

Localized Ridge Augmentation with Mandibular Block Autograft and Guided Bone Regeneration: A Case Report

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Abstract

Numerous alveolar ridge defects resulted post extraction, long standing periodontal disease often require surgical intervention before prosthetic rehabilitation. On the other hand, alveolar bone defects affect the prognosis of dental implants and as a result, their reconstruction is must. Although a wide variety of options have been invented, autogenous bone is still the gold standard and has been yielding promising results. The authors report a case of localized alveolar ridge augmentation using autogenous chin block graft in conjunction with other bone substitutes for prosthetic rehabilitation of lower anterior region. Initially, the alveolar ridge was knife edge and the bone volume was insufficient for placement of dental implant. The CBCT analysis post 6 months shows significant increase in bone volume that was now suitable for prosthetic rehabilitation of the edentulous space.

Keywords: chin graft; alveolar ridge augmentation; bone graft; guided bone regeneration; guided tissue regeneration; block grafting; osteo-periosteal flap

Introduction

Dental implants have been proved to be an excellent treatment modality for rehabilitation of edentulous sites. Alveolar ridge undergoes marked resorption within first six months after tooth loss. Numerous reasons are associated with alveolar bone loss starting from tooth loss, sinus pneumatization, periodontal disease, facial and dentoalveolar trauma, odontogenic and non-odontogenic cysts and tumours, oral pathologic lesions, and a variety of other systemic conditions [1].

One of the essential requirement for placement of dental implants is presence of adequate alveolar bone for achieving accurate bio-mechanical and functional position and to create natural soft tissue profile with long-lasting implant stability [2]. Thus, reconstruction of lost alveolar bone is of prime concern. Variety of alveolar ridge augmentation procedures have been studied till date viz, autogenous bone grafting, guided bone regeneration, distraction osteogenesis, ridge splitting, onlay bone grafting, maxillary sinus augmentation, etc [3]. These procedures not only

help achieve ideal implant positioning but also favor prosthetic rehabilitation. Few of these procedures aid in horizontal ridge augmentation while few aid in vertical ridge augmentation [4,5]. The selection modality depends on variety of factors such as defect morphology, number of walls remaining etc. Owing to their inherent osteo-genetic, osteoconductive and osteo-inductive properties that aid in regeneration of lost bone volume [6]. autogenous (cortical/trabecular) bone grafting remains gold standard till date.

Autogenous bone grafting can be done in the form of block grafts or particulate graft. Block grafts are further classified according to their site of origin as intra-oral and extra-oral. Extra-oral block grafts require need for hospitalization, alteration in ambulation, second surgical site operation under general anesthesia. Indeed, the use of intra-oral block grafts has been considered aggressively owing to its ease of accessibility and less discomfort. Most common intraoral sites used are chin, ramus of mandible, or any edentulous alveolar site. Symphyseal region is one of the easiest site for harvesting the graft and also has the advantage of highest amount of cortico-cancellous bone. The mandibular symphysis site should be evaluated for any hard and soft tissue deficiencies, presence of adequate amount of attached gingiva, depth of the vestibule, and endodontic and periodontal assessment of anteriors. Few complications like graft rejection, graft exposure, nerve injury are associated with block grafting and as a result necessary precautions to avoid the same should be well taken care off [7-9].

The concept of guided tissue regeneration was given by Nyman et al that utilizes resorbable and non-resorbable barrier membrane with or without bone grafts. These membranes are most commonly used with bone grafts that further act as a support to the membranes [10].

Due to horizontal and vertical bone deficiency in the present case, a combined horizontal as well as vertical ridge augmentation was a treatment of choice. As a result, autogenous bone grafting with particulate bone grafts was selected as the treatment of choice. This article presents a case report of localized ridge augmentation with mandibular block autograft and guided bone regeneration.

Case presentation

A 45 year old male patient reported to the clinic with the chief complaint of missing tooth in lower front region of jaw. Patient reported no significant contributory medical history.

CBCT was advised to know lost alveolar bone dimensions. Clinical and radiographic examination revealed severe horizontal and vertical alveolar ridge deficiency which indicated severe bone resorption in lower anterior region between 42 and 31 (Figure No 1). Bone height was 19.1mm and 2.5mm in width respectively which was insufficient for prosthetic rehabilitation of that region. As a result, an intra-oral block graft combined with other bone substitutes was considered as treatment of choice since vertical as well as horizontal ridge augmentation was required. The treatment plan was explained and discussed with the patient and accordingly treatment was initiated. Routine haematological investigations were performed and a written informed consent was obtained from the patient.

