

Case Report

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" Autotransplant with complete root formation"

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Abstract

**Keywords**

Dental autotransplant,  
Third molar and  
splinting.

**Introduction:**

Dental autotransplantation is a useful procedure to reestablish the function of a tooth lost prematurely or due to congenital absence. Its success has increased since the first investigations carried out in the 50s to date; currently with a success rate of 90%.

**Objective:** To describe the evolution of a dental autotransplant with complete rootformation.

**Presentation of the clinical case:** Female patient of 29 years of age, presents tooth 36 with diagnosis of dental caries of 3 °, perforation at the level of the furcation, without possibilities of rehabilitation for which it is indicated that the autotransplant of the dental piece is made 38 to the alveolus of the tooth 36.

**Conclusions:** This is a surgical procedure that has increased its success rate thanks to the research and contribution of different authors; however, it is not considered within the first options, since certain criteria must be taken into account to decide if a patient is a candidate.

## Introduction

Dental autotransplantation is defined as the transfer of a tooth from its alveolus to a post-extraction alveolus or alveolus made surgically, in the same person.<sup>1</sup>All permanent teeth can be transplanted, being crucial the stage of development in which they are.<sup>2</sup>The autotransplant of teeth has evolved to become a treatment option to replace lost teeth.<sup>3</sup>The survival rates of this procedure vary from 74% to 100% as reported by several previous studies.<sup>4</sup>

The loss of dental organs can be due to different circumstances such as extensive caries, fracture of the roots, periodontal disease, trauma, among many other causes. One option to restore the function of the lost tooth is the dental autotransplant, which has considerably increased its success as a treatment since the first investigations carried out in the 50s to date; currently having an average success rate of 90% but there is always the possibility of its failure.

Different studies vary on the stage of development in which the dental organ to be transplanted must be found. Kristerson argues that the optimal time to perform the autotransplantation is when the root of the donor tooth has reached two thirds to three quarters of its final length, other authors suggest that there must be a development of the root of 2 to 3 mm and there are studies in where autotransplants are reported with the root completely formed. All these studies have favorable success rates and indicate that dental autotransplantation is a viable option as a treatment for the premature loss of a dental organ in addition to its low cost compared to dental implants or other prosthetic treatment option.

In this paper we present the clinical case of an autotransplant of the left lower third molar (tooth 38) to the alveolus of the left lower first molar (tooth 36), observing the surgical procedure step by step; from the extraction of the dental piece 36 to the fixation of the dental piece 38 in the receiving site, its evolution to 1 year 6 months, this being done in the Naval Medical Center.

## Discussion:

Dental autotransplantation with complete root formation is a well-established surgical treatment option to replace missing teeth and offers a valuable and aesthetic solution at low cost. The transplanted tooth can offer functional adaptability, preservation of the alveolar ridge and the potential for continuous induction of alveolar bone in growing children.<sup>5</sup>It is mentioned that it is the only treatment in dentistry which is radical, conservative and rehabilitative at the same time.<sup>6</sup>

The selection of patients is very significant for the success of autotransplantation. Candidates must be in good health, demonstrate an excellent level of oral hygiene and be attentive to regular dental care; otherwise, the successful achievement of autotransplantation could be jeopardized.<sup>7</sup>The evaluation to know if the tooth that will be self-transplanted is the ideal, must be done clinically and radiographically (table 1). The anatomical shape of the tooth should be observed and if it coincides with the alveolo receptor, if the preparation of the alveolus is easy, the stage of development of the root and the damage that the tooth that will be transplanted can suffer.<sup>8</sup>

**Table 1.**

Indications	Contraindications
<ul style="list-style-type: none"> <li>• Excellent oral hygiene</li> <li>• Regular dental care</li> <li>• Stage of development of the root</li> <li>• Deep caries that prevents the dental organ from being restored</li> <li>• Teeth absent or lost prematurely.</li> <li>• Ankylosed or malformed.</li> <li>• Traumatic loss of teeth, ectopic eruption of the canines.</li> <li>• Radicular reabsorption</li> <li>• Large endodontic lesions</li> <li>• Root fractures of the root, localized juvenile periodontitis, as well as other pathologies.</li> </ul>	<ul style="list-style-type: none"> <li>• Teeth with pointed root curvatures</li> <li>• Anomalies of shape or position that would increase the risk of damage to the periodontal ligament during extraction.</li> <li>• Teeth in which the treatment of conduits is not possible or which are compromised.</li> </ul> <p>Other contraindications: cardiac anomalies, poor oral hygiene, insufficient width of the alveolar bone; since, if the recipient site has a wide lingual vestibule or insufficient palatal vestibule in it to accommodate the donor tooth, a reabsorption of the alveolar crest may occur.</p>

