

Implants in Deficient Anterior Maxilla: A Modified Prosthetic Approach

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Abstract: Anterior maxilla represents the esthetic zone and implant placement in a deficient anterior maxilla is a unique challenge. This case report highlights a modified prosthetic approach using zirconia copings for achieving a satisfactory restoration in a deficient maxilla where implants have been placed following ridge augmentation. The patient presented with loss of upper incisors except upper left central incisor and a deficient residual alveolar ridge, following trauma due to road traffic accident. Implant site preparation involved- atraumatic extraction of the upper left central incisor and a combination of bone expansion with osteotomes and grafting with allograft supplemented with Platelet rich fibrin for wound healing and stabilization. Four root form implants were placed and submerged for six months with a successful osseointegration. An esthetic challenge during the prosthetic phase was overcome by placement of customized zirconia copings following which the Zirconia crowns with gingival ceramic were prepared and cemented.

Keywords: allograft, Deficient maxilla, , platelet rich plasma, ridge augmentation, zirconia copings

1. Introduction

Anterior maxilla which involves the four incisors and adjacent alveolo-gingival complex constitutes the “aesthetic zone”. The labial plate of bone in the anterior maxilla is thin and often is lost following extraction of the tooth unless preserved by an atraumatic extraction and socket preservation technique.¹

The loss of the alveolingival complex in the anterior maxilla can be due to a plethora of reasons which include trauma, odontogenic cysts and tumors, advanced periodontal disease.² This often results in an esthetically and functionally challenging area when it comes to replacement of missing teeth. Hence restoration of the width and height of the alveolar bone to attain optimal aesthetics is a therapeutic necessity and is achieved through horizontal and vertical augmentation techniques. The factors that influence the treatment options (both surgical and prosthetic) include the smile line, degree of alveolar ridge defect (vertical and horizontal component), mucosal thickness, number of missing teeth, occlusal clearance, nature of occlusion, age and medical history of the patient.³

Alveolar ridge augmentation procedures are traditionally performed with or without simultaneous implant placement. The benefits of a simultaneous implant placement are a reduced duration of treatment, lesser no surgical visits and the drawbacks are the procedure is technique sensitive, less primary stability for the implants and also a higher risk of marginal bone loss.⁴

2. Case Presentation

A 28 year old male patient reported with the Chief Complaint of teeth lost due to trauma following a road traffic accident and a desire to replace the missing teeth. The upper right central and lateral incisor and upper left lateral

incisor were lost due to the trauma. The patient did not have any medical history or habits.

On examination, patient was noted to have a low lip line and a distinct deficiency of the soft and hard tissue components of the alveolar ridge in relation to the missing incisors. The Upper left central incisor was found to be having mobility of Grade 2 (Miller's grading) and recession grade III (Miller's grading). The edentulous ridge was reduced in height and width with a predominant loss of the buccolingual width and minimal loss of the apico-coronal height of the alveolar bone (Seibert Grade III defect).

Treatment planning included assessment of study models, pre-operative Cone Beam Computed Tomography radiographs and hemogram. The hemogram parameters were found to be within normal limits and the findings of the CBCT, soft tissue parameters are summarized in Fig 1 and Table 1 respectively.

Treatment options included procedures for horizontal augmentation with autogenous graft/ allograft and delayed implant placement (or) implants placement with simultaneous augmentation for correction of the labial dehiscence. The prosthetic plan was to give splinted cement retained crowns with gingival ceramic in the cervical third area.

