

## Maxillary Ridge Augmentation Using Autogenous Block Bone Grafts Harvested From Symphyseal Region

*Joshi Samir, More Vijaysinh, Purkayastha Rakhi, Pawar Sudhir, Nair Krishnanunni, Pawar Prashant*


Department of Oral and Maxillofacial Surgery, Bharati Vidyapeeth Dental College and Hospital,  
Pune, Maharashtra, India

Email ID: [rakhipurkayastha@gmail.com](mailto:rakhipurkayastha@gmail.com)

### ABSTRACT

Alveolar ridge resorption is a common phenomenon after loss of tooth, which changes the geometry of the bone available for placement of dental implant. In the current era often patients urges osseointegrated implants for replacing their missing teeth to the clinician. Lack of bone quantity is the primary reason for avoiding such treatment. The solution is to re-establish the ridge height consistent with suitable load-bearing lamellar bone for implant placement and long term stability. Use of autogenous bone grafts continues to represent the “gold standard” in reconstructive surgery of implant site despite recent advances in bone grafts and bone-substitute technology. Here, we present a case of a 25 year old patient treated with anterior maxillary ridge augmentation using autogenous block bone grafts harvested from symphyseal region followed by placement of dental implant after six months of reconstructive surgery.

**KEYWORDS:** Alveolar defect, Autogenous bone graft, Maxilla, Ridge augmentation, Osseointegrated dental implants, Symphysis graft, Mandibular incisive nerve.

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## INTRODUCTION

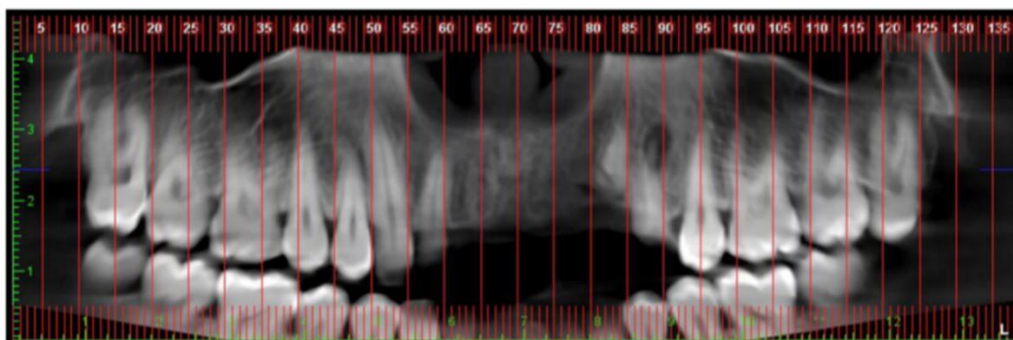
Loss of teeth leads to alveolar bone resorption that can further result in severe jaw atrophy and gradually lead to an unfavorable maxillo-mandibular relationship. Sufficient volume and integrity of the alveolar bone is required for implant-supported rehabilitation of the edentulous ridge.<sup>1</sup> Alveolar ridge augmentation procedures are often required to manipulate maxillo-mandibular relationships, vertical distance between the jaws, re-establish ideal inter-arch occlusion,<sup>2</sup> and to increase bone volume for implant placement. Usually to repair large bone defect extra oral graft is harvested but alveolar ridge defects can be reconstructed with alloplastic bone, osteoinductive agents, or intraoral bone grafts.<sup>3</sup> Intramembranous autografts can be acquired from intraoral sites such as mandibular symphysis, angle of the mandible, ramus, bony exostosis and maxillary palate and tuberosity.<sup>4</sup>

## CASE REPORT

A 25 year old male patient reported with chief complaint of missing upper front teeth since 1 year. He gave a history of trauma to the upper front region of the jaw 1 year back and was wearing removable partial denture. All the treatment options were explained to him and he opted for implant supported restorations for the missing teeth. On clinical evaluation, adequate lip support noted, the gingival biotype was thick with adequate width of attached gingiva and favorable arch position. Missing 11,21,22 noted. Root piece with 12,23,24 [Figure-1]. The radiological (panoramic and periapical) examinations revealed that there was lack of alveolar ridge height and width [Figure-2a] [Figure-2b]. Periapical abscess noted with 24. Hence it was decided to augment the alveolar crest with bone graft. The mandibular symphysis region was selected as the donor site for bone augmentation.



[Figure-1] Preoperative photograph showing partially edentulous maxilla



[Figure-2a] Preoperative scan showing the alveolar ridge and periapical abscess with 24



[Figure-2b] Preoperative scan showing vertical and horizontal bone loss.



[Figure-3] Pre-operative diagnostic casts

Pre-operative radiographs and diagnostic casts were prepared [Figure-3]. The patient was healthy with no systemic complications for intraoral surgery and implant placement. Surgery was carried out as an outpatient procedure. Pre-operative oral antibiotic prophylaxis was given. Painting and draping was done. Local anaesthesia (2% lignocaine hydrochloride with epinephrine 1:2,00,000) was injected.

At recipient site, using surgical blade no.15 crestal incision extending from 11 to 24, bilateral oblique releasing incision was given distal to 11 and 24, a full-thickness mucoperiosteal flap was reflected to visualize extent of bone loss [Figure-4].

At donor site, using surgical blade no.15 vestibular/alveolar mucosa incision was given extending from distal region of 33 to 43. A safety distance of 1 cm was maintained from the mucogingival junction to permit adequate tissue for watertight closure at the end of the surgery. All the bone cuts were placed perpendicular to the cortex in a right angle to the vestibular plain of the symphysis with 702L straight fissure bur under copious irrigation before the graft harvest. The superior cut was placed 5 mm below root apices to prevent injury to tooth roots. The inferior cut was placed 5 mm above the lower border. Vertical cuts were placed at least 5 mm away from the mental foramen. Care should be taken to avoid injuring mental nerve. [Figure-5]



[Figure-4] Receptient site,Mucoperiosteal flap raised to expose the bone loss from the buccal cortex.



[Figure-5] Donar Site, Harvesting corticocancellousbone graft from mandibular symphysis.



[Figure-6] Bone block loosened using chisel and mallet.



[Figure-7] Decortication and perforation of recipient site for graft transplantation.



[Figure-8] Symphysis graft stabilized using Titanium screw



[Figure-9] Absorbable collagen membrane was used to stabilize the graft material for guided bone regeneration.



[Figure-10] Recipient site closed with interrupted suture



[Figure-11] Donor site closed with interrupted suture

The bone block was carefully loosened and lifted from the donor bed [Figure-6] Chisel and Mallet was used to free the block graft from the donor site. Before placing the autogenous graft, recipient site was prepared for predictable incorporation of block grafts which involved decortication and perforation of underlying bone marrow to accelerate revascularization of the graft [Figure-7]. The bone graft obtained from symphyseal region was also prepared to allow intimate contact with the recipient site to facilitate graft incorporation. Block graft was harvested on the recipient site. Titanium screw was used to stabilize the onlay bone graft on the recipient site. Hydroxyapatite bone graft particles were filled in space existing at the edges of the autogenous bone graft [Figure-8]. Absorbable collagen membrane was used to stabilize the graft material for guided bone regeneration [Figure-9]. Finally the mucoperiosteal flap was relieved to cover the bone graft and interrupted suture was placed [Figure-10]. After harvesting the bone block graft from donor site, the donor site was sutured [Figure-11]. Extra-oral compression/pressure dressing given to prevent ptosis of lip and muscle. The patient was prescribed antibiotics, analgesics and antacid for 7 days. Patient was advised to rinse with 0.12% chlorhexidine gluconate for a period of 15 days. Oral hygiene instructions were reinforced. The healing period of six months was given for adequate bone remodelling antimicrobial mouthrinse for 1 week.

## DISCUSSION

Inadequate bone in the anterior maxilla prevents primary implant stability or results in esthetic and functional compromises in implant restorations.<sup>[5]</sup> Detailed clinical and radiological examination should be done to identify the adequate amount of bone loss and plan accordingly for various bone augmentation procedures. Different type of grafts are available for alveolar reconstruction which include autografts, allografts, xenografts, synthetic grafts, and osteoinductive agents. Among numerous techniques to augment bone volume, GBR and the bone graft materials or usage of both are reported to give best and predictable results <sup>[6]</sup>Intramembranous autogenous osseous grafts includes mandibular symphysis, mandibular ramus, angle of mandible, maxillary tuberosity and intraoral exostoses, these are considered the “gold standard” for enhancing intraoral osseous volume.<sup>[7]</sup>

Mandibular symphysis site offers enormous amount of intraoral bone with easy surgical access and less post operative complications.<sup>[8]</sup> Symphysis grafts are blocks of trabecular and cortical bone and are composed of osteoclasts, osteocytes and osteogenesis inducing protein. Advantage of Symphysis graft is, it is thick corticocancellous block compared to purely cortical lateral ramus bone block graft.<sup>[9]</sup>

Depending on the bone volume defect of maxillary alveolar ridge various technique of bone graft harvesting from mandibular symphysis for bone augmentation has been published. All the techniques described mainly have the same principle to repair bone defect by bone augmentation.

Different technique of harvesting such as J-graft Technique, Trephine technique, rectangular blocks or cylindrical bone cores can be harvested from symphysis.

Autogenous “L” or “J” Graft Technique can repair three dimensional (Horizontal and Vertical) defects. The graft receives better blood supply as the buccal bone component (Horizontal) lies in close contact to the host bone which then reinforces the occlusal bone component (Vertical). Interproximal bone is attached as it curves from buccal to palatal aspect against adjacent teeth, which supports the papilla for future implant region. Due to bone augmentation the soft tissue is insufficient to close the recipient site therefore bone graft is binded with a pedicle palatal connective tissue graft. It is an ideal method for bone augmentation in esthetic zone with significant resorption. Usually J-graft is harvested from ramus of mandible as the bone is contoured in three dimension which gives precise horizontal and vertical structure.<sup>[10]</sup> But in case of patients with small jaw, restricted mouth opening graft can be harvested from inferior border of mandibular symphysis and carved with round bur to form “L” or “J” shape.<sup>[11]</sup>

## HARVESTING RULES

### Rule of 5's

Misch in 1992, put forward a surgical method to harvest a bone block graft from symphysis to help avoid injury to neuro-vascular components of mandibular symphysis region. Bone cuts, through the outer cortex to the opposite cortical plain to achieve monocortical graft, should be perpendicular to the cortex at 90° to the vestibular region of the symphysis. Superior cut 5 mm below root apices to prevent injury to tooth roots and mandibular incisive nerve. Inferior cut 5 mm from the lower border. Vertical cuts at least 5 mm away from mental foramen. Perforating Lingual cortex should be avoided.<sup>[8]</sup>

### New safety guidelines

In 2008 Pommer et al proposed a modified surgical method to harvest a bone block graft from symphysis as Misch et al.'s method was not possible in all patients. In Misch et al.'s method mandibular incisive canal were jeopardized in 57% patient but with Pommer et al.'s method, risk were lowered to 16% additionally risk was decreased with proper patient selection <sup>[12]</sup>

New safety margins are, depth of the bone graft 4 mm, superior cut 8 mm below root apices. Inferior cut 5 mm above the lower border. Vertical cuts at least 5 mm away from the mental foramen.<sup>[12]</sup>

Trephine Technique involves two design of bone harvesting;<sup>[13]</sup>

- “Audi Design”, also known as 4 trephine cut pattern. Composed of 8 mm, 4 overlapping traphinerings in midline of symphysis following the new safety graft harvesting rule. Used for small bone defect.<sup>[13]</sup>
- “Reverse-olympic design”, composed of 8 mm, 4-5 overlapping trephine rings in midline of symphysis and 6 mm, 2 separate small trephine rings on superior and lateral edges following the new safety graft harvesting rule. Used for large bone defect.<sup>[13]</sup>

## **CONCLUSION**

Alveolar ridge defect in anterior maxilla is the most complicated site to maintain esthetics during implant placement. Mandibular Symphysis is the favourable site for harvesting graft due to its dense quality and quantity compared to any other intraoral donor sites. Thick cortical layer of the graft decreases resorption and the cancellous part helps to regenerate faster. Due to osteoclastic resorption, graft requires less healing period compared to other osseous repair technique. Symphysis region is easy to access, less time consuming, less post surgical complications, no hospitalization and no scar. Appropriate case selection and precise surgical planning are requirements for successful transplantation. Utilizing the modified safety rules, post operative tooth sensitivity due to injury of mandibular incisive nerve after graft harvesting can be minimized.

## **DECLARATION OF PATIENT CONSENT**

The authors certify that all appropriate patient consent forms were obtained. In the form, the patient have given his consent for his images and other clinical information to be reported in the journal. The patient understand that his name and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

## **CONFLICTS OF INTEREST**

There are no conflicts of interest.

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