### **Autotransplantation with incomplete root formation:**

The transplant of teeth with immature roots offers higher success rates. Transplanted teeth with incomplete root formation have a rate of 96% success in pulp revascularization, compared with 15% for teeth with complete root formation. Teeth with an apical diameter greater than 1 mm have a reduced risk of pulpal necrosis because postoperative revascularization is more likely.<sup>13</sup>In general, the transplant of teeth with immature roots offers high success rates because the root development of the donor tooth and the growth of the alveolar bone are not hindered.<sup>14</sup>

Kristerson argues that the optimal time to perform the autotransplantation is when the root of the donor tooth has reached two-thirds to three-quarters of its final length, so that there are favorable conditions for revascularization.<sup>15</sup>Johnson and Sigurdsson showed 76% survival in the pulp of autotransplanted teeth with the root partially formed.<sup>16</sup>

Most authors believe that roots should develop beyond their bifurcation. Some authors prefer radiographic evidence that the root has developed at least 2 to 3 mm, while others advocate the development of the root less than 3 to 5 mm.<sup>14</sup>

It is possible to wait for the continuation of root development after transplantation if the donor tooth is immature and if the epithelial Hertwig sheath around the apices is preserved.<sup>11</sup>

### **Autotransplant with complete root formation:**

The autotransplant is indicated mainly after 12 years of age, after the root formation has been completed. Previous reports have shown high survival rates of autotransplanted teeth with complete root formation during an average observation period of 5 years.<sup>17</sup>

The pulp of a fully mature tooth can not be regenerated, therefore; Endodontic treatment must be completed before transplant.<sup>12</sup>With endodontics the pH of the intraradicular dentine can be changed from 8 to 10, which inhibits osteoclastic action and prevents early root resorption.<sup>18</sup>

### **Surgical procedure:**

It can be done through an immediate or deferred approach, the immediate one is carried out when the receiving site is free of pathological process and the delayed one when in the receiving site an infectious process or periodontal problems is observed, this pathological process must be eliminated from the receiving area and the soft tissues before carrying out the autotransplant.<sup>11</sup>

Rigorous asepsis must be achieved.<sup>19</sup>If the problem tooth is removed before the date of the autotransplantation, the autotransplant must be done between week two and six after the extraction; Bone resorption could occur after the sixth week.<sup>11</sup>

The tooth that will be extracted from the receiving alveolus must be extracted before the tooth to autotransplant. The receiving alveolus is prepared a little larger than the donor tooth using low speed surgical rods and cooling with saline. The obstacles in the walls of the receiving alveolus are eliminated.<sup>20</sup>

The extraoral management time of less than 15 minutes is associated as a positive effect on the survival of the tooth to autotransplant, which is consistent with the results of previous studies on intentional reimplantation. Fundamentally, the viability of the periodontal ligament cells is one of the most critical factors for a successful adaptation of the donor tooth at the receptor site and, at the same time, it has been reported that excessive extraoral handling time has a detrimental effect on the survival of periodontal ligament cells; therefore, it is important to reduce extraoral management time to improve the prognosis of dental autotransplantation. In this sense, the application of the CARP model is recommended to minimize the extraoral management time in the autotransplant.<sup>21</sup>

The classic autologous technique involves removal of the donor tooth and preparation of the recipient's site, using the donor tooth as a template. This can lead to a prolonged extraoral time and increase the failure rate since the cells of the pulp and the periodontal ligament lack a supply of nutrients.<sup>22</sup>

The use of a surgical template has been proposed to assist in the preparation of the alveolus and to minimize the extraoral period of the donor tooth. This template can be used to reshape the recipient's site socket before extraction.<sup>22</sup> It has been shown that if the donor tooth is extraorally stored while the alveolus is modified, the likelihood of future pulp necrosis significantly increases.<sup>23</sup>

