

# Effect of platelet-rich plasma in alveolar distraction osteogenesis: a controlled clinical trial

Diogo J.B. Menezes<sup>a</sup>, Jamil Awad Shibli<sup>b</sup>, Sergio Alexandre Gehrke<sup>c,\*</sup>, Andréa M. Beder<sup>a</sup>, Wilson R. Sendyk<sup>a</sup>

<sup>a</sup> Department of Periodontology and Implantology, School of Dentistry, University of Santo Amaro, São Paulo, Brazil

<sup>b</sup> Department of Periodontology and Oral Implantology, Dental Research Division, Guarulhos University, Guarulhos, SP, Brazil

<sup>c</sup> Coordinator of Biotecnos – Technology and Science, Santa Maria, Brazil

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## Abstract

We have evaluated the effect of the use of platelet-rich plasma in alveolar distraction osteogenesis. Fourteen patients who were partly edentulous in the anterior premaxilla region were selected and randomised into two groups (n = 7 in each group). Those in the experimental group were given platelet-rich plasma at the time of distraction, and the control group had only distraction. Selected cases had defects in the alveolar ridge of more than 3 mm, and a minimal bone height of 7 mm from the alveolar ridge crest to important anatomical structures. The plaque index and gingival index were recorded on days 3, 7, 14, 21, 28, 45, 60, 75, 90, and 105 postoperatively. There was a strong negative correlation between the gingival index and augmentation of bone, and a strong positive correlation between the mean gingival index and loss of bone from the transported segment. The addition of platelet-rich plasma had a protective effect on the mucosa around the distractor, which decreased the potential for complications.

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## Introduction

Atrophy of bone with a decrease in the size of the vertical alveolar ridge (apicocoronal) prevents the placement of implants of an ideal length, and results in an implant:crown ratio<sup>1</sup> that can produce mechanical challenges for the implant or the prosthesis.<sup>2</sup> However, the current challenge in bone grafting is vertical augmentation, primarily because of the lack of soft tissue to cover the graft and the limited surface area for revascularisation. Alveolar distraction osteogenesis may therefore be considered as an alternative to other

techniques such as alloplastic graft augmentation, autogenous onlay bone grafting, and guided regeneration of bone.<sup>3</sup>

There are a few common complications of distraction, which are mainly related to the soft tissues.<sup>4</sup> Development of an infection in the area that is being operated on increases the possibility of resorption of the alveolar crest of the transported segment, which may reduce its technical efficiency.<sup>5</sup> With this in mind, and knowing that platelet rich plasma greatly aids in the repair of hard and soft tissues,<sup>6</sup> as well as having antimicrobial properties,<sup>7</sup> we have studied the effects of platelet-rich plasma with the intention of accelerating repair and promoting better sealing of tissue around the tower distractor.

We could find no studies of platelet-rich plasma for this purpose, so we designed a trial to find out if its use in the distraction of alveolar bone is capable of bringing some benefit.

\* Corresponding author. Rua Dr. Bozano, 571, 97015-001 – Santa Maria (RS) – Brazil. Tel./fax: +55 55 3222 7253.

E-mail address: [sergio.gehrke@hotmail.com](mailto:sergio.gehrke@hotmail.com) (S.A. Gehrke).

