

# Association between autogenous bone and heterogen graft to optimize outcomes of bone grafting: a case report

**Abstract / Introduction:** Even today, rehabilitation of regions with insufficient bone for implant placement remains a major challenge to the surgeon. The combination of autograft and heterogen material is reported in the literature as a viable and predictable option to readjust the edges, rendering them favorable for implant placement. **Objective:** To report the case of a patient seeking rehabilitation with dental implants for the anterior maxilla, but whose clinical and radiographic examination showed atrophy of the alveolar ridge. **Methods:** The patient was instructed and subjected to bone reconstruction with chin graft. After graft harvesting, it was adjusted and set to the receiving region in association with heterogen material and resorbable collagen membrane. Five months after graft surgery, dental implants were installed in the region where excellent graft incorporation and virtually no resorption of autogenous bone were observed. **Conclusion:** The combination of autogenous bone and heterogen proved to be a predictable option with little or no resorption, allowing implant placement in proper position and proportions. **Keywords:** Bone graft. Bone resorption. Dental implants.

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## INTRODUCTION

The presence of proper alveolar bone is paramount to achieve proper rehabilitation with dental implants.<sup>1,2</sup> However, tooth loss results in an imbalance between bone formation and bone resorption in the alveolar process, often culminating in alveolar atrophy which, in turn, causes defects in bone height or thickness, or a combination of both.<sup>3,4</sup>

There is ongoing search for the ideal bone substitute, one that could help to reconstruct a wide range of defects with high predictability and without the need for a donor site. However, it is a proven fact that the best clinical results are achieved with the use of autogenous bone, as this is the only material that features the ideal properties for effective bone formation (osteoconduction, osteoinduction and osteogenesis).<sup>2-5</sup> Nevertheless, this type of graft features a resorption rate of around 25% when harvested from an intraoral site, and up to 50% when harvested from an extraoral site, such as the iliac crest.<sup>5,6,7</sup>

Given the lack of affordable material with the ability to replace autograft in the treatment of less predictable defects, the attempt to control the resorption potential of this type of graft becomes extremely important. To this end, combining autograft with heterogeneous material and resorbable membranes has proved a viable option according to the literature.<sup>8-15</sup>

Given the above, the objective of this study is to report the clinical case of a patient presented with atrophy of the anterior maxillary ridge, and treated by combining autogenous bone graft harvested from the chin and heterogeneous material, which enabled dental osseointegrated implants placement.

## CASE REPORT

A 45-year-old male patient sought the Department of Oral and Maxillofacial Surgery for dental implants placement. During the first interview, the patient reported undergoing tooth loss 20 years before, and the use of a fixed denture in the region. Clinical and radiographic examinations revealed that teeth #11 and 21 were missing. Moreover, he wore a fixed denture involving teeth #12, 13, 22 and 23, exhibited thick gingiva in the area of the missing teeth and severe bone atrophy of the ridge (Figs 1 and 2).

Treatment planning involved autogenous bone graft harvested from the chin and combined with heterogeneous material and resorbable collagen membrane under local anesthesia.

Surgery was initiated by accessing the receiving site through an incision and mucoperiosteal flap elevated to expose the bone defect (Fig 3). Subsequently, the donor site (chin) was penetrated and a corticomedullary bone block compatible in size with the bone defect (Fig 4) was removed.

Afterwards, the block was adapted to the receiving site and fixed with two 1.5 x 14 mm titanium screws (Neodent) by means of the compression technique (lag screw) (Fig 5). Thereafter, sharp angles were removed and the periosteum released so as to ensure airtight closure after the procedure (Fig 6).

Heterogeneous material (Lumina-Bone, Critéria) was added to all grafting regions in association with resorbable collagen membrane (Lumina-Coat, Criteria) (Figs 7 and 8) in order to decrease autogenous graft resorption and provide increased homogeneity to the reconstruction. To finish the surgical procedure, both donor and receiving sites were sutured with 3-0 Catgut thread (Poin-Suture).

After a 5-month period, surgery was performed to place the implants in the grafted area. After carefully elevating the mucoperiosteal flap, excellent incorporation of bone block and

little resorption (virtually no bone resorption) were observed, thereby allowing installation of two 4.5 X 11 mm implants (Ankylos, Dentsply Friadent) (Figs 9 - 14).

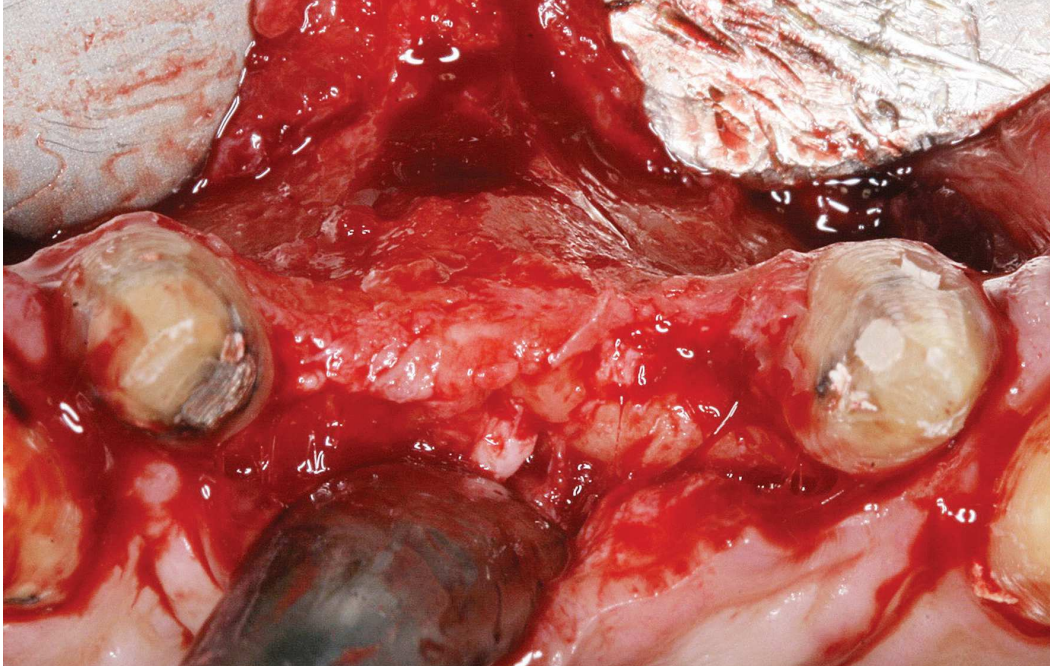


**Figure 1.** Initial photographs showing missing teeth, thick gingiva on ridge crest and bone defect immediately above.

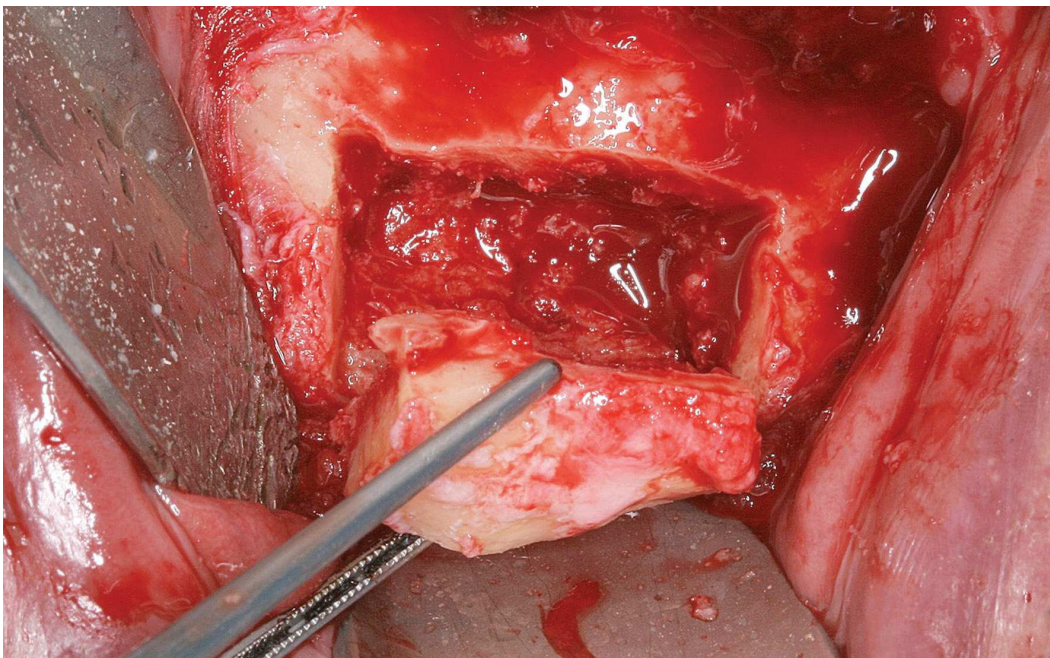


**Figure 2.** Panoramic radiograph revealing fixed prosthesis including teeth #.12, 13, 22 and 23.



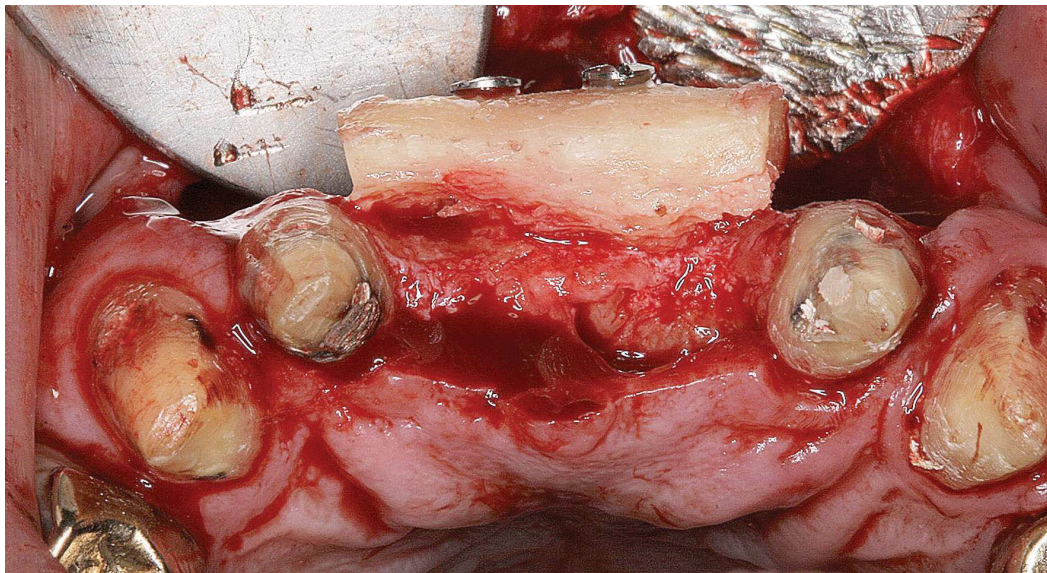


**Figure 3.** After incision and mucoperiosteal flap elevation, the existing bone defect can be completely visualized and measured. It is noteworthy that, in this initial photograph, only gingival thickness is apparent.

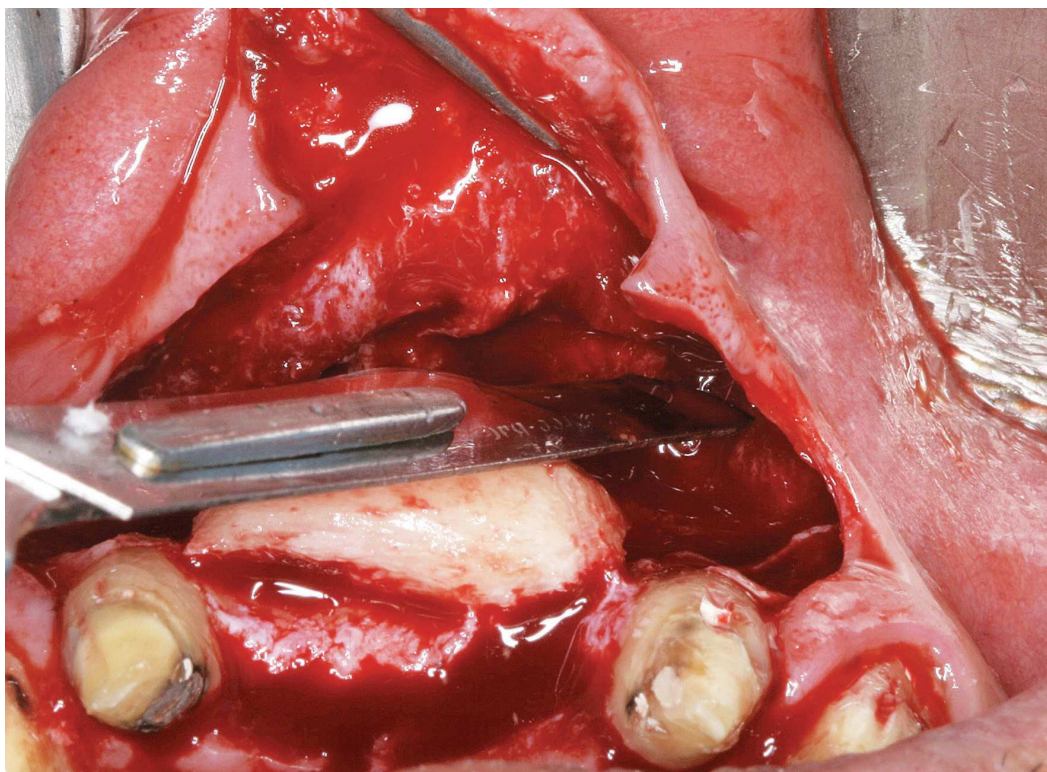


**Figure 4.** Corticomedullary bone block being harvested from the chin..



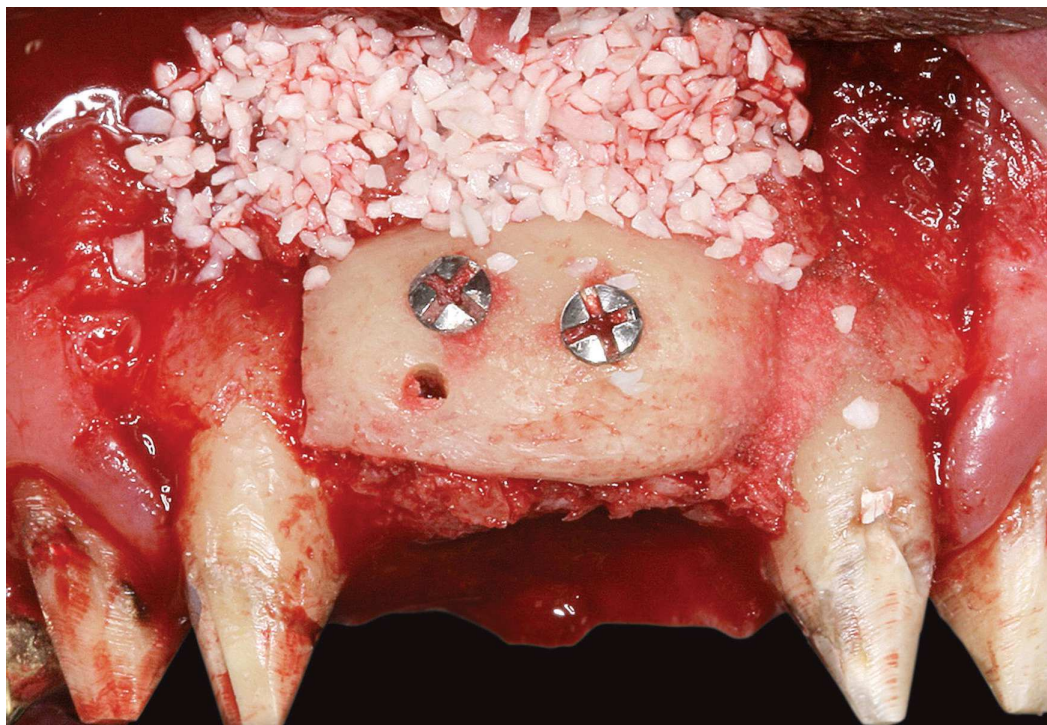


**Figure 5.** Bone block adapted and fixed to the receiving site. Note close contact between the block and the receiving bed. This is important to prevent the invasion of soft tissue in this region, which could lead to graft failure.

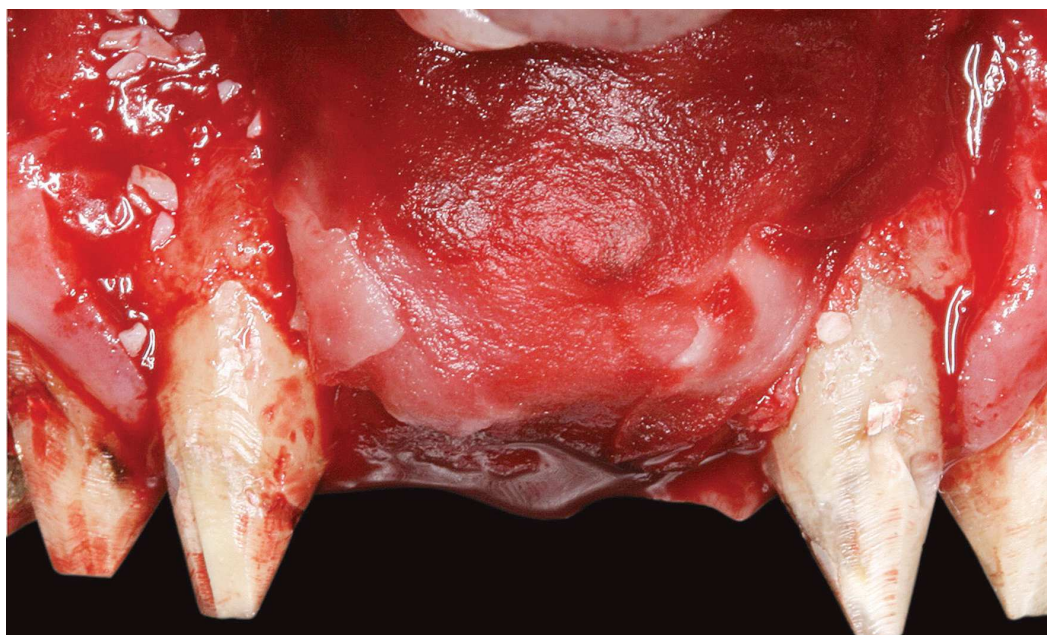


**Figure 6.** Removal of sharp angles and release of the periosteum with a scalpel blade so that the flap settles passively onto the graft, thus ensuring airtight closure.





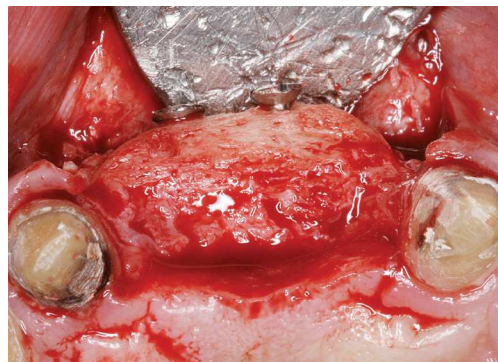
**Figure 7.** Placing a layer of lyophilized bovine bone (Lumina-Bone, Critéria) on all surfaces so as to provide greater homogeneity to the reconstruction procedure.



**Figure 8.** Bone block and lyophilized bovine grafts were covered with resorbable collagen membranes (Lumina-Coat, Critéria) to isolate and protect the graft.



**Figure 9.** Five months after grafting, there is substantial gain in thickness, as well as a healthy aspect of the soft tissue in the region, suggestive of a successful reconstruction.



