



Autogenous Block Graft with Simultaneous Implant Placement in the Aesthetic Zone: A Case Report

Maudina Dwi Heriasti¹ Muhammad Aryaditha Yunial¹ Tri Ardi Mahendra² Vera Julia¹
Lilies Dwi Sulistyani¹ Yudy Ardilla Utomo¹

¹ Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia

² Department of Prosthodontics, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia

Address for correspondence Yudy Ardilla Utomo, DDS, Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Indonesia, Jalan Salemba Raya No.4, Jakarta Pusat, Jakarta 10430, Indonesia (e-mail: yudyardillautomo@gmail.com).

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Abstract

Osseous defects in the alveolar ridge can occur from trauma events, periodontal disease, and infections. Reconstruction of osseous defects requires bone augmentation, which is a crucial component of dental implant procedures, particularly in the aesthetic zone where the availability of sufficient bone volume can be a challenge. The symphysis block graft is a technique that has gained popularity in recent years for bone augmentation, by harvesting a small section of bone from the mandible. The standard procedure usually takes up to 3 to 6 months of a waiting period for implant placement after a bone graft procedure; however, it is not impossible to simultaneously do the single stage surgery of block graft and implant placement in the aesthetic zone. This article aims to evaluate the outcome of autogenous block graft with simultaneous implant placement procedure in the aesthetic zone in one single visit. A 21-year-old man presented with an edentulous area in the upper front teeth and wanted to get tooth replacements of his missing central and left incisors. The front teeth were avulsed and extracted after a road traffic accident 3 months earlier, and the treatment given was a closed reduction with arch bars for 2 months. The osseous defects in labio-palatal width was reconstructed with a symphysis block graft as the donor and two implants were inserted into the recipient site in a single stage surgery. A single stage surgery involving an autogenous block graft with simultaneous implant placement is an effective technique and can be considered safe with a high survival rate. However, further studies with long-term evaluations need to be conducted to provide more evidence to support this protocol.

Keywords

- ▶ aesthetics
- ▶ chin graft
- ▶ implants
- ▶ autogenous bone graft

Introduction

Rehabilitation of oral edentulous site with dental implants has been the treatment of choice owing to its desirable long-term results. The site of implant placement should be in an

ideal implant bed but is often compromised due to resorption of bone defects of various etiology.¹ Bone defects in the maxilla can occur from trauma, periodontal disease, or infections. Hence, the reduction of volume in the alveolar bone will result in inadequate bone volume that is required

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for standard implant osseointegration. Other than that, resorption of the maxillary bone will create aesthetic and functional issues for the patient and it is usually not favorable to place a straightforward implant placement to the site.² Reconstruction through bone augmentation is done to establish adequate height and width of bone volume, allowing an appropriate bed for implant placement. Many options for grafting materials are available, but autogenous bone graft is considered the gold standard, mainly because of its osteogenic potential. Autogenous bone grafts can be harvested from various donor sites, both extraoral and intraoral, such as from the iliac crest, calvarium, tibia, and costume, as well as from the retromolar, ramus, or symphysis areas.³ The mandible is one of the most frequent sites for harvesting because the skull and jaw bones are mainly formed by intramembranous ossification, which shows less resorption than endochondral bone grafts and more rapid revascularization. Mandibular symphysis is one of the ideal and preferable sites for block graft harvesting mainly because of its easy access and ability to provide an adequate amount of bone needed.

The standardized protocol in recent years of the autogenous block graft and implant placement is a two-stage surgery, which consists of the bone graft procedure, and the bed was left to heal for a waiting period of 3 to 6 months, followed by implant placement. This was conducted to ensure bone maturation of the grafts with the implant bed. However, the waiting period was too long and resorption occurred at the alveolar sites nonetheless. Studies have shown good results in conducting the single-stage surgery by performing bone augmentation and implant placement simultaneously. This procedure takes up fewer dental visits, is more convenient for the patient, and is desirable. This article reports a case of a simultaneous autogenous block graft with implant placement in the aesthetic zone.