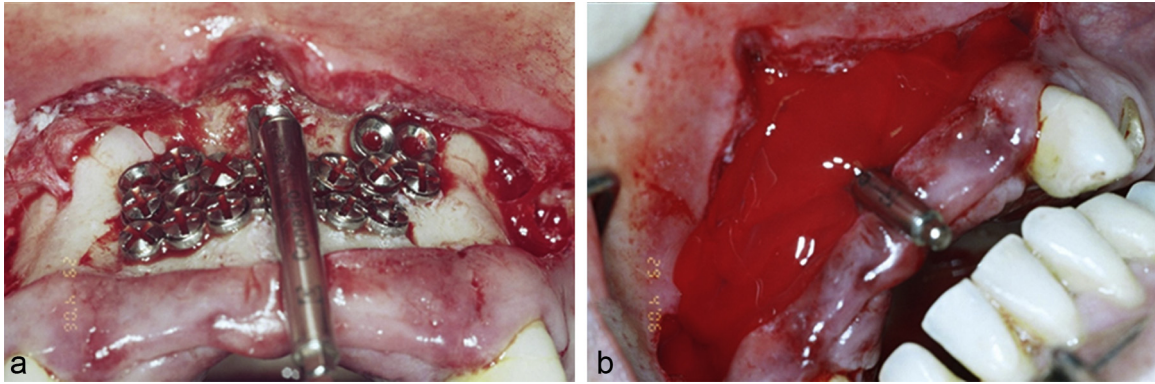


Figure 1. Image of the distractor device positioned in both groups. The control group (A) and the test group (B) with the application of platelet-rich plasma.

### Patients and Methods

We randomised 14 patients, 8 women and 6 men aged between 27 and 58 years of age either to have platelet-rich plasma or not. The study was approved by the Ethics and Research Committee of University of Santo Amaro, Brazil. All patients were informed about the nature of the study and their participation, and written consent was granted by each one according to the Helsinki Declaration of 1994.

The inclusion criteria were based upon the patient's current stable medical condition, the ability to withstand the stress of dental implant surgery, and the request for an increase in vertical bone to the alveolar ridge in the anterior area of the maxilla or mandible for a posterior implant and rehabilitation with a prosthesis. Patients with unstable conditions such as diabetes, hypertension, or osteoporosis; patients with oral problems in their soft or hard tissues; and patients with harmful oral habits such as bruxism or smoking, were not included. Local exclusion criteria included the presence of uncontrolled or untreated periodontal disease, and insufficient volume of bone (a crest at least 7 mm high and 3 mm wide was required to allow the installation of the distractor and implementation of osteotomies in a stable and secure manner).

### Surgical technique

Patients were given an initial dose of 2 capsules of amoxicillin 875 mg orally 2 hours preoperatively, and this was continued postoperatively twice daily for 7 days. In addition, they were instructed to use analgesics for pain in the form of dipyron 35 drops every 6 hours and the anti-inflammatory ketoprofen (Profenid) 100 mg orally 12-hourly for 5 days. All procedures were done under local anaesthetic with 2% articaine (Articaína, Dfl Ltda, Rio de Janeiro, Brazil) in the outpatient clinic by the same surgeon who was familiar with the technique of bone distraction.

After a full thickness mucoperiosteal flap had been raised the underlying alveolar bone was exposed for osteotomy. The size of the distractor was chosen according to the size of the patient. After the distractor had been chosen, it was placed in

position (passive settlement) and the position marked for the osteotomy. A sagittal saw and copious irrigation with 0.9% saline solution (Sodium Chloride) was used to make a horizontal osteotomy, and the two vertical osteotomies diverged slightly. Chisels were used to separate the palatal or lingual cortical bone. The distractor was then fixed with miniscrews and tested. Internal and external sutures were made with polyglactin 910 (Vicryl) and 5/0 nylon, respectively. Platelet-rich plasma was obtained according to the Janh protocol,<sup>8</sup> and a blanket of it was placed on the boards and tower distractor, and on the fullest extent of the flap before suture in the experimental group (Fig. 1). The control group had sutures alone (Fig. 1).

The distractor was activated 7 days postoperatively, three times/day for 6–9 days at a rate of 1 mm/day, as previously described by McAllister & Gaffaney.<sup>9</sup>

### Postoperative control and analysis

The plaque index and gingival inflammation index (Table 1) were measured on days 3, 7, 14, 21, 28, 45, 60, 75, 90 and 105 postoperatively. Solution that stained bacterial plaque was used on the distractor tower to measure the amount, using an adaptation of the technique described by Mombelli et al.,<sup>10</sup> The gingival inflammation index was used to measure the

Table 1

Indices used to assess accumulation of plaque and gingival inflammation around the distractor tower.

Score	Accumulation of plaque	Gingival inflammation
0	No plaque detected	Normal mucosa
1	Plaque only recognised by running a probe across the distractor tower	Changes in the colour of the mucosa, slight oedema, but no bleeding on probing
2	Plaque can be seen with the naked eye	Red mucosa, swollen and bright, with bleeding on probing
3	Abundance of soft matter	Red and swollen mucosa with ulceration and a tendency to bleed spontaneously

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