Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/17193
DOI URL: http://dx.doi.org/10.21474/IJAR01/17193

RESEARCH ARTICLE

RAMUS ONLAY BONE GRAFT FOR MAXILLARY ALVEOLAR RIDGE AUGMENTATION-A CASE REPORT

Dr. Rithesh K.[1], Dr. Sindhu Sudhakar Kumararama[2], Dr. Sharath Babu K.[3] and Dr. Amit Walvekar[4]

1. Professor Department of Periodontology Rajarajeswari Dental College and Hospital,Bangalore.
2. Reader Department of Prosthodontics Rajarajeswari Dental College and Hospital,Bangalore.
3. Professor and HOD Department ofOtorhinolaryngology(ENT) Gadag Institute of Medical Sciences, Gadag,Karnataka.
4. Professor and Head Department of Periodontology Coorg Institute of Dental Sciences Virajpet.

Manuscript Info

Manuscript History
Received: 26 April 2023
Final Accepted: 31 May 2023
Published: June 2023

Key words:-
Implant Restoration, Ridge Defect, Onlay Bone Graft, Augmentation, Piezosurgery

Abstract

Background: Implant restoration in the anterior esthetic zone is always a clinician's challenge and tooth loss in the anterior region often affects ridge architecture resulting in ridge defects compromising esthetics and implant placement.This case report describes the onlay bone grafting along with PRF application for anterior ridge augmentation and subsequent implant placement. The second stage surgery describes preservation of the keratinised tissue and fabrication of implant restoration of the same.

Case description: Block graft was obtained using piezosurgery and onlay bone grafting was done in a 28 year female patient with anterior ridge defect with subsequent implant placement. After 6 months of healing and prosthetic restoration of the implant was done with successful esthetic outcome.

Conclusion: Uneventful post-operative healing was observed in the donor site with the use of piezosurgery. There was successful augmentation of the ridge defect with osseointegrated and esthetic implant restoration.

Clinical significance: Management of ridge defects in the esthetic region with autogenous Onlay grafting offers the advantage of biologic compatibility and PRF acts as a membrane maintaining soft tissue contours thereby allowing placement of implant in the optimal three dimensional position.

Introduction:-

The predictability of the implant treatment is dependent on the long term survival of the implant placed in the correct three dimensional position. the quantity and quality of the bone, understanding the postextraction dimensional changes in ridge/socket morphology is a significant element in planning and timing of implant placement. [1,2]

The most common challenge in the esthetic zone is often ridge defects. the implant placed in the anterior maxilla restores the esthetics and function, matching to the contours of the hard and soft tissue of the adjacent natural

Corresponding Author:- Dr. Rithesh K.
Address:- Professor Department of Periodontology Rajarajeswari Dental College and Hospital,Bangalore.

dentition. Hard and soft tissue defects in the anterior esthetic zone complicate the treatment since the patients may not be able to receive standard dental implants without bone augmentation. [3,4]

Multiple bone augmentation techniques are available selecting the most predictable technique that allows optimal implant placement providing dental implant survival rate in grafted bone is a clinical challenge.

The selection of the type of surgical procedure for augmentation is dictated by the defect shape and size. There are two basic approaches for management of ridge defects one is by guided bone regeneration using biomaterials autogenous bone particles and barrier membranes. The other approach involves use of autogenous block grafts, combination of both techniques can also be used biomaterials and membranes with autogenous bone blocks.[5]

PRF which has been widely used for various regenerative procedures is a natural barrier used in guided bone regeneration. The PRF is entirely derived from autologous blood without any additives and therefore does not cause any foreign body reaction making it an ideal barrier membrane for guided bone regeneration procedure. Another advantage of PRF that it contains living cells (namely platelets and leukocytes) which secrete and slowly release active proteins over time, which include vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), and transforming growth factor-beta (TGF-beta) over time.[6]

Guided bone regeneration can be predictable in augmenting small bony defects cases however for large horizontal defects in bone volume, require more advanced treatment involving bone block grafting to provide a scaffold for bone regeneration and stimulate osteogenesis. "Gold Standard" for such therapy involve preparing an autogenous bone block from the patient's chin, Ramus, Iliac Crest, or other donor sites.[7]

This case report describes a modification of onlay bone grafting using PRF as membrane and also a combined approach to manage the hard and soft tissue around the ridge defect. Firstly, the horizontal ridge defect was managed using onlay grafting along with PRF as a membrane. Six months post-operative implant placement was done, delayed loading and subsequent soft tissue management to preserve the peri implant tissue during second stage procedure creating a harmonious hard and soft tissue esthetic outcome.

Case History:
A 28-year-old woman presented with the chief complaint of missing maxillary lateral incisor. History of receding gingiva and mobility which resulted in subsequent extraction of the tooth. The healed edentulous site presented with a horizontal ridge defect[Figure 1 and 2] and compromised patient esthetics. The patient wanted a fixed restoration and was not in favour for fixed partial denture as it involved using natural teeth as pontics. The patient was healthy and medical history revealed no systemic diseases contraindicating implant placement.

The treatment plan was divided in 3 phases.

The first phase- Involved onlay grafting of the horizontal defect.

Second phase -Implant placement

Third phase-Restoration of the implant

A complete case history with preoperative investigations which included consisting of a conventional orthopantomogram, cone beam computed tomography, and hematological investigations were done. The CBCT confirmed the buccolingual deficiency of the sites and the need for a bone augmentation at the defect. Onlay augmentation of the hard tissue defect followed by implant placement and delayed loading was planned, which was explained to the patient and duly written consent was obtained.

Surgical procedure:
2% lignocaine 1:100,000 epinephrine was used for local anaesthesia. The recipient site was anesthetized with a infraorbital block and donor site the mandibular ramus was anaesthetised with infra alveolar nerve block. The surgical procedure was done in the following stages-

1.**Preparation of recipient site:**
The procedure was done under local anaesthesia and remote palatal incison was designed in the edentulous site extending intrasulcularly one tooth on each side. Divergent releasing incisions were given to provide access and accommodate the block graft that would be placed.

2. **Harvesting the block graft**:
Bone Block graft was obtained from the lower right body of ramus using piezosurgery using saw shaped insert. The incision was given deep enough to obtain a 5-6mm thick corticocancellous block of approximate shape to fit the defect site [Figure 3]. The block was then modified according to defect size for better adaptation and immersed in saline to prevent dehydration.The defect created was filled with absorbable collage sponge was placed in the defect and sutured with continuous interrupted suture.

3.**Stabilisation and fixation of the block to the recipient defect:**
The recipient defect site was perforated using number 2 high speed round bur under copious saline irrigation. This step ensures a bleeding surface to be created on the recipient site A 1.5 diameter mini screw was used to fix the block graft, hydroxyapatite synthetic graft was used to fill the gaps around the block graft to compensate the resorption of the block graft during healing [Figure 4].PRF was prepared by drawing 5ml of patient blood. The PRF obtained was used as a membrane and placed over the block graft. To accommodate the block graft at the defect; Periosteal releasing incision were placed to obtain extension of the flap and was sutured to obtain primary wound closure [Figure 5]. Post operatively antibiotics and analgesics were prescribed with chlorhexidine mouth wash 0.2% for 5 days. Pack and sutures were removed after 7 days. The healing was uneventful, and patient was periodically reviewed for a period of 6 months[Figure 6].

Implant placement
Six months after defect augmentation, Implant placement was done. Local anaesthesia was administered, and a full thickness flap was reflected. Surgical exposure of the site the block graft had fully integrated[Figure 7]. The fixation screw was removed, and implant was placed following standard protocols achieving 25Ncm insertion torque and cover screw was placed [Figure 8] and the interrupted sutures were placed [Figure 9]. Provisional Maryland restoration was given during the osseointegration of the implant.

Prosthetic restoration of implant
Three months after implant placement radiograph was taken to evaluate the osseointegration [Figure 10]. Second stage surgery for uncovering the Implant was done under local anaesthesia by roll flap technique to augment the keratinised mucosa and healing abutments were placed [Figure11 and 12]. After the periimplant tissue healing [Figure 13], impression was recorded and sent to lab followed by metal coping trial [Figure 14] and final cement retained crown was placed [Figure 15]. The patient was asked to follow regular oral hygiene maintenance and a periodic follow up at regular intervals.

Discussion:-
Residual ridge in the anterior region is most commonly compromised in terms of quality and volume of bone. To achieve the objective of aesthetic pleasing restoration and long-term prosthesis survival often requires combination of hard and soft tissue health around the ossoeintegrated implant [8].The quality and volume of bone is important for long term survival of implant and the emergence profile for achieving optimum esthetics.[9]

This case report describes the use of autogenous block graft taken from the ramus retromolar area. The cortico cancellous graft has the advantage of biocompatibility and the common intra oral donor sites for block grafts are chin and retromolar area. Drawback of autogenous block graft is the resorption at the recipient site 25% to 60% and cortical layer of the block graft undergoes slower resorption compared to cancellous portion.[10,11]

The cancellous portion of the graft acts as a source of osteogenic cells providing revascularisation and graft healing, the healing of the graft occurs by creeping substitution. The ramus donor site is associated with fewer postoperative complications and less cosmetic concern with bone removal from the ramus area, and grafting of this donor site is not required.[12,13]

The healingandincorporation of autogenousboneblockgrafts, ie, thephenomenonknownas “creeping substitution”. The objective of augmentation of deficient alveolar ridges is to reduce stress at crestal bone providing the required

ridge width for a favourable outcome and long term implant prosthesis survival. The simultaneous placement of implant along with the block grafts is preferred as it shortens the time between ridge augmentation and prosthodontic rehabilitation thereby reducing the risk of resorption of the block graft. The resorption generally results in mean volume reduction of 7.2% at ramus block bone graft sites.[14]

The use of piezo surgery to obtain the graft definitely has its advantages to prepare the osseous bed and make a precise incision in the bone tissue facilitating the healing process and reduced the inflammatory reaction during the graft healing.[15]

In the present case, we performed onlay grafting using ramus auto graft as sufficient quantity of bone may be obtained. Ridge width less than 3 mm dictated the selection of onlay grafting procedure. Techniques like ridge split expansion of ridge are other available options however the selection of technique is dependent on the ridge width. In this case report the presence of inadequate bone width dictated the augmentation with autogenous block graft with delayed implant placement and loading. Esthetic pleasing outcome was obtained with delayed placement and loading. The most common and detrimental complication associated with onlay bone grafts is wound dehiscence and exposure of the bone during healing. Proper flap management with adequate reliving incision to obtain tension free soft tissue closure can avoid this complication. The onlay block graft obtained must be well fixated and remain unloaded during healing. Healing time of 4 months for maxillary and 4-6months for mandibular onlay grafts is preferred to obtain successful augmentation.

Figures

Figure 1:- Preop deficient alveolar ridge in the upper lateral incisor region.

Figure 2:- Schematic outline of the defect buccolingually.

Figure 3:- Block graft procured from ramus region.

Figure 4:- Fixation of the block graft at receipt defect site.

Figure 5:- Primary closure achieved after block graft placement.

Figure 6:- Post op healing of 6 months showing significant gain at the ridge defect.

Figure 7:- Flap reflection showing the healed block graft at the defect site.

Figure 8:- Implant placed with 25 Ncm.

Figure 9:- Suturing after implant placement.

Figure 10:- Periapical radiograph 3 months after implant placement.

