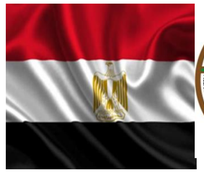
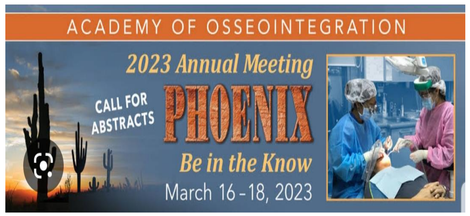


3D Ridge Augmentation For Severely Atrophied Anterior Maxilla Using Patient Specific Poly-Ether-Ether Ketone (PEEK) Buccal And Palatal Sheets



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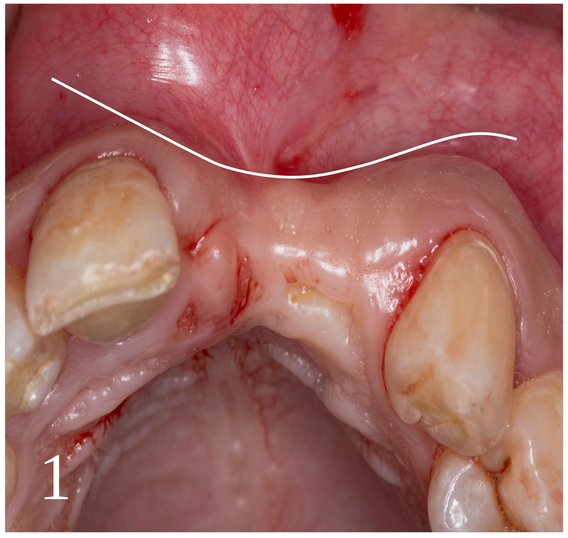
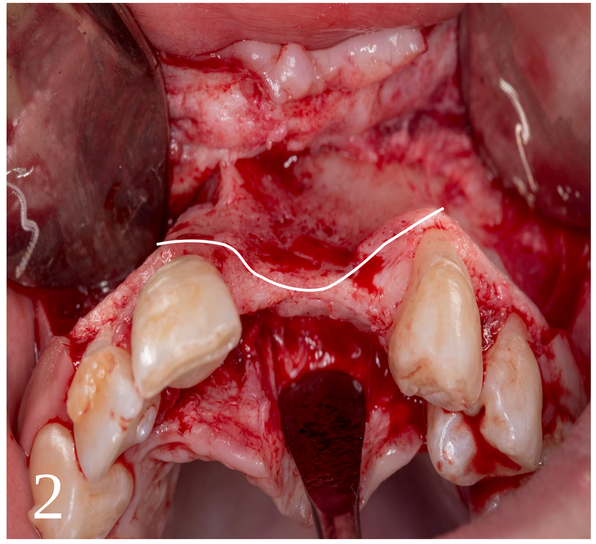
Introduction

Various techniques were used for 3-Dimensional ridge augmentation in the anterior maxillary esthetic zone with staged surgeries, high donor site morbidity and long intraoperative time. The aim of this study is to provide an innovative technique using patient specific buccal and palatal PEEK sheets to perform 3D ridge augmentation with more accuracy, lesser intraoperative time and donor site morbidity.



