will not accompany this development, which is already an advantage for autotransplantation, since it will maintain the viability of the periodontal ligament and the preservation of the alveolar bone, in addition to being low cost and helping in functional rehabilitation.

The transplant is performed either by a prepared alveolus or by an existing one that was occupied by the compromised and/or lost tooth. In the case of congenital missing teeth, it will be necessary to make a new alveolus according to the appropriate dimensions of the tooth that will be transplanted; these dimensions are obtained through radiographic examinations.

According to Jodas et al. (2012), the procedure is contraindicated for patients under 12 years of age, due to the root development of the donor tooth, which at this time will be even larger than that of the area that will receive it.

The donor must be in excellent condition, both systemic and in terms of oral health. He/she must be cooperative with the guidelines given by the dentist before and after surgery and be available for periodic monitoring.

Third molars are an excellent option for transplantation because they develop later than other teeth, with their apex open until approximately 18 years of age, and extraction is still commonly indicated.

Tsukiboshi (2002) believes that if the donor's teeth are at a level above the Nolla stage, the long root will protect the transplant if root development does not occur postoperatively.

For a successful transplant when the donor tooth has a fully formed root, endodontic treatment will be necessary.



If the transplant is performed with a tooth whose rhizogenesis is complete, all periodontal tissues of ectomesenchymal ontogenic origin must be preserved, and they must be taken along with the root of the tooth that will be transplanted.

The transplanted tooth with complete histogenesis has more fibrous and dense tissues compared to teeth with incomplete histogenesis. When the tooth pulp has its nerves and vessels ruptured, it is only possible to reconnect them through plasma imbibition, since fluids do not permeate the intimacy of mature tissues, only through capillarity and humidification.

If a tooth with incomplete rhizogenesis is chosen, which will favor pulp revascularization, success will also depend on the preservation of all periodontal tissues especially the dental follicle present in the apical and middle portion of the root that is in full formation.

When the biological principles of preserving periodontal and follicular tissues are respected, the tooth will present root structures like a non-transplanted tooth.

For reimplantation and transplantation to have any chance of success, it is essential to maintain the viability of the periodontal ligament (John Hunter, 1778). The tooth germ must have at least one-third of complete root formation for the new alveolus to be stable (Andreasen JO, 1994).

One of the problems with dental transplantation is the meticulous preparation of the alveolus to receive the donor tooth in a short period, preventing cell death on the root surface. First, most teeth were extracted and then used as a mold to prepare the recipient alveolus, which resulted in the tooth remaining outside the oral cavity for extra time, resulting in damage to the root cells of the donor tooth, increasing the chance of failure in the procedure.

Based on this, studies were developed that highlighted that a duplicate tooth model that has exactly the same shape and size as the donor tooth can be obtained, and the recipient bone cavity can be prepared using this tooth model even before extraction, which can avoid complications resulting from several attempts with the real donor tooth.

The journal Restor Dente Endod. (2012) conducted studies and wrote a case report using the computer-assisted rapid prototyping (CARP) technique, which was first used in mechanical engineering with the aim of assembling designed products before their actual manufacture.



This technique has been attracting a lot of attention, especially in oral and maxillofacial surgeries, so that a simulation of the result of orthognathic surgery can be produced.

## PRE-OPERATIVE

First, an anamnesis must be performed; laboratory tests must be requested to help determine whether the patient is fit to undergo dental transplantation and detailed planning must be carried out.

The dentist must request some imaging tests such as panoramic radiography, and periapical radiographs of the tooth that will be transplanted. i to be transplanted and the recipient alveolus, occlusal radiography, or computed tomography. The radiographs should analyze the stage of root formation, conditions of the alveolus that will receive the healthy tooth, mesiodistal diameter, and whether there is any pathology in the surgical sites.

All information from the pre-, surgery, and post-operative periods and the ICF must be provided so that the patient and/or guardian are aware of any risk that may occur during the treatment. This information must be documented and must contain language that is easy to understand and all information must be detailed.

The patient must be aware that during the transplant, the transplanted tooth may be lost if the necessary care is not taken at the time of transplantation, pulp necrosis, ankylosis, and bone resorption.

Dental transplant surgery is contraindicated in patients who have periodontal lesions or endodontic lesions in the donor tooth; teeth that are larger than the area that will receive it; when they are in a Nolla stage lower than 7; impossibility of stabilizing the tooth in the recipient bed; when it is necessary to perform odontosection to extract the donor tooth. To continue with the transplant idea, treatment of the present infections must be carried out.

When the tooth to be transplanted is below Nolla stage 7, there may be compromise in the development of the root, causing failure in the maturation process.

## SURGERY

The extraction of both the affected tooth and the donor's tooth must be as non-traumatic as possible, and the area that will receive the transplanted tooth must be free



of periodontal disease, must contain a significant amount of bone in all dimensions and keratinized tissue suitable for stabilizing the tooth so that the autotransplantation can be successful.

There are two ways to perform an autologous tooth transplant: either through the conventional/immediate technique, which consists of performing the transplant in a single stage, preparing the alveolus and extracting it all in a single session, or through the mediate/delayed technique, which is performed in two stages: in the first stage, the alveolus that will receive the healthy tooth is prepared. After approximately 14 days, the second part is completed, performing the extraction and finally the transplantation to the recipient's alveolus.

Marzola C, (1994) and Zambrano et al., (2002) believe that the less the tooth remains outside the alveolus, the greater the chance of success in the transplant, since there is a greater possibility of pulp revascularization in teeth that have an open apex.

The transplanted tooth takes several long hours to reconnect to the blood circulation. During this period, plasmatic imbibition occurs, which is when tissue and plasma fluid leaks out at the site where the transplant took place, at the future interface of contact with the transplanted tooth, since the fluids present on the surface of the recipient site contain ions, amino acids, peptides and various cellular mediators that will nourish and stimulate proliferative and reparative phenomena so that vascular and neural connections are re-established.

The surgical procedure begins with asepsis of the surgical field in the extraoral region, and then the nerves related to the site where the extraction will be performed are blocked. An incision is usually made with a scalpel blade for a flap so that there is a better view of the surgical field. The tooth that will be transplanted is extracted, taking the utmost care possible to avoid any trauma, and then curettage, cleaning of the site, and suturing are performed. While the recipient alveolus is being prepared, the donor tooth should remain in a tank with saline solution. A tooth extraction should be performed with the aid of a straight extractor, using a screw action on the crown of the tooth, avoiding contact with the root of the tooth as much as possible (Marzola, 1988; Marzola and König Jr., 1993).

The dental follicle should be kept in place like a collar, in order to obtain better healing of the transplanted tooth. Ideal contact of the donor tooth with the recipient area can improve the success rate of the transplant, which will improve the level of blood



supply and nutrients to the LP cells.

In the recipient alveolus, after extraction of the compromised tooth, the site is inspected and cleaned with saline solution. In cases where the dimensions of the tooth to be transplanted are not proportional to the dimensions of the alveolus, the alveolus is prepared with the aid of drills to receive the healthy tooth.

Marzola, 1988; Andreassen, (1992), suggests that the tooth be carefully placed in the prepared alveolus and that care be taken to maintain the occlusion 2 mm below the occlusion line.

After the final positioning of the tooth in the alveolus, a retainer is made to assist in the placement. The retainer is used for the healing process and should remain in place for a period of 90 to 120 days. The retainer can be made with 2-0 steel wire or 0.7 mm orthodontic wire and secured with composite resin in the vestibular region of the transplanted tooth and at least one neighboring tooth on each side. The retainer should be removed in ninety days, the time required for the alveolar process to heal, as suggested in research (Sebben G, et al., 2004). 2.3 POST-OPERATIVE PERIOD (Silveira-Beltrão et al. 1998) advise that in the postoperative period, the patient should take the prescribed medication correctly, apply ice packs to the surgical area, avoid physical exertion for five days, not rinse their mouth for three days, do not smoke for 48 hours, follow a soft and/or liquid diet, sleep with a higher pillow, brush your teeth normally and especially the surgical site, with great care. To ensure greater postoperative comfort and avoid the risk of infections, the patient should also be instructed to take the medications prescribed by the dentist, which are: Analgesic – Dipyron 1g every six hours; Non-steroidal anti-inflammatory – Nimesulide 100mg every twelve hours; and Chlorhexidine Digluconate 0.12% twice a day for ten days.