The treatment chosen for this patient was implant placement and simultaneous augmentation. Four root form threaded implants (Nobel Replace Select: 3.5 × 13 mm in relation to 11,12,22 and 4.3×13 mm were chosen for 21). Mid crestal incision was placed with vertical relieving incisions (extending beyond the mucogingival junction) in distal line angle of 13 and mesial line angle of 23. Full thickness mucoperiosteal flaps were raised and a pilot osteotomy was done in 12,11,21. This was followed by bone expansion with osteotomes. Atraumatic extraction was performed in 21 with

periostomes and the osteotomy was prepared with sequential drills towards the palatal aspect of the socket wall to preserve the labial bone. Four implants (Nobel Biocare Replace Select) were placed and a primary stability of 35 N was achieved in all four implants. (Fig 2) Dehiscence of 2 to 3 mm in the labial bone plate over the implant were grafted with Freeze dried bone allograft (FDBA- Rocky Mountain) which was spread over the entire labial plate. Prior to grafting a de-cortication was done at the apical portion of the alveolus to ensure adequate vascularity for the grafted material. The allograft was mixed with Platelet rich plasma prepared from the patient's peripheral venous blood as per the method described by Marx et al 1998.⁵ The flap was coronally advanced and approximated with 3-0 vicryl sutures. (Fig3). The patient was reviewed after 10 days and a satisfactory soft tissue closure of the wound was observed. Postoperative antibiotics and analgesics were administered for 5 days with adjunctive use of Chlorhexidine mouthwash for three weeks. Post operative review was performed at one, three and six month intervals post surgery.

At six months post surgery, second stage surgery was performed and healing collars were attached to the implants. After, a period of 3 weeks following second stage surgery, 15 degree angulated aesthetic abutments were placed and torque to 20 N.

3. Challenge and modification of the treatment protocol

The challenge identified during the course of treatment was that the surface area for the esthetic abutment is less and may not be adequate for crown retention. Method modification which was done involved preparation of zirconia copings which were luted on the angulated implant abutments and milled intra orally to resemble natural tooth preparation (Fig 4). Putty wash impressions were made of the milled copings and splinted cement retained crowns were prepared and luted in place. Pink ceramic was added in the gingival third of the crowns to enable esthetics even though the patient had a low lip line.

Hence, the challenge of retention of the prosthesis was overcome by providing a larger surface area for attachment with milled zirconia copings. Patient was followed up for one year and the post-op CBCT image is provided in Fig 5.

4. Discussion

The prevalence of ridge deformities in the anterior maxilla is 91 %.⁶ A plethora of surgical procedures have been described in the recent past for surgical and prosthetic management of alveolar ridge deformities. A few of the suggested procedures include particulate grafting/ block grafts, autogenous/ allografts, titanium meshes for augmentation/ guided bone regeneration, ridge split technique.⁷

The technique chosen for this case was a combination of bone expansion and simultaneous labial plate grafting with freeze dried bone allograft and platelet rich plasma to accelerate the healing process. Freeze dried bone allograft

(Rocky Mountain Tissue Bank, Aurora, USA) was chosen as the patient was not willing for second surgical site for autogenous bone harvesting. This method also reduces the overall treatment time and number of surgical interventions required for the patient. Since vertical augmentation was not done, the height of the abutment and surface area was increased by use of customized zirconia copings. The reliable alternative for this method is the use of Nobel Biocare Procera system, which enables a screw retained restoration to be provided. Since there was a concern about the screw access hole emerging labially, the cement retained restorations were provided.

A one year follow up of the patient revealed satisfactory healing outcomes for the labial plate grafting and no significant loss of crestal bone around the implants. Hence, we suggest, the use of copings in situations where the crowns height is excessive and/ or surface area for retention on the abutments is not adequate.

A recent systematic review revealed that both staged and simultaneous implant placement are associated with high implant success and survival rates.⁸ To summarize, we suggest the use of customized copings when the surface area of implant abutments does not provide sufficient support for the prosthesis to overcome prosthetic and esthetic problems in the anterior maxilla.

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Figure Legends:

Figure 1: Pre-Operative CBCT images of edentulous region A.) 12, B.) 11, D.) 22 and tooth C.) 21.

Figure 2: Intra- operative surgical images showing immediate implant placement in 21 and bone expansion with implant placement in 12, 11, 22 (Nobel Replace Select).

