



Autogenous Dental Transplantation as a Rehabilitating Option: Integrative Review

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Abstract

Autogenous dental transplantation is offered as a viable option for replacing teeth that have been lost using matched donor teeth in good condition. This technique has a high success rate due to the good functional and aesthetic result for the rehabilitation of patients when replacing the lost tooth with a natural tooth instead of a prosthesis or an Osseo integrated implant, thus minimizing more invasive methods. This work aims to report, through the analysis of the current literature, the possibilities of using autogenous dental transplants as an option for oral rehabilitation. The following databases were used: BVS, Lilacs, BBO- Dentistry and PubMed, including articles in English and Portuguese, published in the last 5 years, as well as publications that respected the delimitation of the theme and the objective of the study. The results highlighted fundamental points such as indications, advantages, preoperative procedures, postoperative practices, clinical and radiographic follow-up, and complications that may arise after the dental transplant is performed. Thus, it is concluded that autogenous dental transplantation appears as a good therapeutic option for oral rehabilitation, when the patient has an available tooth donor, treatment costs and surgical time.

Keywords: Dental Auto Transplantation; Autogenous; Oral Rehabilitation

Introduction

Autogenous dental transplantation has been successfully used in dentistry since 1950, when the first papers were published on the subject [1]. It consists of a treatment used to replace dental elements that were extracted due to cases of impacted teeth, dental agenesis, or premature loss of teeth due to trauma, caries, or periodontal disease [1,2].

Treatments for rehabilitation of tooth loss most used in dentistry are Osseo integrated implants, removable, fixed, or total prostheses [3]. Thus, dental transplantation is generally used as an alternative method when prosthetic treatment is unfeasible for several reasons, including socioeconomic [4].

In addition to being low cost, autogenous dental transplantation has the advantage of being performed in patients in the growth phase, thus maintaining the viability of the periodontal ligament, proprioception, and preservation of the alveolar bone [3]. However, for the success of the procedure it is essential that the patient is in good general health, the element to be transplanted must be compatible with the size of the alveolus, the recipient site must not have periodontal and periapical diseases, as well as have sufficient alveolar bone support in all dimensions, with an amount of tissue keratinized to allow the stabilization of the transplanted tooth [5,6]. In addition, it is necessary that the extraction of the condemned tooth is performed a traumatically and that the donor dental element has partially developed roots [7].

The imaging exam is essential for the selection and indication of surgery (local indications and contraindications that cannot be identified during the clinical examination), it is generally used to measure the receptor alveolus in relation to the size of the tooth germ [8].

The procedure is more successful when the tooth presents incomplete dental rhizogenesis, due to revascularization of the tooth germ pulp, a higher success rate is observed when the patient is approximately 17 years old. This technique can also be performed well in teeth with complete rhizogenesis when combined with endodontic treatment, showing efficacy in the treatment [9,10].

This article aims to demonstrate, through a literature review, the aspects related to autogenous dental transplantation, as a therapeutic alternative for the rehabilitation of patients.

Methods

This is a study with a qualitative approach, carried out through an integrative literature review, which allows the identification, synthesis, and performance of an extended analysis of the literature, about a specific theme [11].

For the elaboration of this study, the following steps were used: definition of the theme and elaboration of the research question; elaboration of the eligibility, inclusion, and exclusion criteria of the studies; survey of publications in databases; categorization and analysis of information found in publications; evaluation of selected studies; presentation of results, including critical analysis of the findings and synthesis of the review [12].

To direct this review, the following question was outlined: "What is the scientific knowledge produced in the literature on autogenous dental transplantation as an oral rehabilitation agent?"

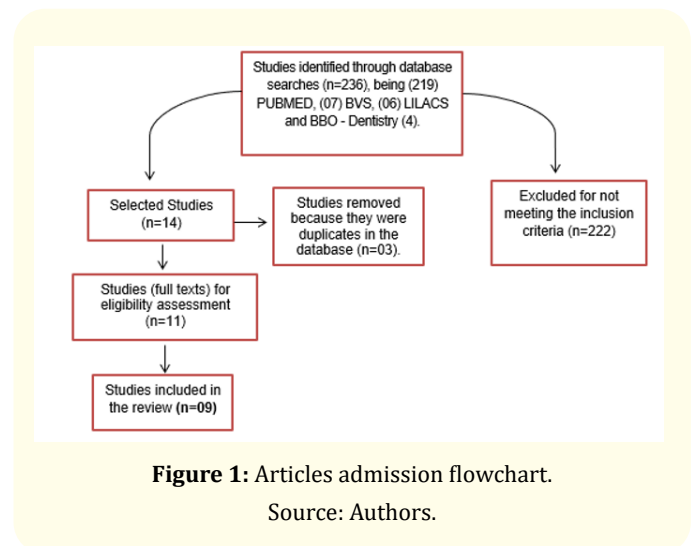
To survey the articles in the literature, searches were performed in the following databases: Latin American and Caribbean Literature on Health Sciences (LILACS), Virtual Health Library (BVS), PubMed and Brazilian Bibliography of Dentistry (BBO). The following Health Sciences Descriptors (DeCS) were used to search for articles: "Surgery, oral" and "Transplantation" and "Tooth" from which 9 articles were selected.