**Figure 10.** Excellent incorporation of bone block into the receiving bed. In observing the region of the graft screws, it is possible to assert that virtually no resorption took place. Importantly, heterogeneous material was completely resorbed.

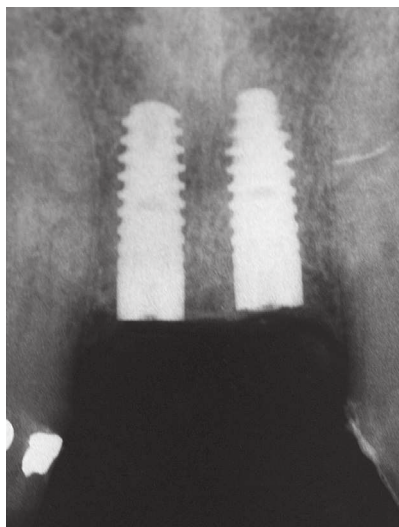


**Figure 11.** After removing the graft screws, milling was started in order to place the implant.



**Figure 12.** Dental implants installed according to surgical guide.





**Figure 13.** Periapical radiograph obtained after implant placement.



**Figure 14.** Panoramic radiograph obtained at the end of patient's rehabilitation.



**Figure 15.** Rehabilitation final outcomes.



## DISCUSSION

The purpose of Oral Implantology is to restore patient's masticatory and phonetic function while providing them with comfort and esthetics in spite of other conditions such as atrophy, disease or injury in the stomatognathic system.<sup>16,17,18</sup> Accordingly, oral rehabilitation with dental implants is seen as a valid option, given that it is predictable, long lasting and effective for the treatment of single-unit, partially or totally edentulous patients. However, certain clinical situations often emerge and render this type of rehabilitation very challenging due to requiring more complex surgical techniques such as bone grafting.<sup>6,8,9,19,20,21</sup>

Scientific evidence reveals that maxillary implant success depends on the amount of available bone and bone quality. Moreover, it shows that bone grafts can readjust atrophic ridges and lead to success rates similar to what is achieved in non-reconstructed areas.<sup>1,3,5,16,18</sup> Nevertheless, performing reconstructive procedures of excellence remains a challenge.<sup>7</sup>

Autogenous bone is reported as the gold standard of bone reconstruction, especially in cases in which alveolar ridge defects are little predictable.<sup>5,8,9,19,20</sup> However, resorption of this type of graft is high — about 25% — which has become a source of constant concern among surgeons, leading many professionals to overcorrect bone defects.<sup>7,13,14,15</sup>

In recent years, placing a layer of heterogeneous material and resorbable collagen membrane over autologous bone with a view to reducing resorption has gained ground in the literature.<sup>10-15</sup> Monje et al<sup>10</sup> conducted a study using computed tomography to assess gain in thickness of

19 grafts blocks harvested from the iliac crest or the mandibular ramus and associated with heterogamous graft. The authors concluded that this is a predictable technique which allows considerable gain for implants placement.

Likewise, Maiorana et al<sup>15</sup> histomorphometrically assessed the effectiveness of combining autograft with anorganic bovine bone. The authors state that the proposed technique is capable of preserving the volume of graft blocks, especially those containing a substantial amount of cancellous bone, as it is the case of the iliac crest.

In the present clinical case, a block of autogenous graft bone harvested from the chin (cortico-spinal block) was placed and covered on all surfaces with heterogeneous bovine material. A resorbable collagen membrane was placed, and by the time the implant was inserted, the heterogeneous material had been completely resorbed. Additionally, the autogenous block was utterly incorporated with virtually no resorption.

The results achieved in the current study are consistent with data presented in papers published in the literature. It can, therefore, be asserted that the combination of the types of material described above provides both surgeons and patients with clinical safety and security.

## FINAL CONSIDERATIONS

The combination of autogenous bone graft and heterogeneous material yielded satisfactory clinical results, providing tangible gains in terms of alveolar ridge thickness while facilitating dental implant placement in appropriate positions.

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