

Clinical Paper  
Pre-Implant Surgery

# Evaluation of new bone formation after sinus augmentation with two different methods

T. Bensaha<sup>1</sup>, H. El Mjabber<sup>2</sup>

<sup>1</sup>Private Practice, Tangiers, Morocco; <sup>2</sup>Private Practice, Clermont-Ferrand, France

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**Abstract.** The sinus infiltration technique for sinus floor elevation and simultaneous implant placement has been used successfully when a reduced vertical height is available in the posterior maxilla. However, the effect of the quantity of graft material and the volume of the solution used on the volume of new bone formed has not been fully investigated. The aim of this study was to evaluate, both quantitatively and qualitatively, the new bone formation after sinus augmentation using either the lateral sinus lift or sinus infiltration technique and to determine any correlation with the volume of bone grafting material used. Further, the volume of solution used in the sinus infiltration technique was also assessed. Twenty healthy adults (13 women, seven men) were randomized to two groups, each undergoing one of the two techniques. Quantitative aspects and the space lifted in the sinus floor were analyzed using Simplant Pro Crystal software. No correlation was found between the volume of bone created in the sinus floor and the volume of bone grafting material used for the sinus infiltration technique or the lateral sinus lift. A strong correlation was found between the volume of liquid used in the sinus infiltration technique and the new volume created in the sinus floor.

**Key words:** bone formation; computed tomography; maxillary sinus; sinus floor elevation.

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Implant anchorage in the edentulous maxilla is often challenging due to insufficient bone volume following crestal bone resorption.<sup>1</sup> In the past, clinicians developed surgical augmentation techniques that used the existing space in the maxillary sinus to restore bone height and subsequently create an adequate implant

bed.<sup>2,3</sup> Several modifications to the originally described sinus augmentation procedure have been made; however, the basic principle of increasing maxillary bone height by placing graft material in the maxillary sinus after detaching the Schneiderian membrane remains the same.<sup>4–6</sup>

After sinus augmentation, the blood supply to the graft and cells originating from the bony walls allow the formation of new bone.<sup>7,8</sup> The volume of augmented graft is usually proportional to the size of the sinus.<sup>9,10</sup> The time required for graft resorption and replacement by new bone is longer in a larger sinus. Therefore, many

studies have reported that the high osteogenic potential of autogenous bone is essential when sinus floor augmentation is performed in a large sinus.<sup>3,8</sup>

The use of the sinus infiltration technique for sinus floor elevation and simultaneous implant placement is an emerging technique that results in fewer complications compared with the conventional lateral sinus floor elevation.<sup>11</sup> However, radiological aspects of the newly formed bone with the sinus infiltration technique have not been studied before. The objective of this study was to evaluate, in a prospective manner, the volume and density of the new bone formed in the maxillary sinus following the sinus infiltration technique and lateral sinus lift and to determine any correlation with the volume of bone substitute used.

Further, the volume of the solution used in the sinus infiltration technique was also measured.

**Materials and methods**

**Study design**

This was a prospective, randomized study, using radiological measures to assess the volume and density of the new bone formed in the maxillary sinus following the sinus infiltration technique and lateral sinus lift and any correlation with the volume of bone substitute used. The volume of the solution used for infiltrating the maxilla sinus was also measured. Approval for the study was obtained from the Ethics Committee of the Union of Tangiers Dental Surgeons. All study participants

gave informed consent prior to taking part in this study.

**Patient selection**

Twenty-six patients were eligible to participate in the study. They required rehabilitation of their dentition in the posterior maxilla with implant placement and sinus floor elevation and were referred to the Tangiers Implant Centre. However, only 20 healthy adult patients in need of sinus floor elevation and implant placement and who fulfilled the eligibility criteria were finally randomized into the two groups of 10 each for the study (Fig. 1). Thirteen were women and seven were men, and they ranged in age from 35 to 58 years.