The inclusion criteria defined for the selection of articles were full articles fully available in the listed databases, articles published

in Portuguese and English, between 2016 and 2021. Publications that did not respect the delimitation of the theme and the purpose of the study were excluded, abstracts repeated within the database itself, as well as those repeated in both bases, were also eliminated. In total, 9 articles were selected for full reading.

Results

The search resulted in 07 publications in the BVS database, 6 publications in the LILACS database, 219 publications in the PubMed database and 4 publications in the BBO-Odontologia, totaling 236 publications. Abstracts repeated between databases were excluded. After reading the titles and abstracts with application of the inclusion criteria, 11 articles remained that were read in full. After reading and final analysis of the manuscripts, only 9 articles remained in the final selection (Figure 1).



To systematize the data from these articles, a collection instrument called the synoptic table was used, adapted from Garuzi, *et al.* 11 (2017) including: study title, authors' names, year of publication, country of origin, objectives, and the main findings (Table 1). Some important characteristics for the success of dental auto transplantation were also selected in the articles, such as indications, advantages, preoperative procedures, postoperative practices, clinical and radiographic follow-up, and postoperative complications (Table 2).

Title	Authors (Year)/ country	Objective	Main Findings
Auto transplantation of a mature mandibular third molar as alternative to dental implant placement: Case report [13].	Tagliatesta, <i>et al.</i> (2021)/ Italy	Describe a case report regarding the surgical management of a dental auto transplant.	An 18-year-old patient presents the lower left first molar (36) involved in a caries process. A radiological analysis showed an immature left lower third molar (38), suitable as a donor tooth. The mandibular first molar was extracted a traumatically. Through alveoloplasty and enamelplasty, it was possible to adapt element 38 to the new alveolus.
Third Molar Auto transplantation: An Alternative to Dental Implant - 9 Years Follow up of a Case [6].	Kumar, <i>et al.</i> (2020)/Índia	To analyze, through a case report, the success of auto transplantation from the third molar to the first molar, with follow-up for 9 years.	A 19-year-old patient reported a chief complaint of pain in the left mandible. The oral examination revealed that tooth 36 was deteriorated and that tooth 38 was vertically impacted. The transplantation of tooth 38 was proposed as a treatment in place of the extracted 36.
Auto transplantation of Impacted Third Molar Using 3D Printing Technology: A Case Report [14].	Kamio; Kato. (2019)/Japan	Describe in a case report the success of auto transplantation of a horizontally impacted mandibular third molar, using a three-dimensional model as a diagnosis (3D).	A 27-year-old healthy woman went to the hospital for conservative treatment of tooth 37. It was concluded that for the treatment it was necessary to extract element 38, which was horizontally impacted. The possibility of transplanting tooth 38 to replace 37 using images from 3D models and cone beam computed tomography were extremely useful for analyzing the morphology of the transplanted tooth and its surrounding anatomical structures.
Autogenous dental transplantation [15].	Aquino, <i>et al.</i> (2019)/Brazil	To report a clinical case of autogenous dental transplantation from an upper third molar to a lower first molar with an indication for extraction.	Female patient, 17 years old, with no history of systemic disease, reported toothache. The intraoral physical examination revealed a carious lesion in tooth 26, and tooth 28 semi-enclosed, making it a therapeutic option for this case. Autogenous dental transplantation from tooth 28 to the alveolus of tooth 26 proved to be effective.
Autogenous dental transplantation as an alternative to oral rehabilitation [16].	da Silva Fonseca, <i>et al.</i> (2019) /Brazil	Report a clinical case of autogenous dental transplantation, describing the surgical steps.	A 16-year-old male patient underwent transplantation of the mandibular third molar into the alveolus of the mandibular first molar, which presented eruption involvement due to advanced root laceration. The extraction took place through the envelope incision technique, followed by containment with suture thread.
Autogenous dental transplantation: literature review and clinical case report [17].	Warmeling, <i>et al.</i> (2019)/ Brazil	Report a clinical case of dental transplantation, with avulsion of the tooth from its place of origin to another alveolus.	Male patient, 18 years old, normosystemic, sought care with caries in tooth 26. For the transplant, the size 28 was used, which was compatible with the recipient site and incomplete rhizogenesis. After 8 months of transplantation, the tooth was in good periodontal condition.
Two-stage technique in third molar autotransplantation: case report [18].	Pinto Júnior, <i>et al.</i> (2018)/ Brazil	Report a clinical case of dental auto transplantation with a 3-year follow-up.	Patient G.S.V, a 17-year-old female, melanoderma, presented extensive coronary destruction of tooth 16, and the presence of impacted teeth (18, 28, 38 and 48). Tooth 16 was extracted and element 28 was chosen to be transplanted, as its dimensions were compatible with those of the recipient bed. Finally, the patient demonstrated to be satisfied with the esthetic results obtained.