The alveolus of the site where the tooth placement will be made should be broad mesially as well as distal, it is suggested that 2 mm wider than the tooth transplanted to avoid affecting the periodontal ligament.<sup>25</sup> When the tooth is placed in the alveolus, the rotation of the crown can be performed so that the implanted tooth resembles the mesio-distal measurement of the tooth to be replaced and, by means of the rehabilitation, to give it the appropriate shape.<sup>26</sup>

After performing the autotransplantation, it must be kept in the mouth and for that various types of fixation have been described.<sup>2</sup> The most used type of splinting and that could be associated with a better prognosis is the suture, material that allows to position the autotransplant with the tissues and at the same time, to make micro-movements that would prevent the development of ankylosis.<sup>18</sup> Only the use of rigid fixation is recommended when there is loss of initial stability; defined as a movement greater than two millimeters in the horizontal direction in the immediate postoperative period. The most used rigid fixing is the 0.5 mm wire with composite resin.<sup>2</sup>

The occlusion should be checked to ensure there is no interference. The contact should be reduced extraorally before positioning the tooth, taking care not to damage the periodontal ligament. It could also be done intraorally before the extraction of the donor tooth.<sup>12</sup>

The most common complications associated with teeth that are autotransplanted are ankylosis and root resorption. Many factors influence this result, such as the stage of development of the tooth to be autotransplanted, the donor tooth, the duration of the extraoral exposure of the tooth during surgery, the damage to the root cement and the periodontal ligament, as well as the experience of the surgeon.<sup>27</sup>

### **Radicular Resorption:**

Periodontal healing is responsible for root resorption after autologous transplantation; Periodontal cells are

known to facilitate ankylosis and root resorption. If the dental pulp becomes necrotic, it can cause inflammation of the periodontal tissue and produce root resorption, so the treatment of ducts in autotransplanted teeth can help improve the prognosis of the tooth.<sup>28</sup>

### **Ankylosis:**

The dental autotransplant inevitably induces the interruption of the vascular supply to the root surface, which could be detrimental to the survival of the cells of the periodontal ligament. Dental ankylosis starts from the destruction of the periodontal ligament and the subsequent infiltration of osteoblasts and osteoclasts into the root dentin.<sup>29</sup> The main objective of autotransplantation is the preservation of the alveolar crest and its continuous stimulation for development. This process is lost when ankylosis occurs.<sup>30</sup>

### **Presentation of clinical case**

**Identification file:** VCY, Female 29 years old.

**Family hereditary background:** Mother with Diabetes Mellitus under medical treatment, rheumatoid arthritis and pharmacological hypothyroidism.

**Pathological personal history:** HPV infection two years ago under medical treatment.

**Non-pathological personal history:** Single, lives at home in the Coyoacán delegation, has all the intradomiciliary services.

**Interrogation by apparatuses and systems:** Systemically healthy, allergic to dust, mites and trees.

**Current condition:** The patient reports that she has extensive decay in her molar (tooth 36) and goes to the oral prosthesis service for rehabilitation.

**Extraoral exploration:** Conscious, oriented in time and space, cooperative with symmetrical and balanced gait, normocephalic skull, without sinking or exostosis, conserved eye movements, permeable nostrils, adequate coloration of teguments, without other relevant data and temporomandibular joint without alterations at the time of exploration clinic.

**Intraoral exploration:** Normochromic and normohydrated mucosae with adequate insertion of braces, chronic localized mild periodontitis on the distal face of the lower left first molar and gingival

bleeding on examination, permanent dentition with various definitive and temporary definitive previous restorations, multiple dental caries of different degrees at first and third lower left molar. (Fig. 1)



Fig. 1: **Intraoral exploration:** Normochromic and normohydrated mucosae with adequate insertion of braces, chronic localized mild periodontitis on the distal face of the lower left first molar and gingival bleeding on examination, permanent dentition with various definitive and temporary definitive previous restorations, multiple dental caries of different degrees at first and third lower left molar.