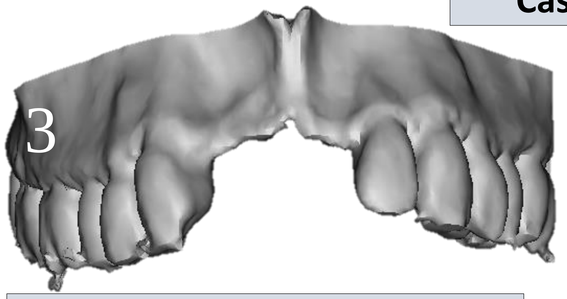


Figures 1,2: severely atrophied anterior maxilla

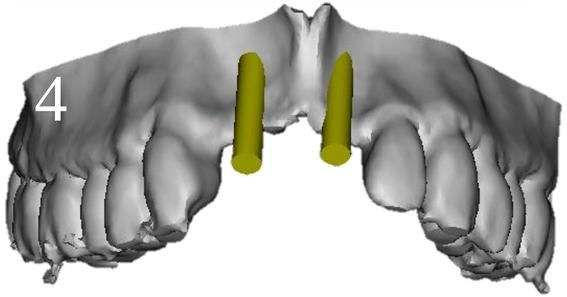
Methodology

- Fourteen patients (34 implants) with severely atrophied anterior maxillary alveolar ridges underwent rehabilitation using custom-made CAD/CAM PEEK sheets acting as a containment system for interpositional mix of particulate autogenous and xenogeneic bone graft, fixed by mono-cortical screws.
- Radiographic Assessment included measurements of linear changes in the vertical and horizontal dimensions on cross-sectional cuts of computed tomography (CBCT) using special software.

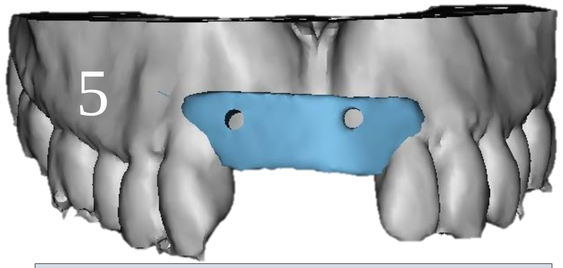
Case 1



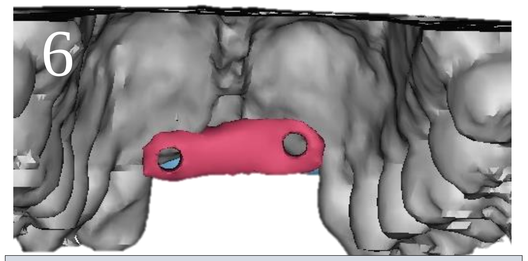
Figures 3 : Preoperative view case 1



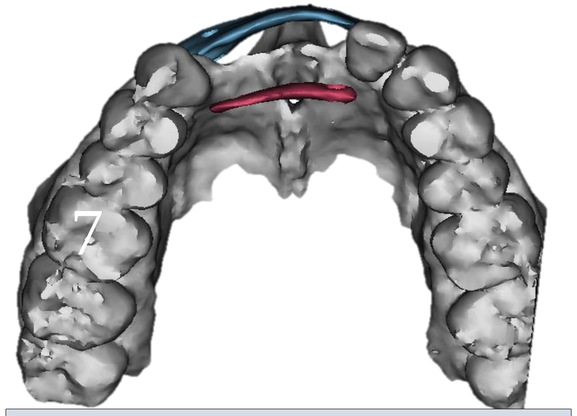
Figures 4 : Virtual implant planning



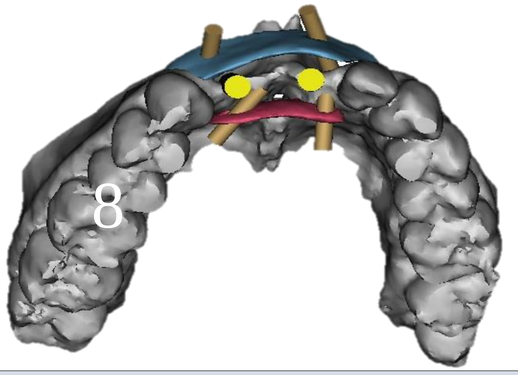
Figures 5 : Virtual buccal shell



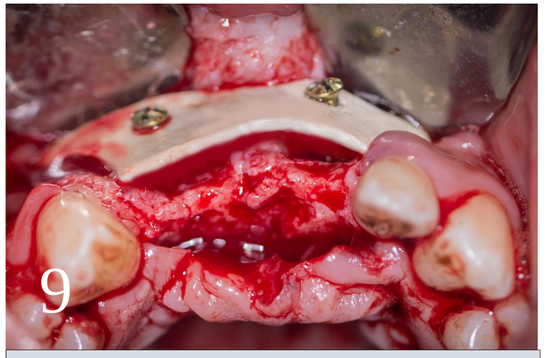
Figures 6 : Virtual palatal shell



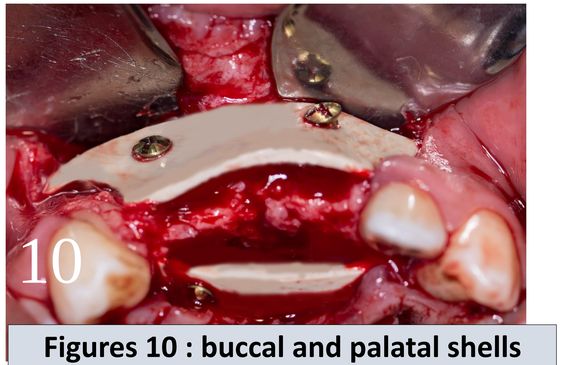
Figures 7 : Virtual buccal and palatal shell



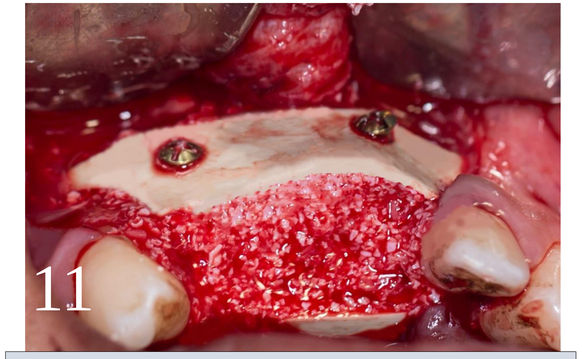
Figures 8 : Virtual implants and proposed fixation screws position



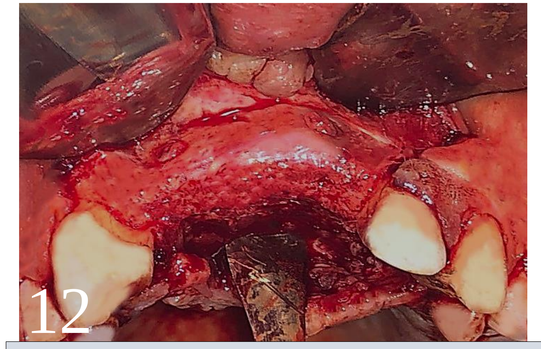
Figures 9 : Buccal shell fixed in place



Figures 10 : buccal and palatal shells fixed in place

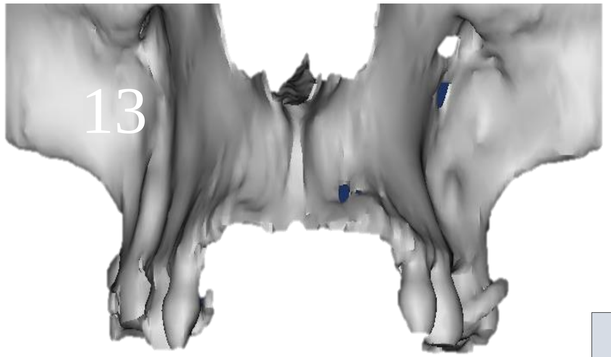


Figures 11 : buccal and palatal shells fixed in place with interpositional bone graft

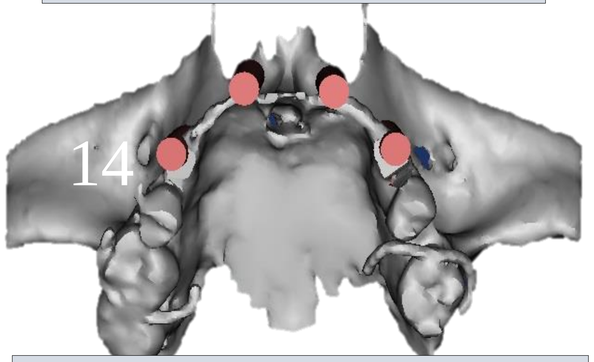


Figures 12 : bone graft healing in second stage

Case 2

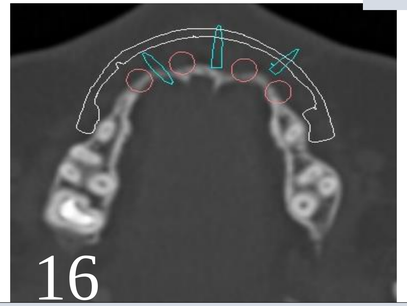


Figures 13 : Preoperative view case 2

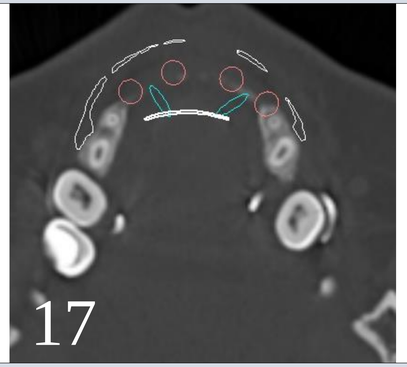


Figures 14 : Preoperative implant planning

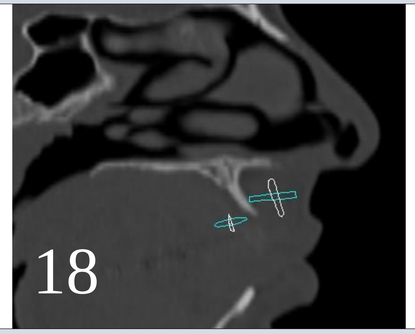
Figures 15 : Preoperative implant planning with buccal and palatal shells v



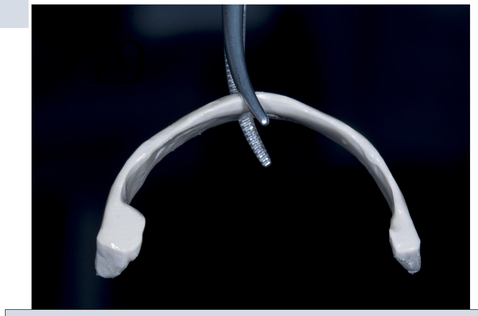
Figures 16 : axial view for buccal shell with virtual implants



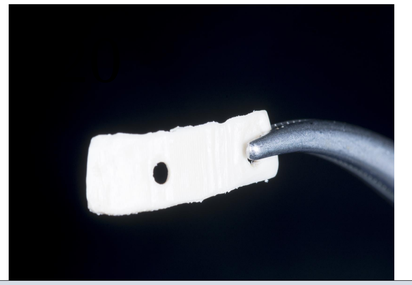
Figures 17 : axial view for buccal and palatal shells with virtual implants



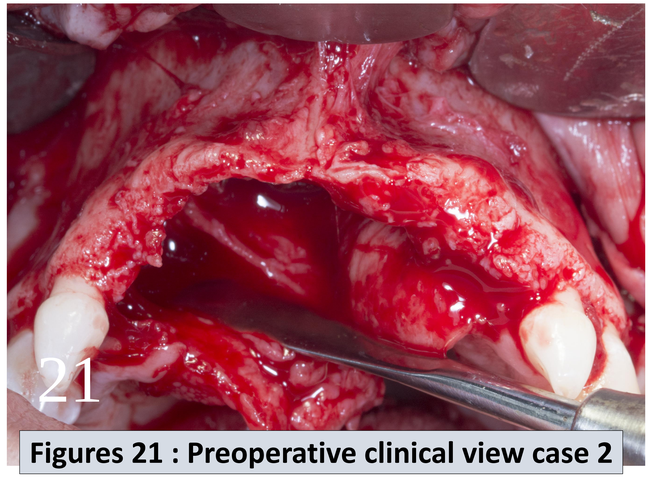
Figures 18 : sagittal view for buccal and palatal shells with fixation screws



Figures 19 :Milled buccal shell

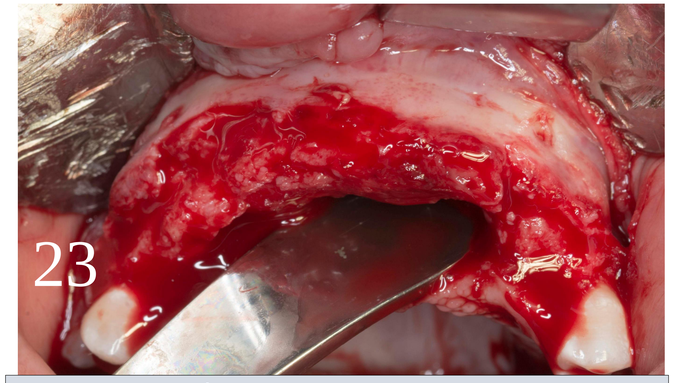


Figures 20 :Milled palatal shell

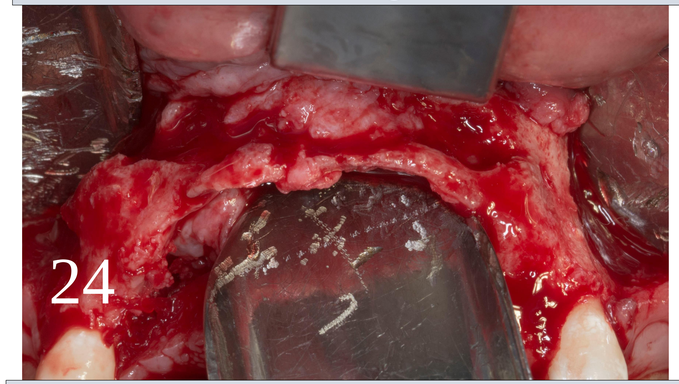


Figures 21 : Preoperative clinical view case 2

Figures 22 : buccal and palatal shells fixed in place with bone graft

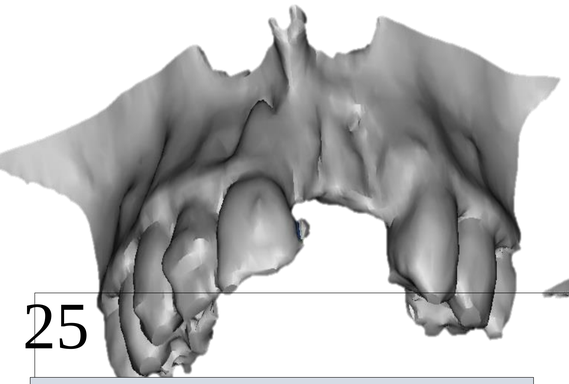


Figures 23 : 2nd stage after removal of Peek shells

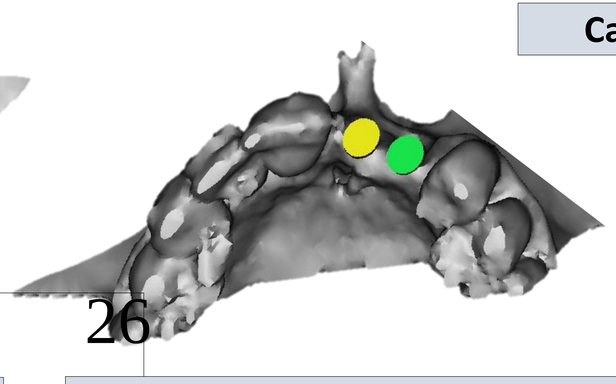


Figures 24 : 2nd stage after removal of fibrous tissue

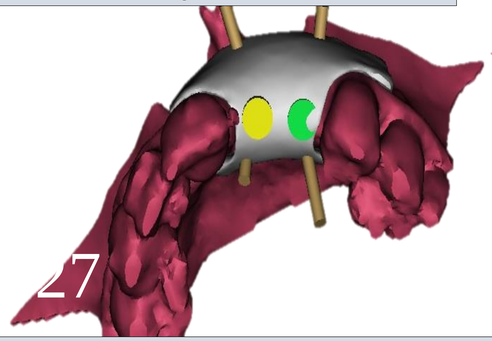
Case 3



Figures 25 : Preoperative view case 3

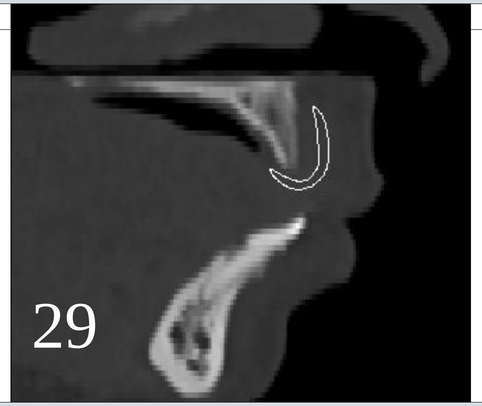


Figures 26 : Preoperative implant planning

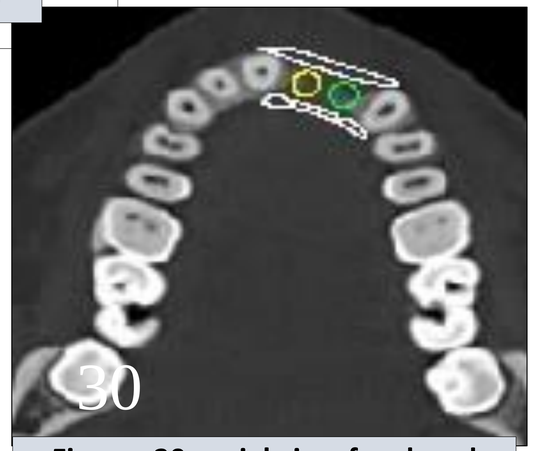


Figures 27 : Preoperative implant planning with closed shell and fixation screws v