Autologous tooth transplant performed on the same patient at different stages of development [19].	Resende, <i>et al.</i> (2017)/Brazil	Report two cases of autogenous dental transplants, performed on the same patient, in different periods of life.	Patient A.C.F., male, 15 years old, was referred for extraction of tooth no. 46, which presented great coronary destruction. Through radiographic examination, the presence of element 48 was observed. As treatment, extraction of element No. 46 and immediate auto transplantation of element No. 48 was performed. After 2 years and 6 months of control, the patient returned for a new dental transplant, this time for dental element No. 16, which presented with great coronary destruction. On clinical examination, a supernumerary included element was observed between dental elements No. 44 and 45, after the radiographic examination it was contacted that this element presented the requirement for transplantation.
Auto-transplantation: An Alternative Treatment [20].	Asif; Noorani; Alam. (2017)/Malásia	Demonstrate through a case report a surgical technique for tooth auto transplantation, using virtually planned 3D printers.	An 18-year-old male patient underwent auto transplantation of the lower right third molar to replace a right second molar. This procedure was based on implant surgery methods guided by overlaying DICOM files and 3D jaw datasets. The transplanted tooth was placed in infraocclusion and fixed with a splint. The intervention took place through pre-planned virtual transplants with guided osteotomies.

Table 1: Presentation of the characteristics of the articles included in the Integrative Review.

Title	Indications for dental transplantation	Preoperative procedures	Preoperative procedures	Clinical-radiographic follow-up	Advantages	Complications
Auto transplantation of a mature mandibular third molar as alternative to dental implant placement: Case report [13].	Mandibular left first molar (36) involved in a caries process.	Mandibular left first molar (36) involved in a caries process. The patient's oral hygiene was performed. In addition, prophylaxis with 2 g of amoxicillin + clavulanic acid was performed.	Antibiotic and antiseptic therapy was prescribed after surgery.	Six months later, on radiographic examination, the tooth showed a normal radial contour.	The surgery was successful due to the atraumatic surgical technique.	There were no complications.
Third Molar Auto transplantation: An Alternative to Dental Implant - 9 Years Follow up of a Case [6].	Tooth 36 involved in caries process.	Before surgery, an oral rinse was performed with 0.02% chlorhexidine and then local anesthesia was obtained.	Immediately the transplanted tooth was stabilized with splints and the occlusion was adjusted.	Clinical and radiographic evaluation did not show any complications.	It presented good functional and esthetic results.	There were no complications.
Auto transplantation of Impacted Third Molar Using 3D Printing Technology: A Case Report [14].	Tooth 37 had a C-shaped root canal and compressive root resorption because the crown of the lower left third molar was impacted.	Local anesthesia was performed (2% lidocaine with 1:100,000 epinephrine). In addition, 3D printer and computed tomography were used.	The root canal was filled, and the occlusal surface was restored with composite resin.	On radiographic images, no significant findings were observed around the root of the tooth or in the surrounding bone.	The patient was able to chew without pain, and no abnormalities were detected on the intraoral radiographs.	There were no complications.

