Case Report

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Implant Placement in a Horizontally Deficient Anterior Edentulous Alveolar Ridge Using Ridge Split Technique: A Case Report

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ABSTRACT

Background: Completely or partially edentulous ridges that are atrophic or deficient in the buccolingual dimension often pose a challenge to successful implant therapy. Augmentative techniques of management include treatment modalities like autografts, ridge expansion, ridge splitting techniques, etc. The ridge splitting technique has the advantage of immediate implant placement without a transitional or waiting period of graft uptake or acceptance. This case report describes the said technique followed by placement of a dental implant in the left maxillary central incisor region. A piezoelectric ridge split was performed in relation to #21 and osteotomy was prepared to the required depth. An endosseous implant was placed in the prepared osteotomy site along with supposition of allogenous graft material stabilized with Platelet-rich fibrin(PRF) in the remainder of the split site. Osseointegration was successfully achieved and superstructure fabrication completed.

Keywords: Implant, Osteotomy, Osseointegration, Ridge-Split, Augmentation.

INTRODUCTION

Atrophy of the maxillary alveolus following extraction has always been a problem that prevents numerous patients from receiving dental implant therapy for replacement of missing teeth[1]. Even the most atraumatic of extractions may often result in a resorbed residual alveolus due to the often seen sparse thickness of the maxillary labial/ buccal cortices. This sparseness often also results physiologically from the relative labial/ buccal positioning of teeth in the maxillary arch, as a result of which this thin post-extraction labial/ buccal cortex resorbs much more than the comparatively stronger and thicker palatal cortex[2]. As a consequence of this, the final width of the residual ridge becomes very deficient in dimension. In such situations, it often becomes difficult for the clinician to utilize the standard osteotomy techniques employed for implant placement therapy to replace the missing tooth or teeth.

Numerous procedures have been implemented to supplement the width of the ridge such as autogenous block bone grafts taken from the symphysis or ramus of the mandible, the iliac crest, the dorsal surface of the fibula, etc. grafted with or without a barrier membrane[4]. But such procedures are often undesirable owing to postoperative pain, possible nerve or vascular injury, cosmetic deformity, haemorrhage and/or possible infection of the donor site.

Other popular augmentation techniques include split crest techniques and distraction osteogenesis[5]. The split crest bone manipulation technique, also known as the widening technique was first performed by Tatum et al in the early 1970s for

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Fig1: Edentulous Space with Defective Labial Bone.

Fig 2: Crestal Incision.

Fig 3: Flap Reflected And Defect Exposed.

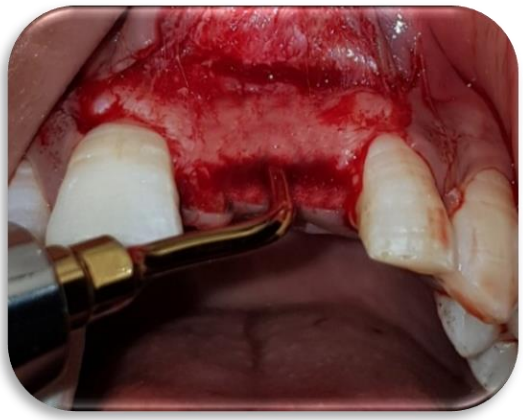

Fig 4: Ridge Splitting with Piezoelectric Kit

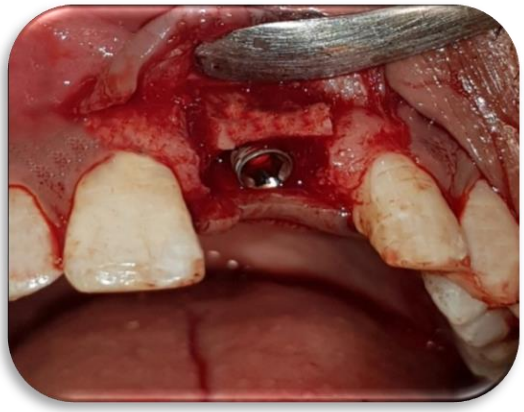

Fig 5: Cortical Green Stick Fracture And Implant Placement.

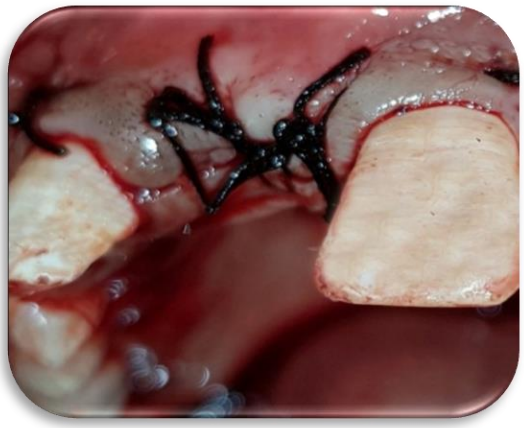

Fig 6: Flap Approximated And Interrupted Sutures Given.

Fig 7: IOPAR Taken after the Procedure.

horizontal ridge augmentation while maintaining the attachment by careful vertical splitting and expansion of the cortical plates[7]. This technique carries the advantage of augmentation of ridge width, placement of implant and supplementation of inter-implant split space with autogenous/ allogenous graft material (if required) all in the same clinical appointment, saving chair side time and reducing the patient's post-operative recovery period and the number of surgical visits to a singular event.