**Cabinet and / or laboratory tests:** Periapical radiographs (Fig. 2).



Fig. 2: **Cabinet and / or laboratory tests:** Periapical radiographs

**Diagnosis:** Chronic localized periodontitis mild at the level of the first lower left molar, 2 ° dental decay in the lower left third molar, 3 ° caries in the lower left first molar, with no possibility of rehabilitation.

**Treatment plan:** Lower left third molar autotransplant (tooth 38) to the alveolus of the left lower first molar (tooth 36)

**Prognostic:** Reserved to evolution.



**Treatment:** The distance of the distal face of the dental piece 35 to the mesial face of the dental piece 37 is measured to corroborate that the tooth to be transplanted does not exceed these dimensions and adapts as best as possible to the alveolus of the tooth 36 (Fig. 3), se realizó por medio de un abordaje quirúrgico inmediato, el manejo extraoral máximo es de 15 minutos, se administra Lidocaina/Epinefrina para anestesiarse el nervio dentario inferior izquierdo y se refuerza con puntos locales (Fig. 4), dental odontectomy is performed 38 trying to damage as little

as possible the fibers of the periodontal ligament and the dental organ is placed in saline (Fig. 5). Subsequently, the extraction of the dental piece 36 proceeds, the dental organ to be transplanted is placed in the alveolus of the dental piece 36 in infraocclusion (Fig. 6). Simple stitches are placed in the place where the extraction of the dental piece 38 was performed, the transplanted tooth is fixed with suture using a cross stitch and braided wire in the vestibular faces of the teeth 37-38-35. (Fig. 7)



Fig. 3: Measure the mesio-distal distance of the tooth to be extracted to corroborate that the tooth to be transplanted does not exceed these dimensions and adapt as best as possible to the alveolus (2 mm wider).

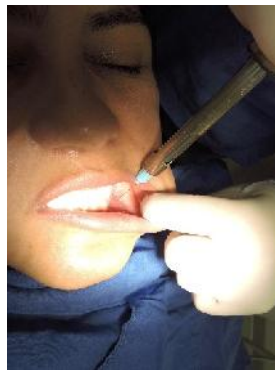


Fig. 4: was performed by means of an immediate surgical approach, maximum extraoral management is 15 minutes, Lidocaine / Epinephrine is administered to anesthetize the lower left dental nerve and reinforced with local points

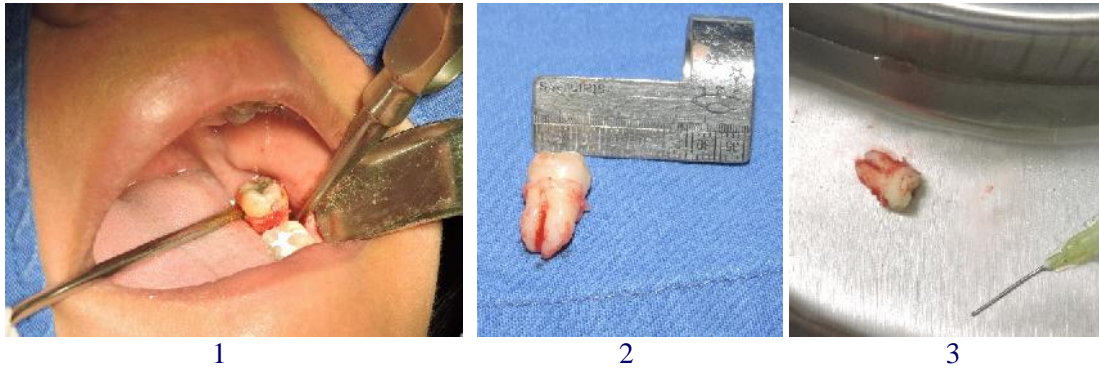


Fig. 5:Odontectomy of the left lower third molar is performed, trying to damage the fibers of the periodontal ligament as little as possible and placing the dental organ in saline solution.



Fig. 5:The first lower left molar (tooth 36) is extracted, taking care not to damage the fibers of the periodontal ligament, the dental organ is placed in saline solution and the mesiodistal distance of the surgical bed is corroborated.



Fig. 6: The tooth to be transplanted is placed in the alveolus of the receiver in infraocclusion.