Autogenous dental transplantation [15].	There was a carious lesion in tooth 26, with extensive coronary destruction.	Local anesthesia was performed with 1 anesthetic cartridge of 2% mepivacaine with adrenaline 1:100,000.	Drug therapy was instituted through 500 mg amoxicillin, 100 mg nimesulide and 500 mg sodium dipyron.	On radiography, it was possible to observe bone neoformation in the alveolus.	Autogenous dental transplantation proved to be effective, as it provided functional, aesthetic, and economic rehabilitation	After 7 days, the patient returned with the fractured retainer. Therefore, a new containment was carried out
Autogenous dental transplantation as an alternative to oral rehabilitation [16].	Element 46 included in buccolingual position and probable root tear.	Extraoral physical examination was performed. For anesthesia, a regional blockade of the buccal, lingual, and inferior alveolar nerves was performed using as anesthetic Mepivacaine HCL 2% with Epinephrine 1:100 000.	Antibiotic, analgesic and rinsing solution (chlorhexidine gluconate) were prescribed. The patient was instructed to maintain good hygiene and ingest liquid or pasty food.	Pulp vitality tests, mobility assessment, probing examination and radiographic examination were performed, which suggested the continuation of rhizogenesis in the receiving bed.	Low cost and biologically viable therapy in cases of oral rehabilitation.	There were no complications.
Autogenous dental transplantation: literature review and clinical case report [17].	Presence of extensive caries on tooth 26.	Computed tomography was requested. In addition, infiltrative anesthesia with 4% Articaine and 1:100,000 epinephrine was used.	Postoperatively, Amoxicillin 500 mg, Ibuprofen 600 mg, Paracetamol 500 mg and 0.12% Chlorhexidine gluconate were prescribed.	The periodontal tissue tomography showed no changes, and the pulp sensitivity test was performed, with a positive response.	Cost reduction compared to implants or fixed prostheses, in addition to recovering lost tooth space.	There were no complications.
Two-stage technique in third molar auto transplantation: case report [18].	Painful symptoms, edema, presence of fistula on the vestibular surface of the root remnant of the tooth 16.	Anamnesis was performed and then local anesthesia.	The patient was reassessed through clinical examination, seven days after the surgical intervention.	Clinical examination showed healing of the surgical bed and grade III mobility. In the radiographic evaluation, the maintenance of the infraocclusal position was observed.	Greater practicality and lower cost, since it uses a patient's own organ, restoring function and esthetics.	Grade III mobility and Periodontal Disease of 3.0 mm associated with slight bleeding, which normalized after 1 year.

Autologous tooth transplant performed on the same patient at different stages of development [19].	It presented great coronary destruction in elements 46 and 16.	Antisepsis was performed with 0.12% chlorhexidine digluconate. Regional anesthetic block was performed using 2% mepivacaine hydrochloride with 1:100,000 epinephrine.	Non-steroidal anti-inflammatory drug (100 mg Nimesulide and peripherally acting analgesic (Dipyrone 1 g) was prescribed, in addition to the use of 0.12% chlorhexidine gluconate (Periogard).	It was possible to assess that the element did not present mobility and evidence of infection. In addition, no changes to the radiographic examination were observed.	This technique was successful, no infections were observed, and dental and facial development was balanced.	There were no complications.
Tooth Auto-transplantation: An Alternative Treatment [10].	Extraction due to horizontal impaction of teeth 37 and 47.	General anesthesia was performed, followed by intra-oral irrigation with 0.2% chlorhexidine, and then Scandonest Special 2% and 2 cartridges (2.2 ml) of adrenaline (1:100,000) were administered.	The patient was instructed to perform daily mouthwashes with 0.12% chlorhexidine gluconate, 3 times a day, for 7 days.	They demonstrated normal physiological tooth mobility and the radiographic results were considered satisfactory.	In the end, the position and level of the transplanted teeth were satisfactory, in addition to being economically viable.	The postoperative period was uneventful.

Table 2: Presentation of the characteristics of the articles included in the Integrative Review.

Discussion

Dental auto transplantation corresponds to the transplantation of the tooth itself removed from the alveolar bone and adjacent tissues to a recipient site [21]. This surgical option has shown through studies to be an effective alternative for the recovery of cases of impacted teeth, dental agenesis, and premature loss of teeth due to trauma, caries, or periodontal disease [16]. Thus, when analyzing the articles, it was found that the process of tooth loss due to caries, impacted and impacted teeth are constant, thus requiring more conservative treatments to replace elements lost.

According to Zuffa, *et al.* [22]. (2017) The success of a case depends on the careful selection of the patient, an atraumatic surgical procedure and good postoperative care. Clinical studies carried out demonstrate that this procedure is an economical, safe, and quick alternative. However, it only presents advantages when combined with a series of factors such as the patient's oral hygiene technique, complete or incomplete root formation, adequate dimensions of the donor tooth and recipient bed, systemic health of the patient and case follow-up [6].