All patients underwent a clinical and occlusal examination, including

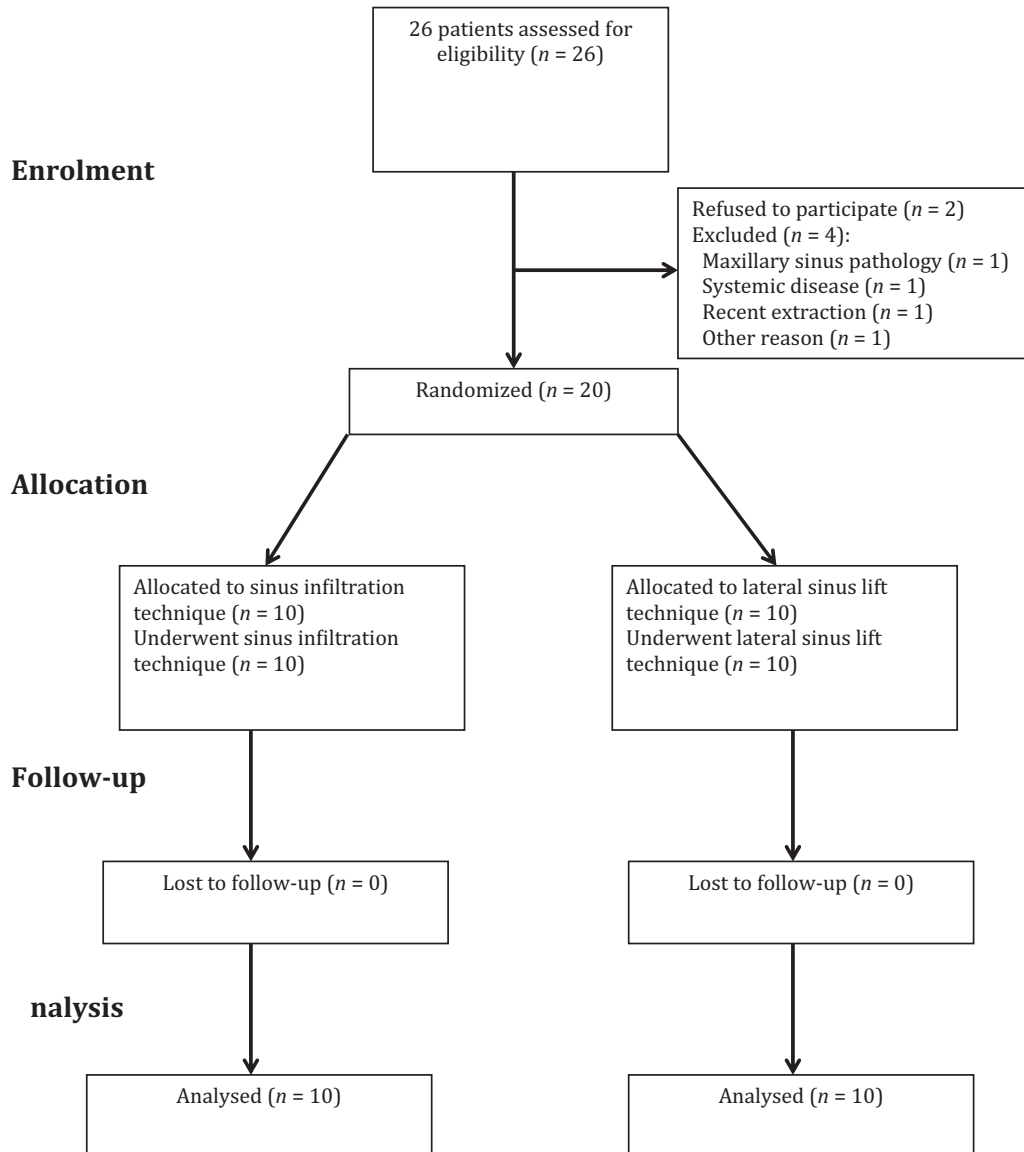


Fig. 1. Flowchart of patients included in the study.

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