Figure 3: Augmentation of implant dehiscence and labial plate. A.) Platelet rich plasma. B) Bone Grafting with Freeze

dried bone allograft, C.) Suturing with 3-0 vicryl sutures, D.) 15 days post operative healing.

Figure 4: A.) Second stage surgery- After 6 months, B.) 15 degree angulated esthetic abutments- Nobel Biocare, C.) Zirconia copings cemented and prepped like crowns, D.) Zirconia crown with gingival ceramic.

Figure 5: One year Post-op CBCT images of the implants revealing adequate bone in labial plate in A) 12, B.) 11, C.) 21, and D) 22 regions.

Table 1: CBCT measurements and Soft tissue parameters:

| S.No | Tooth Number | Bone Width- Crestal (mm) | Bone width- Mid level (mm) | Bone Height (mm) | Soft tissue thickness Crestal (mm) | Soft tissue thickness Mid buccal (mm) | Soft tissue thickness Palatal (mm) |
|------|--------------------|--------------------------|----------------------------|-----------------------|------------------------------------|---------------------------------------|------------------------------------|
| 1. | 12 | 4.1 | 8.5 | 15.0 | 2 | 1 | 3 |
| 2. | 11 | 4.2 | 9.2 | 22.4 | 2 | 1 | 4 |
| 3. | 21 (tooth present) | NA | 8.2 | 12.4 (from root apex) | NA | NA | NA |
| 4. | 22 | 5.7 | 8.3 | 15.7 | 2 | 2 | 4 |

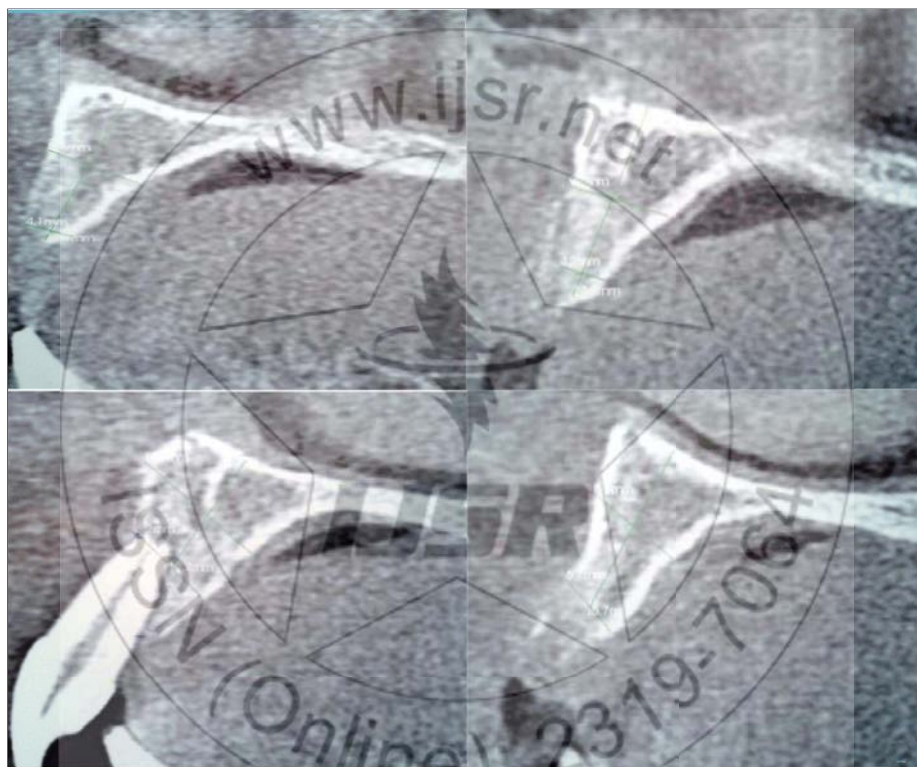


Figure 1:

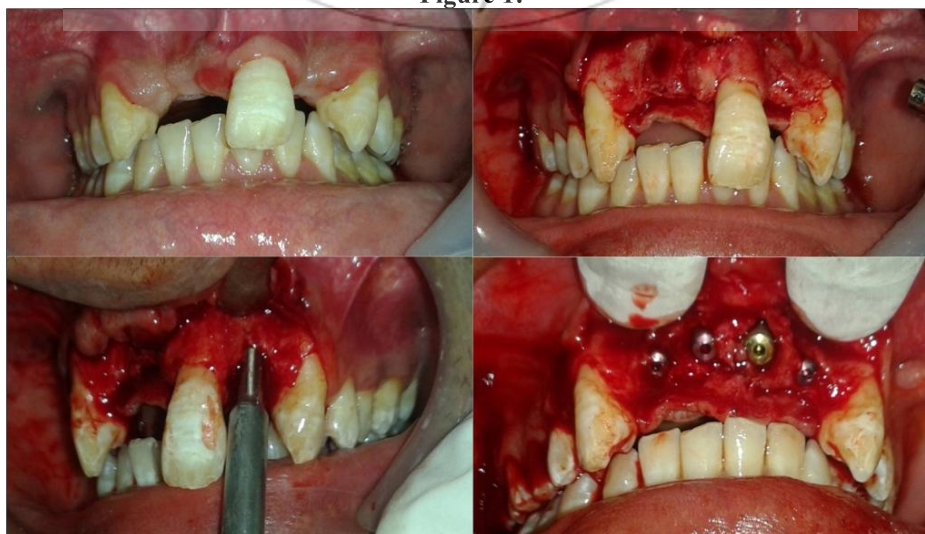


Figure 2:



Figure 3:



Figure 4:

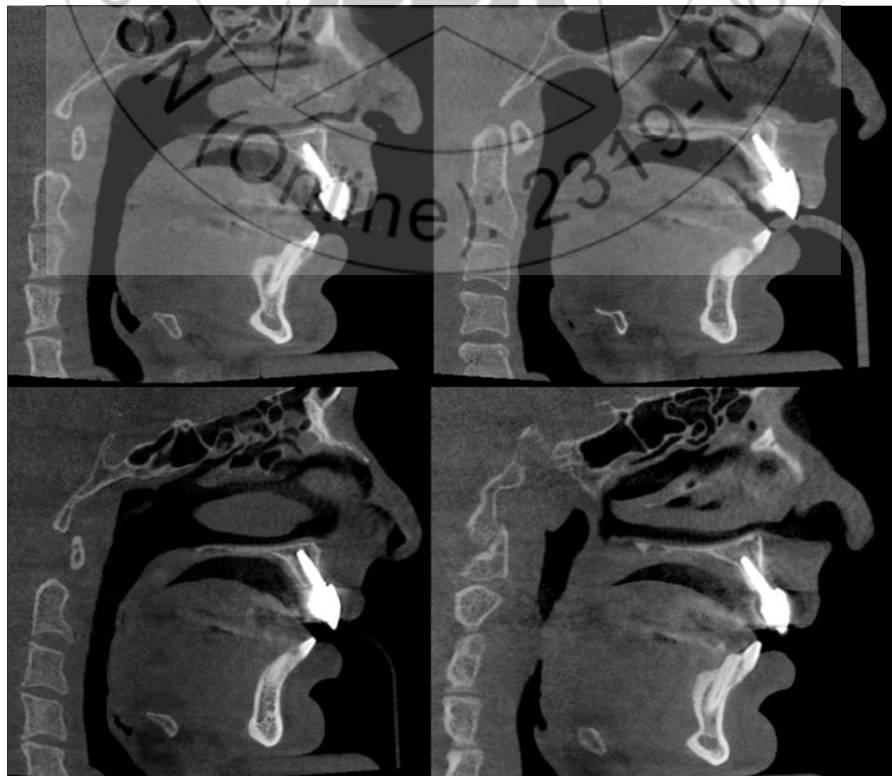


Figure 5: