



# Dental Auto Transplantation: A Promising Treatment for Public Health System

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## Abstract

**Introduction:** Tooth autotransplantation is a biological and innovative technique for the rehabilitation of compromised or missing teeth. It involves the surgical repositioning of healthy teeth in the dental arch to restore the functions of the stomatognathic system. Despite being a promising technique, few professionals have performed dental autotransplantation in clinical practice.

**Aim:** To review the literature and evaluate the clinical success rate and factors associated with the technique of dental autotransplantation, focusing on its application especially in the Brazilian public health system.

**Methods:** Articles were searched in PubMed (Medline), Scielo and Google Scholar databases for a period of 10 years (2012-2022) by two independent authors. Clinical studies and case series about dental autotransplantation presenting more than 10 patients older than eight years, and a follow-up longer than one year were included.

**Results:** A total of 320 articles were eligible for inclusion, of which 57 were selected for full-text evaluation. Fifteen articles were included in this review. A total of 1048 patients were reported in the articles, with an age range of 8 to 58 years and a follow-up of 1 to 29 years. The mean success rate was 86.79%. Molars were the most commonly used teeth for autotransplantation.

**Conclusion:** Dental autotransplantation has high success rates and proves to be an excellent, low-cost therapeutic option that should be promoted in clinical practice, especially in the public service.

**Keywords:** Autogenous Tooth Transplantation; Autologous Tooth Transplantation; Dental Autotransplantation; Public System; Treatment

## Introduction

Dental autotransplantation is the surgical repositioning of a vital tooth from its original location in the alveolar bone to another site of the missing teeth [1]. The absence of dental elements causes an imbalance in the stomatognathic system, affecting chewing, phonation, tissue support and aesthetics [2]. The main causes of tooth loss are carious lesions and their progression to periapical pathologies, dental trauma,

and agenesis [3]. Therefore, dental autotransplantation has emerged as a promising rehabilitation technique [4]. Nevertheless, this procedure is uncommon, and few professionals have performed dental autotransplantation in clinical practice, especially in the public health system in Brazil.

Prosthetic treatment is the most common rehabilitation procedure in the Brazilian public health system. [5]. However,

it may require a large number of appointments, higher costs for the public system, and a risk of prosthetic maladjustment [6]. In addition, some oral lesions may be associated with the use of prostheses, such as inflammatory fibrous hyperplasia and ulceration, which may lead to the abandonment of the use of dentures [7]. Thus, tooth autotransplantation is a lower-cost procedure compared to conventional rehabilitation treatment, and it may increase patient compliance [8].

The surgical technique of dental autotransplantation is influenced by several factors, such as the stage of root development, tooth morphology, extraoral time, vascularization of the recipient site in the alveolar bone, and the vitality of the periodontal ligament cells [9]. Non-manipulation of the roots and preservation of the alveolar bone must be ensured [10]. Thus, clinical knowledge of the technique of dental autotransplantation, the factors associated with the success of the procedure, and its indications will improve its benefits in-patient rehabilitation and encourage the practice of this technique in the public health system.

## Methodology

The literature search was performed in the PubMed (Medline), Scielo and Google Scholar databases, for a period of 10 years (2012-2022) by two independent authors. The following descriptors were used: "tooth

transplantation", "dental autotransplantation", "autogenous tooth transplantation", "young caries", "successful tooth transplantation", "dental transplantation", "public health", "dental transplant", "autotransplant". The Boolean operators "AND" and "OR" were used as a search strategies.

The titles and abstracts of all the articles retrieved by the electronic search were independently assessed by 2 authors (JFO and SPC). The full texts of all the articles were obtained to determine study eligibility. Clinical studies, case reports and retrospective studies were included considering

- Articles in English and Portuguese on dental auto transplantation
- With more than 10 patients
- Patients older than eight years
- A follow-up longer than one year
- Showing success rates based on clinical-radiographic data.

Studies with incomplete clinical radiographic data were excluded from this review.

## Results

A total of 320 articles on dental autotransplantation were identified. After screening the titles and abstracts, 57 studies were selected. The full text reading excluded 42 publications. Fifteen articles were included in this review, comprising 13 were case series and 2 clinical studies.

Author	Type of Study n (%)	Number of Patients	Age Range (Years)	Type of Teeth	Follow-up Mean (range)	Success Rate (%)
Total n=15	Case series 13 (87%) Clinical studies 2 (13%)	1048	8 to 58	I, C, PM, M	10.45 (1.44 to 29)	86.79 (68.2 to 100)
Mendoza, et al. 2012	Case series	12	9 to 13	P	14	80
Yoshino, et al. 2013	Case series	35	24 to 79	P	20	72.7
Tsukiboshi, 2014	Case series	11	10 to 18	I	9	85.3
Jang Y, et al. 2015 [11]	Case series	96	45*	I, PM and M completely formed roots	12	68.2
Kokai, et al. 2015	Case series	89	29*	I, C, PM, M	5.8	93
Gilijamse M, et al. 2016 [12]	Case series	46	9 to 18	I, C, PM, M	1.44	94
Tang H, et al. 2017 [13]	Clinical study	23	18 to 42	M	8	100
Yu HJ, et al. 2017 [14]	Case series	60	19 to 55	M	9.9	93.1
Jakobsen C, et al. 2018 [15]	Case series	66	8 to 14	PM	10.1	95

Yang S, 2019 [16]	Case series	82	13 to 51	PM and M	10	74
Abela S, et al. 2019 [17]	Case series	314	10 to 58	C, PM and M	29	88
Westerveld KJHV, et al. 2019 [18]	Clinical study	51	9 to 23	PM and M	9.7	95.4
Raabe, et al. 2021	Case series	32	8 to 25	PM and M	3.4	91.4
Boschini L, 2020 [19]	Case series	20	20 to 41	M	11.9	80
Lucas-Taule E, et al. 2021 [20]	Case series	36	10 to 61	M	2.45	91.7

**Table 1:** Clinical data of the articles included in this study.

- I: Incisors
- C: Canines
- PM: Premolars
- M: Molars

\*Mean age reported in the studies.

Table 1 shows the number of patients, age, type of tooth autotransplanted, and follow-up and success rate of the 15 studies. The total number of cases evaluated was 1048 patients, ranging in age from 8 to 58 years. Studies of autologous tooth transplantation in patients younger than 23 years-old showed the highest success rate (>95%). The success rate ranged from 68.2% to 100%, with mean of 86.79%. The mean follow-up was 10.45 years, ranging from 1 to 29 years. Among the studies, a greater predilection for molars was observed in autotransplantation procedures. Most of the patients analyzed were reported in case series (87%), and 13% were reported clinical studies (13%).

## Discussion

The study of the criteria for performing dental autotransplantation is essential to increase the success rate. The surgical protocol was first established in the early 1950, when decayed first molars were replaced by third molars [21]. Tooth extraction must be atraumatic with preservation of the periodontal ligament and immediate tooth donor placement in the alveolar socket. The extraoral time of the transplanted tooth should be minimal [9]. As a simple technique, Jakobsen C, et al. [15] report that even inexperienced dental surgeons can perform dental autotransplantation. However, it is known that the criteria involved in dental autotransplantation contribute to an effective and improved success rate [22].

In the present study, the success rates ranged from 68.2% to 100% [11]. Tang H, et al. [13] suggested that the high success rate was related to some factors, including strict

selection of both the teeth and the recipient alveolar socket, protection of the periodontal ligament of the transplanted tooth, and control of oral hygiene. Although Jang Y, et al. [11] showed the lowest rate, the authors compared different extra oral time, tooth type, ankylosis, and root resorption. Age is a factor that has been highlighted as significant in the success of tooth autotransplantation [19]. Jang Y, et al. [11] reported that patients aged less than 45 years and extraoral surgical time less than 15 minutes were associated with a significantly better prognosis compared to their counterparts. Completely formed roots in older patients have shown a reduced potential for periodontal ligament regeneration [16], which explains the higher failure rate in this group. In addition, Yang S, et al. [16] attributed the success to the combination of strict criteria including early stages of rhizogenesis and postoperative stability. Therefore, studies analyzing the procedure of tooth autotransplantation in younger patients and using an atraumatic technique show better prognosis.

Clinical and radiographic follow-up is essential to prevent complications of dental autotransplantation. Abela S, et al. [17] reported a follow-up of more than 15 years and showed a success rate of 88% of teeth with completely formed roots. Similarly, Tang H, et al. [13] results indicated 100% of success rate of endodontically treated teeth in an 8-year follow-up. Root canal treatment should be considered in clinical planning when transplanting teeth with complete rhizogenesis [19], Lucas-Taule E, et al. [20] suggest that further investigation and additional research should be conducted to explain the long-term stability of repositioned teeth.

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The third molar has been shown to be a good choice for transplantation in partially edentulous adult patients, especially when the procedure is performed immediately after removal of the damaged tooth. Yu HJ, et al. [14] showed a 93.1% success rate for third molar autotransplantation in a 10-year follow-up. The use of this tooth type is favorable due to the common indication for its extraction. Lucas-Taule E, et al. [20] suggests that third molar transplantation is a predictable treatment for replacement of teeth with poor prognosis in young patients. In contrast to conventional dental implants rehabilitation, Westerveld KJHV, et al. [18] highlighted the success in 95.4% of autotransplanted patients and showed that this technique offers advantages over dental implants, such as physiological connection, bone regeneration, periodontal stimulation, and the possibility of orthodontic treatment. Gilijamse M, et al. [12] showed bone development in the recipient bed in 94% of cases. Furthermore, Boschini L, et al. [19] also emphasize that the total cost is lower than dental implants and prosthetic rehabilitation.

The present review found that most of the dental autotransplantation is from Japan, Korea and China [23]. In Brazil, this procedure is uncommon, although it is included in public system documents, such as Oral Health in the Unified Health System (2018) [24]. Nevertheless, autogenous tooth transplantation is not widespread among the treatments offered in public dental services, clinical studies have shown high rehabilitative success [25]. Tooth autotransplantation is promising for its effects on the physical and social aspects of patient care [26]. This procedure can be considered a good therapeutic option, especially in the public health system, where most of the young Brazilian population is treated. Thus, this procedure becomes accessible to economically disadvantaged population and offers treatment with high success rates. On the other hand, dental implant is an interesting treatment option, especially in private services. However, it is essential to consider its high cost for both the public and private sectors. Thus, the patient's income level is a limiting factor in access to specialized dental services [27]. In addition, longitudinal clinical studies are needed to analyze the cost-effectiveness of tooth autotransplantation and the impact on low-income patients in public health services.

## Conclusion

Tooth autotransplantation seems to be a viable treatment option for replacing missing and damaged teeth. Its high success rates are attributed to the patient's age, the use of a atraumatic technique for preserving periodontal tissues and follow-up. As it is a simple and biological technique, tooth autogenous transplantation is a low-cost option that must be encouraged in public health system.

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