To monitor the patient's postoperative condition, radiographic exams should be performed for better observation. Consultations should be performed daily for one week; one month; three months; and six months; and then consultations should be performed every six months for a period of three to ten years.

Mobility, pulp vitality, and periodontal probing tests should be performed. A positive pulp sensitivity test indicates that there has been revascularization and reinsertion of the periapical fibers. If the LP is affected during surgery, root resorption and ankylosis of the transplanted tooth will often be observed. If there is mobility, the organism is probably rejecting the transplant.



The response to tooth sensitivity may be negative in the third month, as it normally takes seven months for root development to be observed.

Transplanted teeth can receive all orthodontic and aesthetic treatments in the same way as a non-transplanted tooth, as they can also undergo induced movements. In some cases, the transplant can be planned together with orthodontic treatment when the patient has negative cephalometry and/or other factors that lead to indications for premolar extraction.

## DISCUSSION

These transplants have been performed for over 40 years in Scandinavian countries, allowing a high success rate in the population of these countries, being routine procedures with well-established protocols in dental services (Santos et al., 2013). In Brazil, Clovis Marzola stood out for his technical and scientific production on dental transplants (Kumar et al. 2012 Yoshino et al. 2012; Santos et al., 2013).

There are currently two distinct surgical techniques, when the surgery is performed in a single session and the tooth is transplanted in a period of more than four hours after removal, which is the classic technique. The composite technique is performed in two sessions with an interval of 15 days, wherein in the first session the recipient alveolus is prepared to receive the transplanted tooth in a second session (Costa et al. 2013).

Marzola (1997) prioritizes that dental transplants be performed in just one stage, due to blood support.

The success rate of dental transplants is lower than the results obtained with implant-supported prostheses, but the socioeconomic factor can be decisive in the therapeutic choice. (Kumar et. al., 2012).

Silva et al<sup>2</sup> (2013) report that during tooth extraction, the neurovascular bundle may rupture in teeth with developed roots, impairing possible pulp revascularization, resulting in necrosis, requiring endodontic treatment, which should be performed 15 days after the transplant. Nagori et al (2014) state that performing endodontic treatment after the transplant is ideal since early intervention could damage the periodontium that is regenerating, while late treatment risks bacterial infection of the necrotic pulp, initiating reabsorption. According to Pogrel (1987), most cases recommend a semi-rigid retainer for 7 to 10 days, reducing the chances of bone reabsorption or ankylosis, and



allowing functional movement of the tooth and bone repair in the region. Sebben G. et al., 2004 report that according to research, retention should be removed in ninety days, the time required for the healing of the alveolar process.

Through studies carried out by (Yoshino et al., 2013) the most common complications are: loss of graft insertion (54.9%), followed by root resorption (26.5%), caries (4%) root fracture (2.9%), and others (11.8%), including failure in initial healing.

Ribeiro et al., 2019 say that Women have higher success rates in TAD, as they are more cooperative in dental treatments and demonstrate better oral hygiene habits.

According to the study based on literature reviews, it is believed that it is preferable for the tooth to be transplanted to still have incomplete rhizogenesis so that it can be completed within the recipient bed itself.

(Gomes et al. 2001) indicate that this type of procedure should be performed under general anesthesia, as they consider it an invasive and traumatic procedure for the patient. (Ziegler, S and Neukan, F. W. 2012) (Mejère, B; Wannfors, K; Jansson, L., 2004) state that patients can undergo surgery without the risks and costs of general anesthesia, agreeing with most authors who perform dental transplants using only local anesthesia.

The success of autotransplantation can also be influenced by the patient's age, development, anatomy and conditions of the donor tooth, and the surgical technique used. (Kallu R, et al., 2005).

## **CONCLUSION**

Based on the literature review, it is concluded that dental transplantation is a low-cost oral rehabilitation option, in order to avoid wear of adjacent teeth for the use of fixed prosthesis. Orthodontic movements can be performed to maintain alveolar bone structure and recover the space of the lost tooth.

Transplantation can be classified according to the donor/recipient relationship and also according to the level of root formation. It is understood that the best stage for performing the transplant would be with two-thirds to three-quarters of the root formed, because when involving teeth with less than two-thirds of formation, there may be a compromise of the root and impair the maturation process.

For dental transplantation to be successful, the patient's cooperation is necessary for relation to oral hygiene and other pre- and post-operative care.



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