Grafting for apposition of autologous biomaterial in the edentulous maxillary area with the tooth transformer technique. A case report

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ABSTRACT

Background The loss of a tooth causes bone resorption if no alveolar preservation strategies are implemented. The restoration of an adequate bone volume is essential in obtaining a site that allows the subsequent implant-prosthetic rehabilitation.
Objective The purpose of this study is to verify the effectiveness of the use of autologous material deriving from the tooth with the aid of the Tooth Transformer in guided bone regeneration.
Materials and methods The patient, edentulous in area 2.6, intends to rehabilitate this area through implantology. In the first surgical phase, a guided bone regeneration of the site is performed, making use of the compromised element 3.8, previously extracted, as autologous material to be affixed for grafting through the Tooth Transformer. After 4 months, the surgical site was reopened and the implant fixture was inserted.
Results The result obtained demonstrates the effective regenerative power of the Tooth Transformer method: a height of 9.82 mm of bone was obtained which allowed obtaining an adequate bone volume suitable for implant insertion.
Conclusions The autologous material derived from the Tooth Transformer is able to recreate a partially atrophic area and this device is establishing itself as an innovative bone regeneration system in the field of tissue engineering.

KEYWORDS: guided bone regeneration, bone atrophy, Tooth Transformer, implantology, oral surgery

INTRODUCTION

Bone loss represents a real challenge in the surgical and implant-prosthetic fields. The aim is to deal with a chronic process such as bone resorption with a view to implementing an aesthetic-functional rehabilitation(1).
The main cause of dental bone loss is attributable to partial or total edentulism and this condition causes serious consequences on the functional and aesthetic levels(2,3,4).
An already advanced condition of bone resorption makes it impossible to insert implant fixtures. It is possible to resort to dental bone regeneration techniques (Guided Bone Regeneration, GBR), using specific materials in order to obtain the requirements for a fixed prosthetic rehabilitation(5,6,7,8).
The Tooth Transformer is a device that allows to reduce the mineral component of the dentin and to exploit the BMPs with high regenerative power of the dentin itself so as to obtain an ideal material for bone regeneration(9,10).
Dentin and alveolar bone are very similar: the organic part consists of 10% proteins and 90% collagen fibers. Collagen fibers are 94% type I, 3% type III, and 3% type IV(11,12,13).
The proteins present are those synthesized by odontoblasts: sialoproteins, osteopontin, osteocalcin, osteonectin, bone morphogenetic proteins (BMP-2), insulin growth factor (IGF-2), transforming growth factor (TGF-beta) and acid phosphoprotein of the dentin matrix (DMP-1)(14,15). The proteins of greatest interest for regenerative purposes are BPM-2 and the growth factors IGF-2 and TGF-beta: the former allow the mesenchymal cell to differentiate into an osteoblastic cell, supporting the bone apposition process at the base of regeneration(16,17,19,20). The objective of this study is to verify the effectiveness of the use of autologous material deriving from the tooth with the aid of the Tooth Transformer in guided bone regeneration.

MATERIALS AND METHODS

The case report subject was a 38-year-old male, non-smoker, ASA 1 and able to understand the treatment

FIG. 1 Bone atrophy in the upper jaw area

FIG. 2 Radiographic bone augmentation

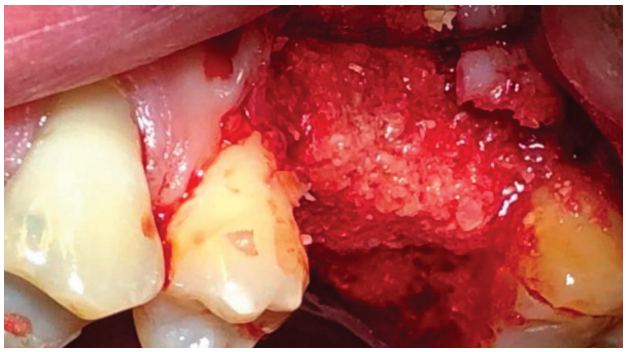

FIG. 3 Clinical bone augmentation

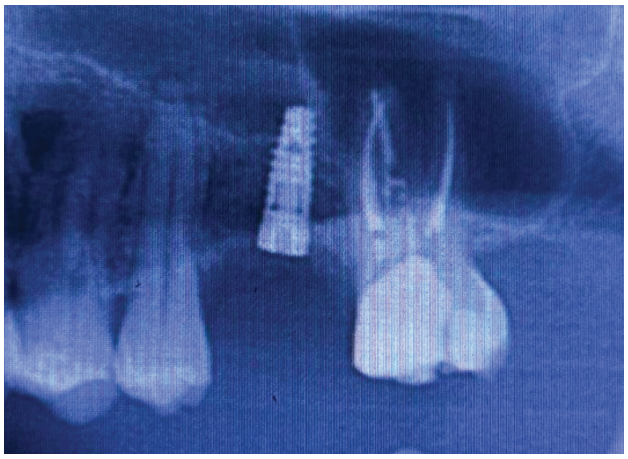

FIG. 4 Radiograph after implant placement

information provided.
The clinical and radiographic examinations show partial edentulism in the upper jaw area (area 2.6) characterized by severe bone atrophy: the result of a previously performed extraction (Fig. 1). After proposing various therapeutic alternatives, in agreement with the patient, we opted for the implant rehabilitation of the site in question after guided bone regeneration.
The patient's maintenance of a previously extracted mandibular molar (3.8), allowed the operator to propose to the patient the use of the same dental element for the regeneration of the atrophic area. The patient approved the proposed treatment protocol and signed an informed consent form before surgery.
The tooth in question (3.8) was cleaned, cut, ground, demineralized and sterilized using the Tooth Transformer. The biomaterial obtained has been placed and compacted on the site in question. The preparation of the operative field took place using a trapezoidal flap. A 3-0 mono-filament suture was performed.
Standard postoperative instructions were provided: 10 mL of 0.2% chlorhexidine mouthwash twice daily for seven days and nonsteroidal anti-inflammatory drugs (ibuprofen 600 mg twice daily for three days).
Four months after surgery, radiographic investigations were performed to evaluate bone healing and to plan implant placement(Fig. 2). After local anesthesia, a full thickness mucoperiosteal flap was raised in region 2.6 and the presence of available bone volume and quality for fixture placement was confirmed(Fig.3-4). The surgical procedure ended with the suture of the flap. The recovery was uneventful.

RESULTS

The result obtained confirms the effective regenerative power of the Tooth Transformer method which ensures high predictability of therapeutic success. At the end of the bone regeneration, a height of 9.82 mm of bone was obtained which made it possible to obtain an adequate bone volume suitable for implant insertion.

DISCUSSION

This case report has demonstrated that teeth preserved in good condition can be used as a source of bone replacement material. A determining factor in evaluating the extent of the bone resorption process is represented by the presence of the buccal bone wall and its width(36). Guided regeneration techniques have been proposed to

restore bone volume(26,30). Based on the results of the research conducted by Schmidt-Schultz and Schultz in 2005, we hypothesized that the characteristics of the teeth did not change during the storage period, maintaining both mineral and non-mineral composition(33,37).
There are several works on the use of dental materials (dentine and enamel) as bone substitutes, recognizing the advantage of being available after tooth extraction, thus avoiding other surgical procedures to graft(32,38,39).
In 2018, a systematic literature review was published by Gual-Vaques et al.: the authors stated that the use of such biomaterial was safe and effective to allow implant placement in sites requiring bone augmentation(32).
The study published by Del Canto-Diaz et al. in 2019 reported the results obtained using autogenous dental material in nine patients: changes in bone volume were lower in the test group than in sites left to heal spontaneously(40,41).

CONCLUSIONS

The Tooth Transformer represents an interesting alternative in the field of tissue regeneration. The advantages are clear and the therapy is more predictable, cheaper and safer. All of this is performed ensuring simplicity and safety for the entire duration of the therapy and without resorting to invasive sampling.

ETHICAL APPROVAL

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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