Under this bias, the main advantages described in the literature for the success of dental transplants (DT) are the lower financial value of the surgical procedure, its greater biocompatibility and good fixation of the transplanted element, which according to some authors, such as Rezende, *et al.* [19] (2017), the form of fixation of the transplanted elements must be well executed using different techniques for its accomplishment. Thus, some authors guide the use of the technique with light-curing composite resin with orthodontic bracket or only light-curing composite resin, for this, at least one anterior tooth and one tooth posterior to the transplanted one must be fixed using a steel wire, called rigid fixation or with nylon thread, known as semi-rigid fixation [23]. In this sense, the fixation of the dental element facilitates the oral hygiene process performed by the patient.

Auto transplants can yield profoundly gratifying results for adolescent patients when the donor tooth is adequate and when a qualified surgeon is presented [24]. Thus, most reported cases used individuals aged 15 to 19 years, except for the article by Kamio, Kato [14] (2019) in which the patient was 27 years old, the

choice for younger patients occurs more frequently in third molar extraction, as they are excellent donors. Furthermore, these teeth, when developing relatively late, have an open apex until the patient is approximately 18 years old [7]. Thus, as demonstrated in the case reported by Aquino, *et al.* [15] (2019), the transplant of tooth 28 semi-included and with incomplete rhizogenesis was successful during its execution.

Furthermore, according to the literature, the receiving bed must be free of any previous pathology. In this sense, it was observed that a series of research has contributed to improve the predictability of the clinical results of auto transplantation. The techniques that use Cone Beam Computed Tomography (CBCT) images and 3D models, observed in the studies by Kamio, Kato [14] (2019); Asif, Noorani, Alam [20] (2017), demonstrate to be useful for surgical simulation. The use of 3D models becomes essential for greater reliability and reduces operating time [25].

The imaging exam, as well as the periapical radiography, are represented in the literature as essential for the selection and indication of surgery, mainly to establish the stage of root formation, the mesiodistal diameter of the tooth to be transplanted and the possible pathologies in the surgical site [16].

In addition, the postoperative period has an influence on the outcome of the procedure, as its efficacy has been demonstrated in the cases presented here, the use of antibiotics, as well as an adequate cleaning of the manipulated area, are intended to prevent different types of cross-infection [26]. However, even taking all the precautions of an aseptic surgery, a possible infection can lead to the loss of the dental transplant, causing greater damage to the patient than in cases where only extractions are performed [5].

According to the retrospective study by Yoshino, *et al.* [27] (2013), the most common complications in the postoperative period are: transplant insertion loss (54.9%), followed by root resorption (26.5%), caries (4%), root fracture (2.9%) and others (11.8%), including failure in initial healing. Of the analyzed articles, two presented complications, Aquino, *et al.* [15] (2019) demonstrated in their studies tooth mobility as a disorder that appeared in the postoperative period, in the case report of Pinto Júnior, *et al.* [18] (2018) presented periodontal complications observed through mobility and bleeding, which normalized after 1 year after surgery.

Rios [28] (1993) indicates the endodontic treatment in the post-operative period if there are clinical symptoms of pulp necrosis, periapical inflammatory alterations and progressive internal and/or external resorptions. In the Clinical Case of Tagliatesta, *et al.* [13] (2021) endodontic treatment was required, since, according to the authors, in adult patients, with the apex formed radiographically, it is advisable to perform an intra-oral endodontic treatment before surgery to reduce the length of stay of the extra-oral dental element. In the report by Kamio, Kato [14] (2019), the dental pulp of the transplanted tooth was not vital after 2 months postoperatively, requiring root canal treatment. Resende, *et al.* [19] (2017) also showed that after a period of six months, the pulp vitality test was performed, obtaining a negative result for the transplanted element, when the execution of endodontic treatment of this element was then indicated. Asif, Noorani, Alam [20] (2017) also reported in their clinical case that endodontic treatment was performed to prevent pulp infection.

Through the analyzed literature, it is considered that autogenous dental transplantation was successful in all cases observed, with positive results, such as absence of infections and root resorption, balanced dental and facial development, and maintenance of space [19].

Conclusion

Many therapeutic methods for the rehabilitation of missing dental elements are constantly applied with the aim of restoring the patient's aesthetic and functional characteristics. Autogenous dental transplantation, in addition to having a high success rate, can be considered a viable alternative to replace a tooth with an indication for extraction, through the functional and aesthetic return of the phonetic and masticatory system, and at a reduced cost when compared to other methods of rehabilitation. It is extremely important that the dental surgeon analyzes all the selection criteria for the dental element, as well as using a good surgical technique for a successful procedure.

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