Figure11:- Roll flap during healing screw placement.

Figure 12:- Suturing around the healing screw satbilising the roll flap.

Figure 13:-Healed gingival cuff after removal of healing screw.

Figure 14:- Metal coping try in.

Figure 15:- Final cement retained crown placed.

Acknowledgement:-
Nil.

Conclusion:-
This case report suggests the predictability of the onlay bone graft for maxillary anterior ridge augmentation with successful osseointegrated implant and esthetic restoration. Ridge augmentation with implant placement is preferred method for its various advantages, however proper assessment of the ridge deficiency and analysis of the defect type which is the key determinant to guide in the selection of the appropriate technique of ridge augmentation.

References:-
1. Araújo MG, Lindhe J. Dimensional ridge alterations following tooth extraction. An experimental study in the dog. J Clin Periodontol2005; 32:212-8.
2. Tan WL, Wong TL, Wong MC, Lang NP. A systematic review of post-extractional alveolar hard and soft tissue dimensional changes in humans. Clin Oral Implants Res 2012;23(Suppl 5):1-21.
3. Ishikawa T, Salama H, Funato A et al. Three-Dimensional Bone and Soft Tissue Requirements for Optimizing Esthetic Results in Compromised Cases with Multiple Implants. Int J Periodontics & Restorative Dent 2010; 30:503-511.
4. Esposito M, Zucchelli G, Cannizzaro G, et al. Immediate, immediate-delayed (6 weeks) and delayed (4 months) post-extractive single implants: 1-year post-loading data from a randomised controlled trial. Eur J Oral Implantol. 2017;10(1):11-26.
5. Miron RJ, Bosshardt DD. OsteoMacs: key players around bone biomaterials. Biomaterials. 2016;82:1-19.
6. Kobayashi E, Flückiger L, Fujioka-Kobayashi M, et al. Comparative release of growth factors from PRP, PRF, and advanced-PRF. Clin Oral Investig. 2016;20:2353-2360.
7. Elgali, I, Omar, O, Dahlin, C, Thomsen, P. Guided bone regeneration: materials and biological mechanisms revisited. Eur J Oral Sci 2017; 125: 315– 337.
8. Sclar AG. Strategies for management of singletoothextractionsitesinaesthetic implant therapy. J Oral MaxillofacSurg2004;62(suppl 2):90–105 [erratum2005; 63:158].
9. Hunt DR, Jovanovic SA. Autogenous bone harvesting: A chin graft technique for particulate and monocortical bone blocks. Int J Periodontics Restorative Dent 1999;19:165–173.
10. Simion M, Jovanovic SA, Trisi P, Scarano A, Piatelli A. Vertical ridge augmentation around dental implants using a membrane technique and autogenous bone or allografts in humans. Int J Periodontics Restorative Dent 1998;18:8–23.
11. Widmark G, Andersson B, Ivanoff CJ. Mandibular bone graft in the anterior maxilla for single tooth implants. Presentation of surgical method. Int J Oral MaxillofacSurg1997;26:106–109.
12. GordhM, AlberiusP. Some basic factors essential to autogenic nonvascularizedonlaybonegraftingtothecranialskeleton. Scand J PlastReconstr Hand Surg1999; 32:129–146.
13. Pallesen L, Schou S, Aaboe M, Hjørting- Hansen E, Natestad A, MelsonF. Influenceofparticlesizeofautogenousbonegrafts on the early stage of bone regeneration: A histologic andstereologicstudyinrabbitcalvarium.IntJOralMaxillofac Implants2002;17:498–506.
14. Pavlíková G, Foltán R, Horká M, Hanzelka T, Borunská H, Sedý J. Piezosurgery in oral and maxillofacial surgery. Int J Oral Maxillofac Surg. 2011 May;40(5):451-7.
15. BurchardtH. The biology of bone graft repair. Clin OrthopRelatRes 1983;(174): 28–42.