Figures 28 :Closed shell frontal view

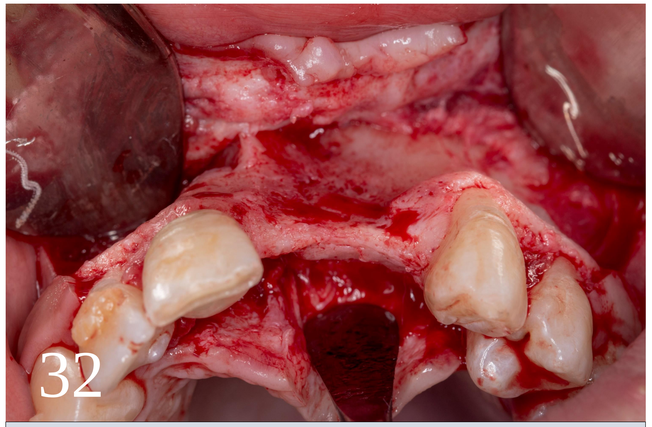


Figures 29 : sagittal view for closed shell



Figures 30 : axial view for closed shell with virtual implants

Figures 21 : Preoperative clinical view case 3



Figures 32 : Flap reflection

Figures 34 :Milled shell with bone graft

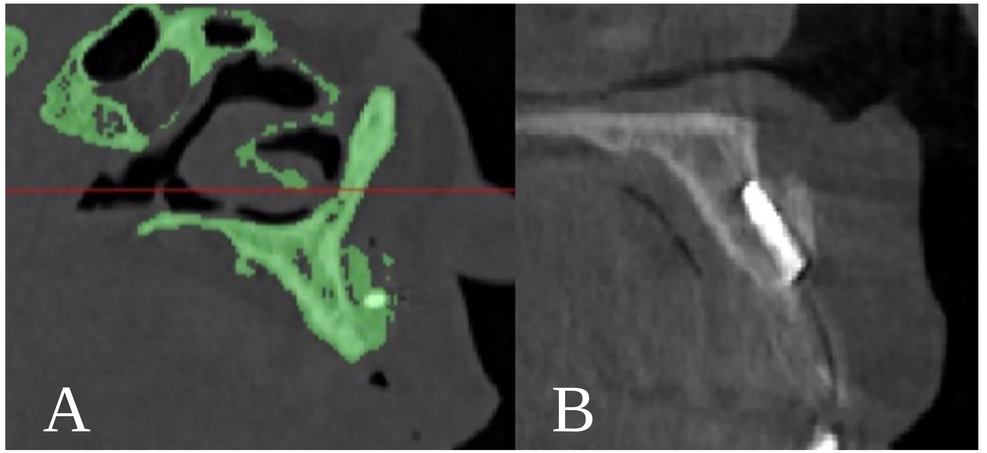
Figures 34 :Milled shell

Figures 35 : Peek shell after fixation

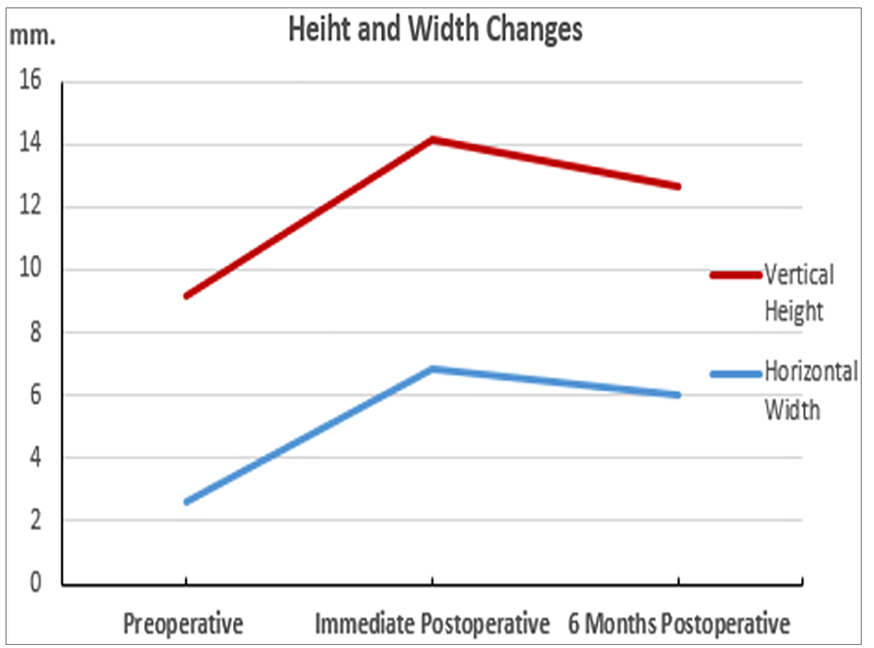
Figures 36 : 2nd stage after removal Peek shell

Results: Wound healing was uneventful for all the patients except 2 patients that showed wound break down 2 weeks postoperative that didn't affect the final outcome of the procedure.The customized shells were removed 6 months postoperative with successful placement of dental implants

Conclusion: customized PEEK buccal and palatal CAD/CAM shells appear to be promising and a highly accurate method for 3D ridge augmentation in the anterior atrophied maxilla.



Figures 37 A, 6 months postoperative CBCT. B, Implant placement 6 months postoperatively



Graph 1 showing pre, immediate, and 6 months postoperative vertical and horizontal bone dimensions