The surgical phase was initiated with extraoral scrubbing with 5% betadine followed by infiltration of 2% lignocaine hydrochloride as an anaesthetic agent in the lower anterior adjacent tissues. Surgical access was gained through mid-crestal incision followed by vertical diverging releasing incisions from 42 and 31. Further, a full-thickness flap was

reflected to expose the underlying alveolar ridge that was found to be knife-edge in nature (Figure No 2).

The recipient bed was thus prepared and decortications (Figure No 3) were created on it with a help of surgical burs to aid in vascularization and facilitate incorporation of the graft. A block of 10mm by 20mm marking was done and harvested from mandibular anterior symphysis region with piezo-surgical instruments due to its ease of availability (Figure No 4). Piezo-surgery device was adjusted at settings of 25-30 KHz. Reciprocation along with oscillating saws were used with piezo to help prevent further bone loss. The block graft thus obtained (Figure No 5) was then recontoured with a help of a diamond bur / 702 bur to shape off sharp margins. The harvested block graft (Figure No 6) was then placed within the 42 and 31 and fixed with fixture screws for stabilization. Further the space between the graft (Figure No 7) was filled with particulate graft material in which autogenous bone graft was mixed with DFDBA and Alloplastic bone graft material (Perioglas). The surgical site was then covered with resorbable collagen membrane (Cologide) and the blocks were then fixed with auto-tacs (Figure No 8) both coronally and apically. Further sutured with interrupted sutures with 4-0 non-resorbable suture. Extra-oral pressure dressing was given on the surgical site for a total of 3 days.

Patient was prescribed Tab Augmentin 625mg b.i.d for 5 days, Tab Ketorol SP b.i.d for 5 days with a suitable antacid. The patient was advised to carry out appropriate oral hygiene measures for few days and recalled after 15 days for suture removal.

There was uneventful healing observed at both donor as well as recipient sites and as a result, suture removal was carried out at the end of 15th day. There were no post-operative complications experienced.

Radiographic interpretation

Pre-operative CBCT examination revealed bone height of 19.1mm and width of 2.5mm respectively (Figure No 9); while the CBCT examination at the end of 6 months showed a bone gain of 21.4mm in height and 4.0mm in width in horizontal and vertical ridge (Figure No 10). As a result, the total gain in bone height was 2.3mm and bone width was 1.5mm.

Figure legends:



Figure no 1: dimensions of the defect pre-operatively



Figure no 2: *incision and flap reflection*



Figure no 6: *harvested block graft*



Figure no 3: *decortication*

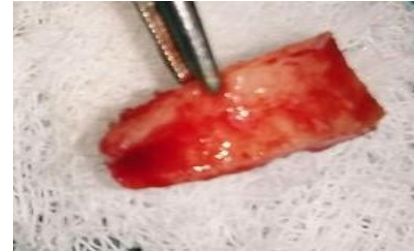


Figure no 7: *interblock space filled with particulate graft material*



Figure no 4: *block graft marking done with piezosurgery*



Figure no 8 : *auto-tacs positioned on the block graft*



Figure no 5: *harvesting block graft with piezosurgery*



Figure no 9 : *pre-operative radiograph (cbct)*

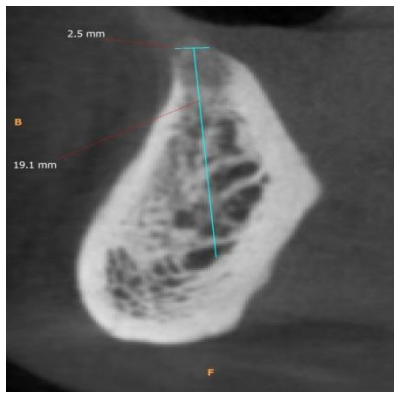
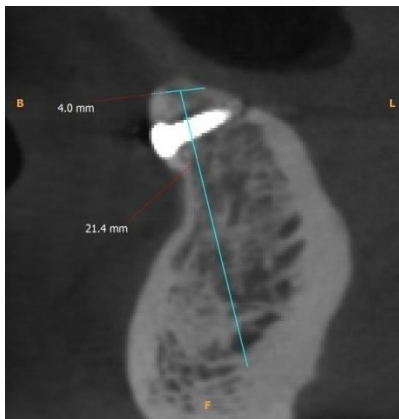


Figure no 10 : post-operative radiograph (cbct)



Discussion:

The prognosis of dental implant does not merely depend upon osseointegration but also on establishment of an ideal base for implant supported prosthetic reconstruction. The available literature evidence supports placement of implant in alveolar ridge width of atleast 5 mm and a bone height of 8-10mm for favourable outcomes. Any alterations in the ridge dimensions and available bone predispose the placement in anatomically compromised conditions further increasing the chances of implant failure. As a result, a variety of techniques have been employed till date for horizontal ridge augmentation including the use of numerous bone grafts, guided bone regeneration with resorbable and non-resorbable membranes and also with titanium mesh, ridge splitting, alveolar distraction osteogenesis and use of block grafts [11].

Although, a variety of bone grafting and bone substitute materials have been available now, intra-membranous autogenous bone grafting remains gold standard till date due to its inherent osteogenic, osteoconductive and osteo-inductive properties [12].

In the present case report, the reason behind selection of chin as the bone harvesting site was mainly because of ease of access to chin and was closer to recipient site making second surgical site avoidable, along with that sufficient amount of cortico-cancellous nature of the symphyseal bone help in enhancing revascularising property of the cancellous bone and mechanical support with rigidity of the cortical bone

Giesenhagen in 2006 was the first to report bone-ring technique and he stated this technique could help provide 3-dimensional augmentation followed by immediate implant placement in a single surgical visit [13]. **Pommer et al 2008** reported a new set of guidelines for harvesting block

graft, in 56% of patients donor site can be used for harvesting graft of about 10mm, whereas a 8mm of graft could be easily harvested from this region in about 74%, inadvertently a large number of patients about 90% of them could provide only 6mm of graft. The remaining of 10% population is considered not so suitable for harvesting chin graft [14]. **Bansal et al 2014** carried out prosthetic rehabilitation of missing anterior periodontally compromised tooth treated with natural tooth pontic preceded by horizontal bone augmentation using autogenous chin block graft yielded excellent results [15]. In parallel, **Desai et al 2015** used autogenous chin block graft at periodontally compromised extraction site is a promising option [16].

In our present case we procured chin graft through piezosurgery owing to its high precision and operating sensitivity and ease to differentiate between cortical and cancellous bone while procuring block.

As space maintenance is one of the main criteria for GBR, in the present case DFDBA (60%) infused with Perioglas (40%) to fill the inter-block space was preferred with resorbable collagen membrane Cologide to reduce bone resorption. Comparably, in our case too we used bio-resorbable collagen membrane Cologide. The primary reason behind using resorbable membrane was to refrain complexity of soft tissue dehiscence with mesh. In a study conducted by **Maiorana et al 2005**, showed use of bovine bone particles (Bio-Oss) with block grafts, help lessen the degree of bone resorption almost up to 9.3% in the test group while 18.3% in the control group.¹⁷ In contrast, **Khoshhal S 2016** carried out a case of mandibular ridge augmentation using chin graft procured using trephine drills. FDBA 70% infused with DFDBA 30% was used with chin graft [18]. Similarly, in the present case, initially the alveolar ridge was knife edge in nature, 6 months post autologous bone block augmentation, CBCT showed marked increase in ridge width, sufficient enough for placement of a dental implant.

Deepa D 2017 managed a case of localized maxillary posterior alveolar ridge defect by horizontal ridge augmentation with guided bone regeneration using autogenous particulate chin graft followed by placement of hydroxyapatite bio-resorbable membrane Sybograf-GBR [19]. The 6 months post-operative clinical and radiographic examination revealed a significant increase in height and width of the alveolar ridge defect. Thus, the authors concluded that combined treatment approach using autogenous chin graft and GBR membrane is a better option for the treatment of localized posterior alveolar ridge defects which was supporting our treatment plan.

A systematic review and meta-analysis carried out by **Gorgis et al 2021** on augmentation of lateral alveolar ridge with an autogenous bone block graft alone with or without barrier membrane coverage also provided predictable results [20]. Likewise in present case, autogenous bone block with resorbable membrane also yielded predictable results.

The set of complications known to be associated with harvesting of the chin graft are viz., pain and discomfort, infection at the donor as well as surgical site, temporary paresthesia, bruising of chin, ptosis of chin, incision line opening, neurosensory deficit of lower lip, dental hypersensitivity with lower anterior teeth, post-operative change in the soft tissue contour of chin, decrease in height of lower lip, graft dehiscence. Fortunately, none of the complications were reported by the patient in the present case. Interestingly, the combination of chin graft with particulate bone grafts covered by a collagen membrane has yielded gain in bone dimensions in the present case and as a result [21-23].

Conclusion

Ridge augmentation is undoubtedly a challenging procedure but the use of autogenous chin graft proves to provide predictable results. Furthermore, prognosis of dental implants has been shown to improve in augmented sites. As a result, authors advocate use of symphyseal bone graft supplemented with particulate bone graft. Nevertheless, long term follow up will help provide predictable results of autogenous bone grafting with chin graft in case of severely resorbed ridges and thus aid in rehabilitation of partially edentulous ridges.

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