Case Report

A 21-year-old man presented with an edentulous area in the upper front teeth and wanted to get tooth replacements of his missing central and left incisors (→ Fig. 1). The front teeth were avulsed and extracted after a road traffic accident

3 months earlier, and the treatment given was a closed reduction with arch bars for 2 months. The patient wanted to get a replacement for his teeth especially because he was concerned about the aesthetic issue. At the time of presentation, the patient was healthy, with no local or systemic pathologies.

From the extraoral finding, the patient had no facial asymmetry, and his mouth opening was normal. From the intraoral examination, an edentulous site on teeth 11, 21, and 22 was observed with a significant insufficient labial-palatal volume of the area. The condition of the gingiva was normal, with no sign of inflammation. A cone beam computed tomography (CBCT) revealed bone loss on the labial of the maxillary anterior site. An autogenous block graft from mandibular symphysis was planned to reconstruct the bony defect on the maxillary anterior area, followed by an implant placement simultaneously during the same surgery. The size of the defect was measured using Horos software based on the CBCT data.

Recipient Site

A vasoconstricting agent was injected into the surrounding area of the operation site. A trapezoidal incision was made along the region with vertical incisions were placed on the distal side of teeth 13 and 23. The mucoperiosteal flap was raised with a raspatorium. The width and height of the defect site were measured on the area of teeth 11 to 22. The initial plan was to insert the implants on tooth regions 11 and 22 and a block graft in those areas; however, intraoperative evaluation resulted in severe bone loss and a very thin labial-palatal width of tooth region 11. The mesiodistal space on tooth 11 was approximately 5 mm, which was considered very short. Hence, the plan was changed to put the implants on teeth 21 and 22, with a block graft only on the left maxilla, and to put a cantilever on tooth 12.

Donor Site

A vestibular incision approach was made on the inferior labial mucosa starting from tooth 34 and extending to tooth 44. The mucoperiosteal flap was then elevated until the donor site was fully identified and exposed. Osteotomy was done with a piezoelectric instrument device to create a rectangular cut

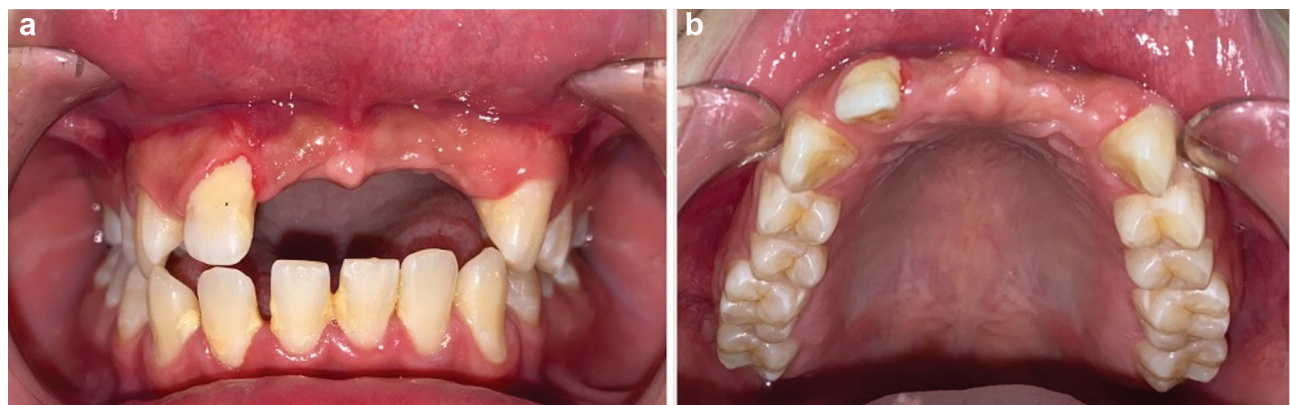


Fig. 1 Initial intraoral findings from (a) frontal view and (b) maxillary arch dentition.

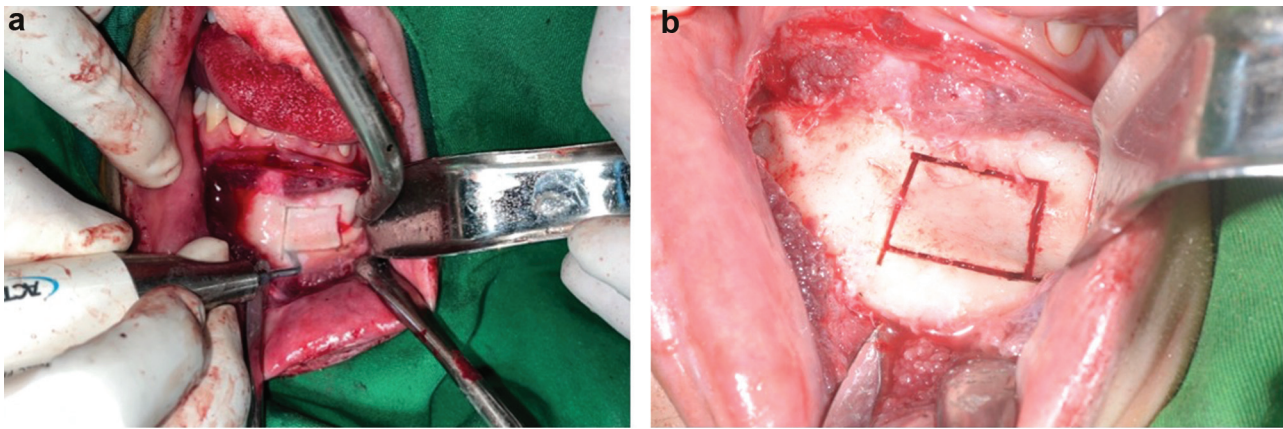


Fig. 2 (a) Bone harvesting from the mandible using piezosurgery. (b) The harvested bone site after using the piezosurgery before osteotomy.

on the symphysis, avoiding the apex of the anterior mandibular teeth (►Fig. 2). The cut was made monocortically measuring 1.5×2.5 cm, and was harvested with an osteotome. The block graft was stored in a sterile saline solution. A collagen sponge was then placed into the donor site.

Implant and Graft Placement

Two implants were inserted into the sites of teeth 22 and 21 using 3.7-mm-diameter and 12-mm-long implants (►Fig. 3). The cover screws were placed on both implants. The block graft was then carefully placed on the labial side of the implants, with minimal recontour to adapt to the recipient

site, then a screw was placed to ensure immobilization of the block graft. A resorbable membrane was placed to cover the operation area, including the implant sites, leaving only the cover screw areas exposed. The operation sites on the maxilla and mandibular symphysis were then irrigated using sterile saline and sutured with 4-0 Vicryl. Postoperatively, the patient was given post-op instructions and home medications including antibiotics and analgesics.

After 12 weeks, the patient was recalled and checked on the operation site. The recipient site showed adequate soft tissue healing. At this appointment, the cover screws were both replaced with healing abutments.

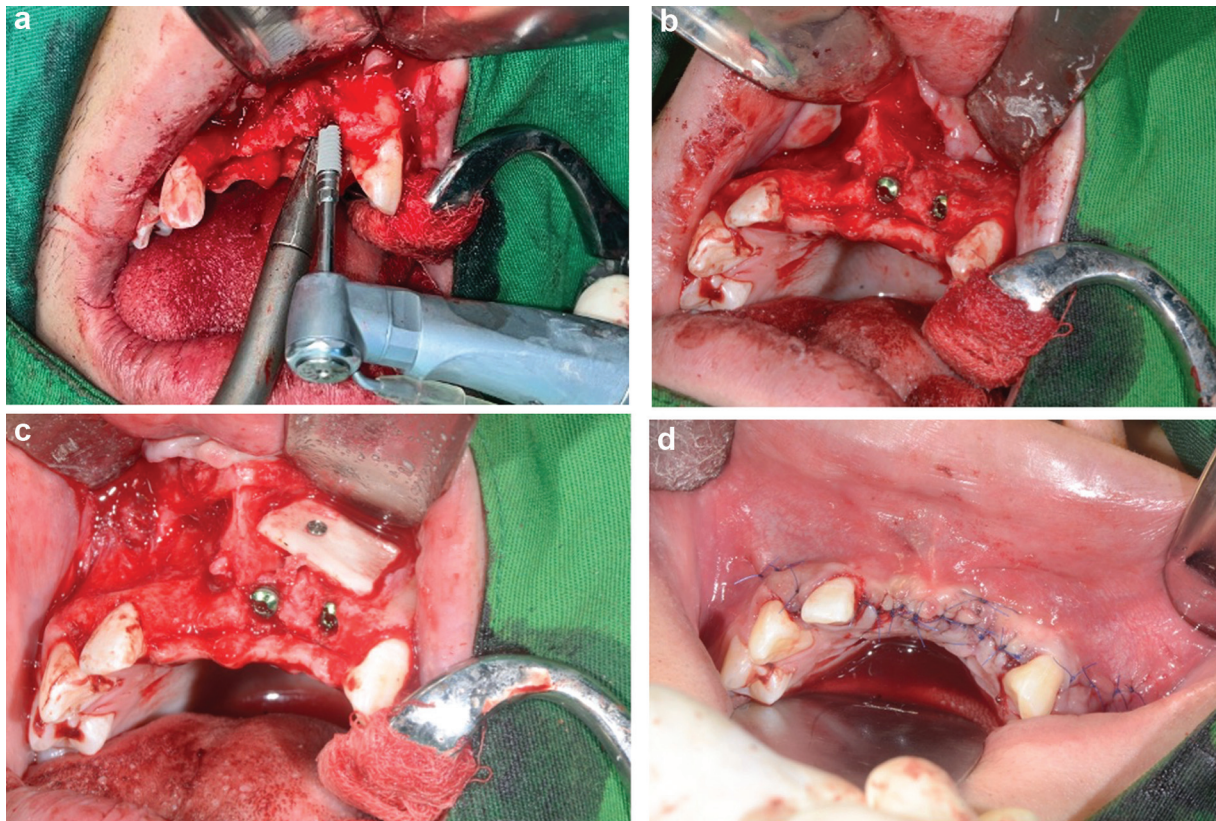


Fig. 3 (a) Implant placement on the surgical site, (b) followed by the implants inserted into the site. (c) A block graft was fixed with a single screw on the labial surface and (d) flap closure on the surgical site.

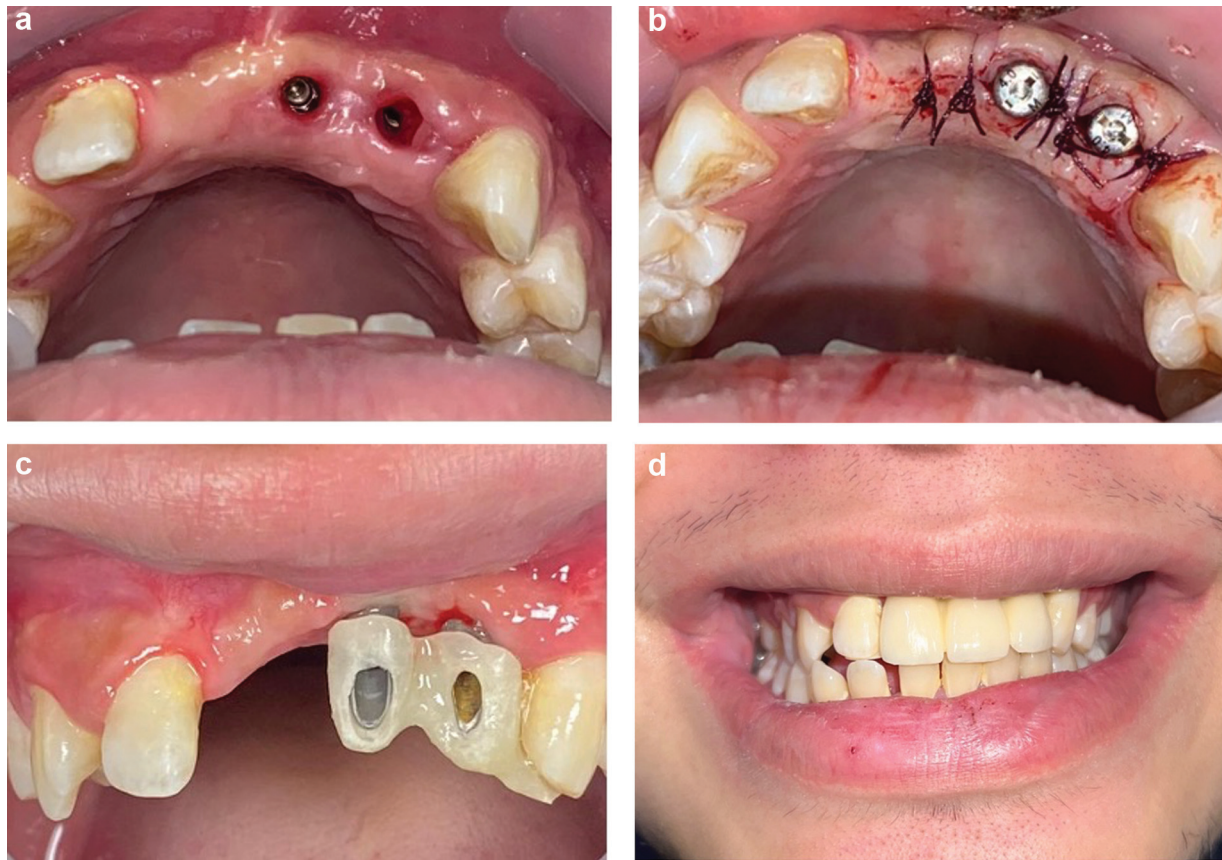


Fig. 4 (a) The healing abutments were placed. (b) Two weeks after healing abutment placement. (c) Crown insertion with titanium abutments and (d) at 2 months of follow-up after crown insertion.

Prosthetic Rehabilitation and Postoperative Evaluation

The patient came 2 weeks after the implants were uncovered and placement of healing abutments was done. The marginal soft tissue showed no inflammation and healed completely (►Fig. 4a, b). The final impression of the implant was made. Ceramic crowns were fabricated and placed in a customized titanium abutment, with a cantilever bridge on tooth 11 (►Fig. 4c). The cantilever bridge was considered because of the short mesiodistal length on tooth 11, which was evaluated intraoperatively. The occlusion contact was made very light on anterior teeth restoration, and a canine guidance articulation was observed. Hence, the occlusal force on the restoration was safe and tolerable.

The patient came 2 months after crown insertion to check on the implant condition (►Fig. 4d). No sign of inflammation or infection was observed. The implants were intact and there was no mobility on both implants. The patient was instructed to get regular check-ups for 6 months to 1 year.

CBCT Measurement

The palatal-labial width of the maxilla on teeth 21 and 22 areas was measured preoperatively through CBCT using the Horos application from a sagittal view. The width of the area of tooth 21 was 6 mm, while the area of tooth 22 was 7 mm. At 6 months postimplant and block graft placement, we observed a significant increase in the width of the alveolar

bone. The width of the areas of teeth 21 and 22 was measured at 1.1 cm (►Fig. 5). A 4- to 5-mm gain was observed at 6 months postimplant on the recipient site.

Discussion

Ridge augmentation for prosthetic rehabilitation of insufficient bone volume in the maxilla can be performed with many available methods, such as distraction osteogenesis, bone splitting, and guided bone regeneration, depending on the size of the defect. In some cases, the autogenous block graft is considered the gold standard to restore the bone volume to ensure implant primary stability. The autogenous block graft also has a major advantage as a source of osteogenic cells, with osteoinduction and osteoconductive properties, and carries no risk of adverse immunological reaction.⁴⁻⁶ Four main characteristics of ideal bone grafts are osteoconductivity, which allows scaffold bone regeneration; osteoinductivity, which has growth factors to induce new bone formation; osteogenesis; and bone binding to integrate with soft tissue. Autogenous grafts harvested from the oral cavity can include soft tissue and bone grafts. Soft tissue grafts, such as free gingival grafts, can be obtained from the hard palate, maxillary tuberosity, and the posterior part of the hard palate. On the other hand, autogenous bone grafts can be harvested from intraoral donor sites such as the crista zygomatic-alveolar, ramus mandible, and symphysis mandible. Additionally, a unique source of autogenous bone graft is the use of

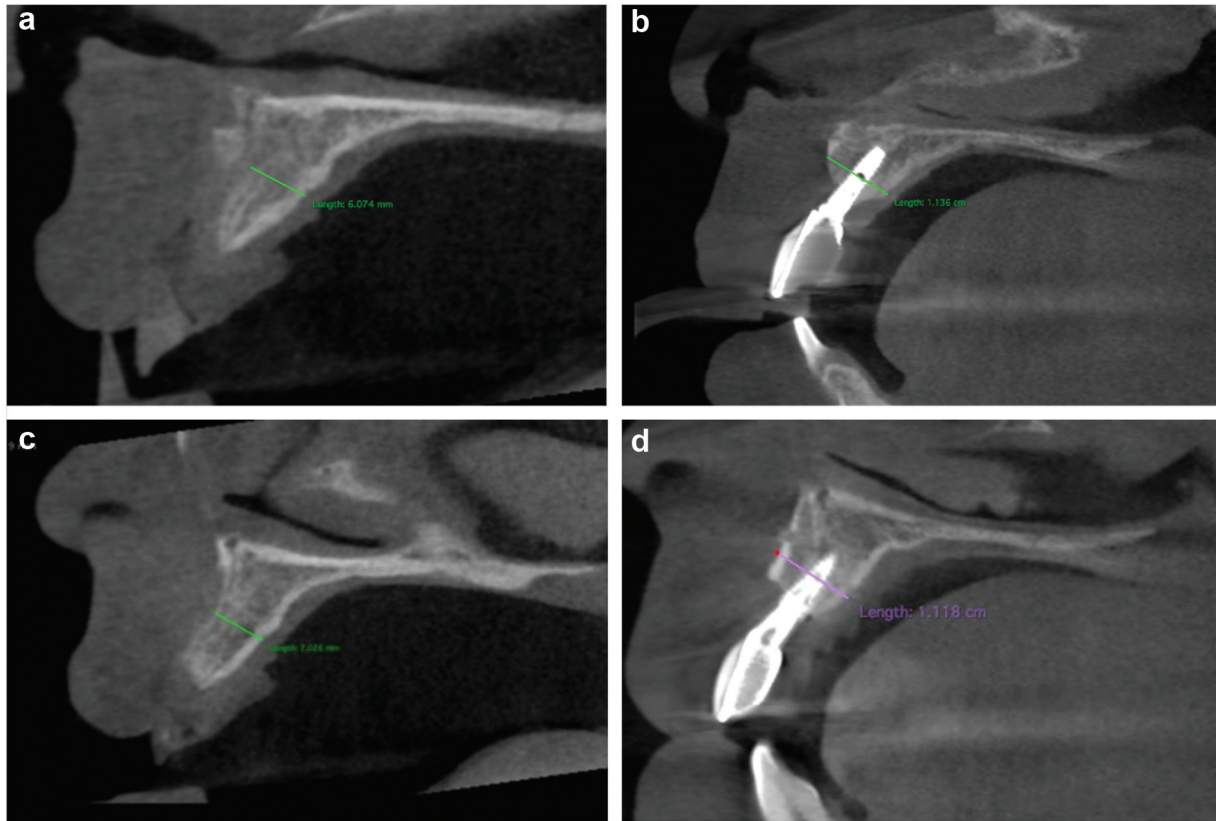


Fig. 5 Cone beam computed tomography evaluation of (a, b) tooth 21 shows 5-mm gain at 6 months postoperatively and (c, d) tooth 22 shows 4-mm gain on the bone at 6 months postoperatively.

extracted teeth, known as autogenous tooth bone graft, which closely resembles bone tissue and eliminates the need for a separate donor site surgery. The use of autogenous grafts from the oral cavity is advantageous due to the proximity of the donor and recipient sites, reduced risk of infection, and faster healing time.⁷⁻⁹ Autogenous bone grafts have been shown to possess all the materials and also to have good biocompatibility; hence, it has been the gold standard of bone grafting materials.¹⁰ Harvesting autogenous block grafts from the mandibular symphysis is one of the recommended options because of its simple and easy access and less morbidity, and because it can be performed in an outpatient setting. Also, few studies showed excellent survival and success rates. A 20-year follow-up study evaluated the stability of marginal bone levels and it showed that implant stability did not change significantly, although minimal resorption was found on the horizontal bone. This was said to be caused by the embryological nature of the bone.¹¹ However, the complications of these procedures, such as pain, neurosensory disturbances, and loss of pulp sensitivity on the lower anterior teeth following harvesting of bone graft from the symphysis, should be minimized.¹²

A symphysis mandibular block graft is an autogenous bone graft obtained from the mandibular symphysis, which is the central portion of the mandible. This type of graft is commonly used for augmenting osseous defects of the alveolar process, particularly in preparation for dental implant placement. The mandibular symphysis is a favorable donor site for this purpose due to its local availability, accessibility, and relatively

lower resorption rate of the graft compared to other bones in the region. The bone harvested from this area is mainly cortical in nature, allowing for rigid fixation and providing good primary stability. The graft can be used to address horizontal and vertical ridge deficiencies, and studies have shown that it yields corticocancellous particulate material in addition to a block graft, making it a valuable source for ridge augmentation procedures. The use of corticocancellous bone grafts is preferred in certain clinical scenarios due to their unique properties. Corticocancellous grafts combine both cortical and cancellous bone, providing structural support from the cortical component and excellent osteogenic potential from the cancellous component. This combination offers a balance between structural integrity and osteogenic properties, making it suitable for various bone grafting procedures, including alveolar bone grafting, cleft lip and palate repair, and orthopaedic applications.¹³⁻¹⁵ The use of the mandibular symphysis as a donor site for block grafts is well documented in the literature and has been shown to provide excellent results for osseous reconstruction and implant placement.^{4,16,17} The mandibular symphysis block graft can allow augmentation of up to 6 mm in horizontal and vertical dimensions or up to the three-tooth defect. The cortical cancellous graft is around 3 to 11 mm, with an average of 5 to 8 mm. The bone density of this graft type is cortical-dense marrow type D1 or D2.¹⁰ The techniques for harvesting the symphysis block graft can be done through a sulcular or vestibular incision, according to the surgeon's preference. In this case, we used a vestibular approach because

it allows less time in suturing back the flap with minimal risk of gingival recessions. The graft is outlined with a tapered fissure bur, 5 mm below the root of the incisors and canine teeth, and 4 mm from the inferior border, with approximately 7-mm-deep holes made along the design.^{16,18}

The timing of implant placement after the block graft procedure, according to the standard procedure, often ranges from 3 to 6 months postoperatively. It is recommended to wait until bone maturation, taking into consideration the size of both the donor and recipient sites. The disadvantages of conducting the two-stage surgery are delayed treatment of the prosthetic rehabilitation, postoperative morbidity, and length of overall treatment.¹⁹ A few kinds of literature have discussed the benefits of simultaneous or one-stage surgery protocol of autogenous block graft and implant placement. This single-step protocol was described as safe and effective, but the standard protocol remains the two-stage surgery. Von Arx and Buser²⁰ have stated that the main criterion for the best time of simultaneous implant placement after bone block graft was the volume of the bone at the host site.^{21,22} This case had mild to moderate bone loss in which a simultaneous implant placement and primary stability could still be achieved.

One of the benefits of a single-stage surgery that was evaluated was the better osseointegration of implants with minimal marginal bone loss. Insertion of implants during graft maturation allows better integration and stability, and thus success was achieved. Another factor supporting the benefit of simultaneous implant placement after a block graft procedure is that the characteristics of bone regeneration are more likely to be dependent on the recipient bed rather than the grafted bone. A study by Ma et al showed a high survival rate (93.1%) with simultaneous implant placement after a follow-up of less than 2.5 years, based on a large, pooled data (1,368 implants).^{19,23,24}

This case reported great results during the 6-month postoperative period, with minimal horizontal resorption and bone loss. Neither crown nor implant mobility was not observed in the postoperative period. A total gain of 4 to 5 mm was adequate to serve as an implant bed. The bone-implant contact also showed good integration, indicating successful osseointegration. Nevertheless, this case report needs a long-term evaluation to observe the overall implant survival.

Conclusion

A single-stage surgery of the autogenous block graft with simultaneous implant placement is an effective technique and can be considered safe with a high survival rate. However, further studies with long-term evaluations are needed to provide more evidence to support this protocol.

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Conflict of Interest

None declared.

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