

Localised atrophic ridge augmentation with symphysis bone graft for implant placement

Dr. Ekta Mistry¹, Dr. Arvind Agarwal², Dr.Devanshi S. Vaghela³, Dr.Nimesh Patel⁴, Dr. Chirag Raval⁵, Dr. Itishree Kansal⁶

1. Reader, Department of Oral and Maxillofacial Surgery, Karnavati School of Dentistry, Karnavati University, Gandhinagar, Gujarat, India.
Email ID: ekta1650@gmail.com (Corresponding Author)
2. Professor and HOD, Department of Oral and Maxillofacial Surgery, Karnavati School of Dentistry, Karnavati University, Gandhinagar, Gujarat, India.
3. Senior Lecturer, Department of Oral and Maxillofacial Surgery, Karnavati School of Dentistry, Karnavati University, Gandhinagar, Gujarat, India.
4. Reader, Department of Oral Medicine and Radiology, Goenka Research Institute Of Dental Sciences, Gandhinagar, Gujarat, India.
5. Consultant Oral and Maxillofacial Surgeon, Ahmedabad, Gujarat, India.
6. Consultant Oral and Maxillofacial Surgeon, Ahmedabad, Gujarat, India

Abstract

Dental implants are now a gold standard for replacement of missing natural tooth. To optimize aesthetic implant placement in the atrophic alveolar ridge, augmentation is required. The present article describes a case series of localized atrophic ridge augmentation with symphysis bone graft prior to implant placement for evaluation of efficacy of symphysis bone graft as an autogenous bone graft before implant placement in atrophic ridge.

Key words: Ridge augmentation, Symphysis, Implant.

Introduction

Adequate ridge height and width must for successful implant placement. Tooth loss causes alveolar ridge resorption & ridge atrophy which leads to alteration in ridge size & shape. The solution to such situations are the re-establishment of the ridge form which is consistent with the load-bearing lamellar bone for implant placement and the prosthetic design for long term stability.^{[1],[2]}

Deficient height and width of the alveolar ridge in the anterior jaw region often require hard and soft tissue reconstruction before implant placement. There are many techniques to increase the height and width of the bone in the jaw. Out of all autogenous bone has been proved to be highly effective in reconstructing jaw anatomy, restoring esthetics and providing biomechanical support for the placement of dental implants.^[3]

Mandibular symphysis (chin bone in interforaminal region) is a most favorable donor site as it offers the advantage of elimination of hospital stay, minimal donor site discomfort, avoidance of cutaneous scars and an excellent risk-benefit ratio.

^[1]Chin offers a sufficient amount of cortico-cancellous autograft and easy access among all the intraoral sites.^{[1],[4]} Mandibular bone grafts result in an improved quality of bone with a shorter healing period in comparison to other methods of bone repair.

Aim and Objectives

The aim of the study was alveolar ridge augmentation in any ridge defect of one or two teeth using mandibular symphysis autogenous bone graft prior to implant placement in patients.

The objectives were to evaluate outcome of autogenous bone block grafts obtained from mandibular symphysis region, to evaluate predictable bone augmentation at the recipient site using symphysis graft, to evaluate stability of implant in the grafted site.

Material and Method

A total number of 10 patients with localized alveolar ridge atrophy or defect without any systemic disease were selected from the outpatient department of Oral & Maxillofacial Surgery, Karnavati School of dentistry, Uvarsad, Gandhinagar. Pre-operative Cone-Beam Computed Tomography (CBCT) was taken to confirm the alveolar ridge defect. A detailed case history was recorded, informed consent was obtained on the prescribed format and the patients were informed about the potential risks and benefits of the procedure. Routine blood investigations

required prior to surgery were done. In each patient's symphysis bone graft augmentation in the localized atrophical alveolar ridge area was done. Ethical committee approval was taken before the commencement of the study.

Surgical Procedure

Step-1 Harvesting the Symphysis Bone Graft

After painting and draping, the surgical site was cleaned with the povidine-iodine solution. Local anesthesia (2% lignocaine with 1:80000 adrenaline) was injected at the surgical site. Vestibular incision was made 1 cm below the muco-gingival junction in the mandible symphysis region extending just anterior to the mental foramina bilaterally. Full thickness mucoperiosteal flap was reflected. After exposing the symphysis and locating the mental foramina, a straight fissure tungsten carbide bur with hand piece was used to outline a rectangle of the required size. The superior aspect of the rectangle was $\geq 3-5$ mm below the tooth apex, and the integrity of the lower border of the mandible was maintained. Laterally, the osteotomy performed was ≥ 5 mm anterior to the mental foramina. Osteotomes (chisel and mallet) were used to free the block graft. Hemostasis was achieved at the donor site suturing was done with 3-0 silk suture material.

Step-2 Placement of Graft to Receptient Site

After injecting local anesthesia solution, a crestal incision and two vertical releasing incisions were made adjacent to the recipient area and a full thickness mucoperiosteal flap was reflected at the facial side. After trimming the sharp borders, recipient site was prepared to receive the graft and the bone block graft was stabilized with the help of screws. Protein Rich Plasma (PRP) was placed for better healing. Surgical site was closed in layers using 3-0 vicryl. Analgesic and Antibiotics were prescribed. After six months, an endosseous implant was inserted and again the site was closed. Post-operative CBCT was taken at 6 month interval to check the increase in bone diameter at recipient site. If the alveolar ridge diameter seems appropriate implant placement was done at the grafted site. Patients were evaluated on periodic basis to check for the graft and implant

Results

Table 1. Increase in Diameter in Alveolar Ridge Bone in Each Patient

| Patient | Teeth Region | Pre-Operative (before graft placement) Alveolar Ridge Bone Diameters | | Post-operative (after graft placement) alveolar ridge bone diameters | | Increased Diameter | |
|------------|--------------|--|--|--|--|--------------------|--|
| | | Width (mm) | | Width (mm) | | Width (mm) | |
| Patient 1 | 11 | 2.7 | | 7.13 | | 4.43 | |
| Patient 2 | 24 | 2.2 | | 5.7 | | 3.5 | |
| | 25 | 2.3 | | 5.6 | | 3.31 | |
| Patient 3 | 11 | 4.4 | | 6.21 | | 1.79 | |
| | 12 | 2.1 | | 8.57 | | 6.47 | |
| Patient 4 | 11 | 1.7 | | 3.1 | | 1.4 | |
| | 12 | 2.4 | | 3.1 | | 0.7 | |
| Patient 5 | 11 | 2.0 | | 5.5 | | 3.5 | |
| Patient 6 | 11 | 2.0 | | 5.8 | | 3.8 | |
| Patient 7 | 11 | 2.4 | | 4.5 | | 2.1 | |
| | 12 | 1.7 | | 3.8 | | 2.1 | |
| Patient 8 | 11 | 2.3 | | 5.2 | | 2.9 | |
| | 12 | 2.2 | | 5.2 | | 3.0 | |
| Patient 9 | 11 | 4.4 | | 6.2 | | 1.8 | |
| Patient 10 | 24 | 2.1 | | 4.8 | | 2.7 | |
| | 25 | 2.8 | | 5.4 | | 2.6 | |

Table 2. Bone Healing At Recipient Site after 6 Months (At the Time of Implant Placement)

| Patient | Recipient site(teethregion) | BoneHealing |
|------------|-----------------------------|--------------|
| Patient 1 | 11 | Satisfactory |
| Patient 2 | 24,25 | Satisfactory |
| Patient 3 | 11,12 | Delayed |
| Patient 4 | 11,12 | Satisfactory |
| Patient 5 | 11 | Satisfactory |
| Patient 6 | 11 | Satisfactory |
| Patient 7 | 11,12 | Satisfactory |
| Patient 8 | 11,12 | Satisfactory |
| Patient 9 | 11 | Satisfactory |
| Patient 10 | 24,25 | Satisfactory |

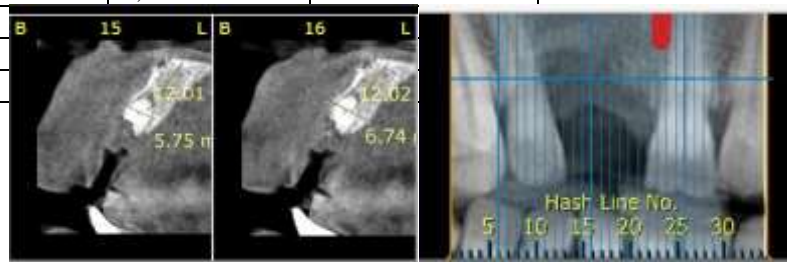
Table 3. Stability of the Implant after Loading

| Patient | Implant Site | Stability |
|------------|--------------|-----------|
| Patient 1 | 11 | Good |
| Patient 2 | 24, 25 | Good |
| Patient 3 | 11, 12 | Good |
| Patient 4 | 11, 12 | Good |
| Patient 5 | 11 | Good |
| Patient 6 | 11 | Good |
| Patient 7 | 11,12 | Good |
| Patient 8 | | |
| Patient 9 | | |
| Patient 10 | | |

CASE SERIES 1



Clinical



CBCT

Figure 1. 1 Pre-OperativePhotographs



Incision Placed



Symphysis Graft Harvesting



closure

Figure 1.2 Intra-Operative (DonorSite)



Figure 1.3 Intra-Operative (Recipient Site)

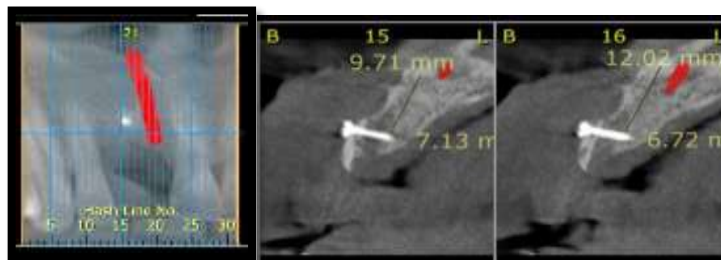


Figure 1.4 Post-Operative CBCT

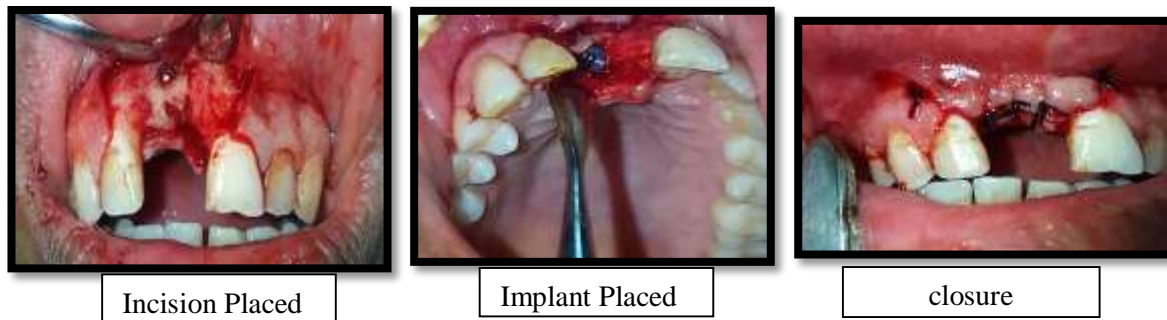


Figure 1.5 Implant & prosthesis Placement



Discussion

With the advent of implants replacement of missing tooth or teeth with it has become a clinically established treatment modality with very good prognosis. However limitation to implant placement in cases of tooth loss or missing teeth is mainly because of unavailability of adequate bone width and height. Various surgical techniques to enhance alveolar bone volume includes- grafting techniques, distraction osteogenesis, bone splitting or guided bone regeneration.^{[5],[6]}

There are many intraoral and extraoral bone harvesting procedures but intraoral sites have been preferred especially for the treatment of localized bone defects in partially edentulous jaws.^[5] Intraoral sites such as mandibular symphysis, external oblique ridge and the ascending ramus of the mandible offers advantages like easier access, good bone quality, the operation being performed in the same surgical field as the host site, conservative cost, less postoperative morbidity, no problem with ambulation, avoidance of a cutaneous scar and perception by the patient that an intraoral operation is less extensive as compared with extraoral donor site.^[7]

The limitations to the placement of implants in patients with tooth loss or missing teeth are the absence of adequate bone for implant placement. The symphysis region has been reported to provide adequate bone to augment a deficient ridge by 4-6mm in horizontal dimension and up to 4mm in vertical dimension, covering a length up to a 2-3 tooth defect.^{[3],[8]} The autogenous graft can be obtained in block or particulate form. Therefore, corticocancellous blocks are preferred because they possess enhanced revascularization of cancellous portion, and mechanical support and rigidity of the cortical portion, which ensures optimal ridge augmentation.^{[8],[9]}

Here we used symphysis graft for localized ridge augmentation as it is also more convenient for the patients with localized atrophic ridge to replace their missing teeth with implants. We use this graft technique in 10 patients for localized alveolar ridge defect.

10 patients with localized atrophic ridge have been treated surgically & results evaluated as follows:

8 out of 10 patients had maxillary anterior tooth alveolar ridge defect. 2 patients had maxillary posterior tooth alveolar ridge defect. Comparison of pre & post CBCT was done. After observing marked increase in bone diameter & sufficient healing, implant placement was done after 6 months. In all cases radiographic evaluation was performed after implant placement. Abutment and prosthesis were given after 6 months of implant placement.

According to **Table 1** average value of increase in the width of the alveolar ridge bone after 6 months is 2.8mm which is satisfactory for implant placement. Similar results were obtained by Koyel Bhowal et al. in 2020 where they treated a single tooth ridge deformity in the maxillary anterior tooth region using autogenous symphysis bone graft and gained a labio-palatal ridge width of 3.5mm after 6 months of the augmentation procedure.^[10] However a systematic review conducted by Ramadan N in 2015 included 10 studies where the mean horizontal bone gain at re-entry was determined ranging from 3.4 to 5.0 mm with no intraoperative complications.^[11] (Narman Ramadan)

With exception to 1 patient who had habit of smoking, in rest of all the patients, healing at the recipient site was uneventful and satisfactory & resulted in satisfactory callus formation. (**Table 2**) Another such case presented by Aby et al. in the year 2020 where they grafted the symphyseal mandibular bone graft (1.5*1cm in size) in the mandibular anterior region for the deficient alveolar ridge width and observed minimal resorption at the 4th month follow up period.^[12] Robert E. Marx describes Bone and Bone graft healing in his study where he explains autogenous bone graft healing in 4 phases and states that if there is a hard callus formation at the time of implant placement (after 3 months of graft placement) at recipient site, it is good bone healing and if there is still soft callus present, it can be considered as a delayed healing.^[13] This is very much in accordance with our results.

Table 3 is of stability of the implant after loading. All patient had good stability of implant after loading. In each patient prosthesis was given after 6 months and results were satisfactory.

Conclusion

Mandible symphysis is an ideal source of autogenous bone for small defects. The harvesting & grafting procedure is simple and uncomplicated & hence can extensively be used for stability and success of implants.

References

1. Ankit Jivan Desai, Raison Thomas, AB Tarun Kumar, DS Mehta. Current concepts and guidelines in chin graft harvesting: A literature review, International Journal of Oral Health Sciences, 2013. Vol 3(1):16-25.
2. Buser D, Dahlen C, Schenk RK. Guided Tissue Regeneration in Implant Dentistry. Chicago: Quintessence; 1994.
3. Pikos, Michael A. 'Mandibular Block Autografts for Alveolar Ridge Augmentation'. Atlas of the Oral and Maxillofacial Surgery Clinics 13, no. 2 (September 2005):91-107.
4. Hunt DR, Jovanovic SA. Autogenous bone harvesting: Aching graft technique for particulate and monocortical bone blocks. Int J Periodontics Restorative Dent 1999; 19:165-73.
5. V. Bagavad Gita, S. C. Chandrasekaran. Hard and Soft tissue augmentation to enhance implant predictability

- and esthetics: 'The Perioesthetic Approach'. Journal of Indian Society of Periodontology 2011.15(1):59-63.
6. Hammerle CH, Jung RE, Feloutzis A. A systematic review of the survival of implants in bone sites augmented with barrier membranes in partially edentulous patients. J Clin Periodontol. 2002; 29: 226-31.
 7. D Tecimer, M M Behr. Use of autogenous bone grafting to reconstruct a mandibular knife edge ridge before implant surgery: a case report. J Oral Implantol. 2001; 27(2): 98-102.
 8. DeepaD,MrinaliniAgarwalBhatnagar,KVArunkumar,PratikBhatnagar.Autogenouschin graft and guided bone regeneration (GBR) in localized ridge augmentation – A case report. International Journal of Periodontology and Implantology, 2017. 2(3):91-94.
 9. E Rosenberg, L F Rose. Biologic and clinical considerations for autografts and allografts in periodontal regeneration therapy. Dent Clin North Am. 1998 Jul;42(3):467-90.
 10. Dr. Koyel Bhowal, Prof. (Dr.) Samiran Ghosh and Prof. (Dr.) Soumitra Ghosh. 2020. "Ridge augmentation using mandibular symphysis bone graft for the placement of dental implant - a case report", International Journal of Current Research, 12,(08), 13007-13011
 11. Nermine Ramadan. Symphysis onlay bone grafting for horizontal maxillary alveolar ridge augmentation: a systematic review. Dent Oral Craniofac Res, 2015: 1(6): 172-77
 12. Dr. John Aby, Dr. Sanjith P. Salim and Dr. Nichu Anna Sunny. Ridge augmentation using mandibular symphyseal bone graft for the placement of dental implants- A case report. World Journal of Pharmaceutical and Medical Research. 2020: 2(6): 97-102.
 13. Robert E Marx. Bone and Bone Graft Healing. Oral Maxillofacial Surg Clin N Am 19 (2007) 455-466.