This clinical report describes the treatment of a case of marked alveolar atrophy of the left maxillary central incisor region due to traumatic loss of the respective tooth, treated for implant placement therapy using the split crest bone manipulation technique, followed by placement of a submerged endosteal implant (Adin Dental Implant Systems Ltd., Afula, Isr) along with augmentation of the interproximal split defect with platelet-rich fibrin(PRF)[6].

CASE REPORT

A 22-year-old male patient with a chief complaint of missing anterior tooth #21 reported Department of Periodontics of Daswani Dental College & Research Centre, Kota. On clinical examination, an edentulous space with an hourglass defect on the labial aspect was seen. No other abnormalities were detected. Patient's health condition was normal, with no chronic systemic diseases or adverse tobacco chewing/ smoking habits. Pre-surgical intraoral periapical radiograph, panoramic radiograph(OPG) and cone-beam computerized tomographic scans were made. Clinical and radiographic examination revealed ideal vertical bone height and inter arch space for implant placement. The radiographically reported ridge width of 4mm was not adequate for implant placement. Hence it was decided to augment the alveolar crest horizontally.

PROCEDURE

Informed consent for the surgical procedure was taken by the patient before the procedure. The patient preparation for implant placement followed the standard protocol for implant procedures. Following asepsis of the surgical site, local anaesthesia was administered using 2% lidocaine with adrenaline. The infraorbital and nasopalatine nerve block was administered. A full-thickness flap was raised following a mid-crestal incision from the mesial interdental papilla of #11 to the mesial interdental papilla of #22. Upon reflection of the periosteum, the crestal bone diameter(labiolingual) was confirmed to be 4mm, as suggested by the cone-beam computed tomography report. Releasing incisions were given on either side of the site to allow complete visualization of the labial cortex, as the CBCT suggested the deficient width extending up to a depth of 5mm. Thereafter, a piezoelectric ridge-spilt was created up to a 5mm depth to increase the diameter of the osteotomy site using the cat's paw osteotomy wand (Woodpecker Surgicals Pvt. Ltd, Rhine, GA). The crestal osteotomy was augmented by two perpendicular releasing splits on either side of the site of interest, creating a partial greenstick fracture and widening the split space. The crestal diameter was further augmented supplementarily using manual osteotomes. Following required adequate splitting of the labial and palatal cortices to the desired dimensions(6.5-7mm), the pilot drill was engaged to begin preparation of the osteotomy site. A paralleling pin radiovisiograph was made to confirm the parallelism and correct angulation of the drill direction. Following radiographic confirmation, sequential twist drills were then employed to increase the diameter of the osteotomy site till the implant diameter(3.5mm)the implant fixture(3.5x11.5mm)was then hand wrenched into the osteotomy site and torque up to 40N. Primary stability was hence successfully achieved. The resultant inter-cortical defect on either side of the

placed implant was restored with allogenous graft material stabilized with Platelet rich fibrin(PRF). The raised flap was then repositioned into place, and interrupted sutures were placed to approximate the releasing and crestal incisions. Postoperative instructions and medications were given.

DISCUSSION

Alveolar ridges with sparse buccolingual width, that otherwise serve as a contraindication for implant therapy are increasingly managed remarkably well in recent times using ridge splitting techniques[9]. The subsequent success of treatment and implant survival have also been found to be very encouraging. Before the popularization of ridge split techniques, the surgical approach for implant therapy primarily consisted either of augmentation of the deficient ridge using autologously harvested block grafts or the usage of a minimalistic implant dimension and compensation of the resultant osseous compromise or dehiscence with allogenous graft materials with collagenous membranes[2]. The prognosis of these treatment options depended largely upon favourable uptake of the graft material and osteogenesis to facilitate implant osseointegration. Also, post-surgical inflammatory cascades at the recipient as well as a donor site in the case of block graft procedures, possible aesthetic defect at the donor site, failure of uptake, etc. pose as potential risks deterring a favourable outcome[11]. Other surgical alternatives include the use of ridge expanders, guided bone regeneration, etc. Dr.Tatum Hilt, in the early 1970s, introduced the primary concept of ridge splitting or bone spreading. Thereafter, Summers and Scipioni *et al.* in 1994 published further research on ridge expansion in edentulous subjects with a 98.8% five-year rate of implant survival. In subsequent years, ridge splitting has emerged as a coveted treatment option in implant dentistry for deficient ridges today with the emergence of specific ridge split osteotomies, micro saws and piezosaws wherein the dynamic viscoelastic cortical bone is expanded with more refined as well as better controlled instrumentation, recording much lesser risks of fracture or bone perforations[10]. The only major limitation of this technique is the non-management of vertical defects along with the lack of spongy bone that becomes a necessity for a more stable and nutritive/osteoconductive implant environment.

A further augmented ridge split technique involves a crestal osteotomy along with a vertical osteotomy cut on either or both sides of the prospective implant site leading to a greenstick fracture of the buccal cortical plate, further increasing the buccolingual window for the accommodation of the implant diameter. A five-year success rate in osseointegration of more than 97% was reported in two-stage implants placed using this technique[12].

CONCLUSION

As implant therapy continues to be the treatment of choice for the replacement of missing teeth, successful treatment of buccolingually deficient edentulous alveolar ridges is an important benchmark as well as challenge for a successful dental practice with respect to implant therapy. Ridge split techniques have made it increasingly possible even for exodontia sites having suffered trauma or cortical fracture at the time of extraction to be successfully treated and rehabilitated using implant therapy with a successful prosthetic prognosis and long-term results.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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