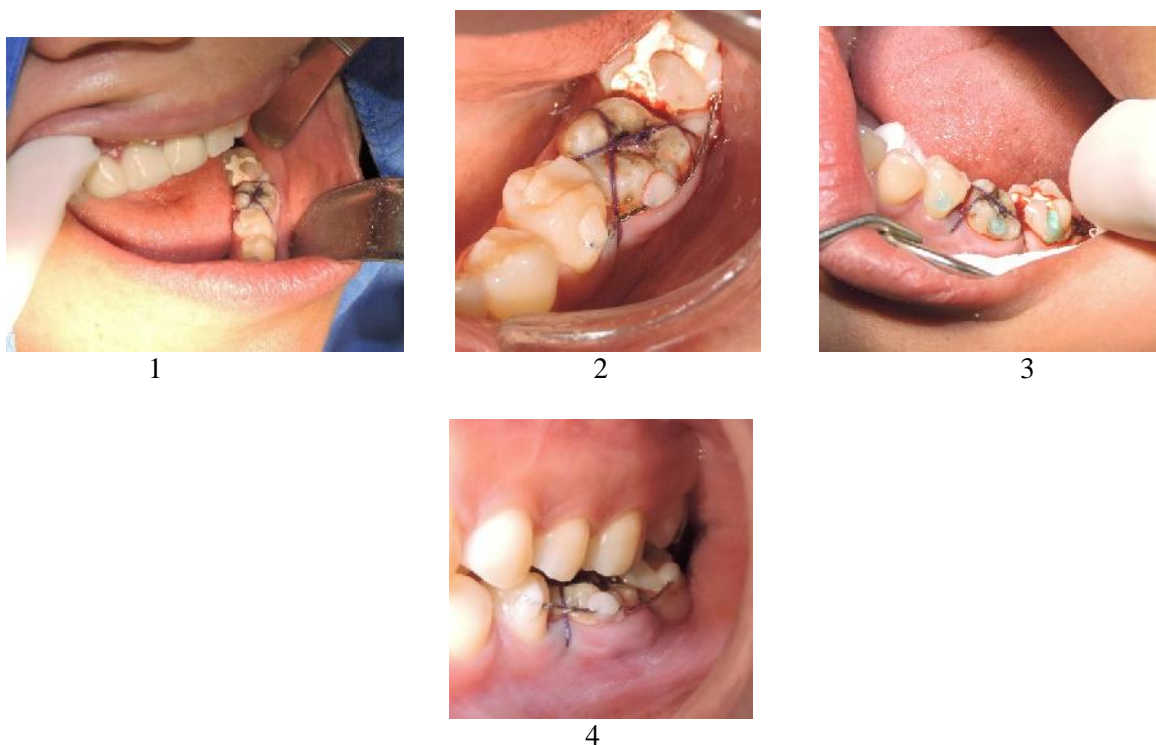


Fig. 7: Simple points of 4-0 vycril suture are placed in the site where the extraction of the left lower third molar was performed, the transplanted tooth is splinted with suture using a cross stitch and braided wire in the vestibular faces of the adjacent teeth.

**Tracing:** Adequate healing, without mobility data or pain symptomatology, adequate position and function, adequate periodontal situation, without signs of gingivitis, in periapical radiographs of monthly control the osseointegration of the dental organ transplanted to the recipient site is observed (Fig. 8 and 9). ),the patient refuses to endodontic tx, so in a period of 1

year she presents a periapical lesion radiographically (Fig. 10),the disadvantages of not performing an endodontic treatment are explained again, the patient accepts and proceeds to the treatment of the ducts, a radiographic control is taken at 1 year 6 months in which we can observe the remission of the periapical lesion (Fig. 11)



Fig. 8: Radiographic control at 3 months





Fig. 9: Radiographic control at 6 months



Fig. 10: radiographic control at 1 year



Fig.11: radiographic control at 1 year 6 months

## Conclusions


Dental autotransplantation is a surgical procedure that has increased its success rate over the years thanks to the research and contribution of different authors; However, this procedure is not considered as one of the first options to replace the absence of a dental

piece, since certain criteria necessary to decide whether a patient is a candidate for this procedure must be taken into account. It is important to carry out the dental transplant protocol. step by step as already described by different authors and raise awareness among patients since this depends on the success of this procedure and its predictability.

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