ABSTRACT
Rehabilitation of completely edentulous patients is a challenge to prosthodontists. This is more so with mandible as the resorption rate is 4 times more than that of maxilla. This article describes a case report of a completely edentulous patient with resorbed mandible who insisted on better esthetic and masticatory comfort. The treatment plan included fixed implant prosthesis with titanium framework and ceramic restoration for the mandible and removable complete denture prosthesis for maxilla. All procedures including surgical, prosthetic and lab procedures were explained in detail to the patient and the treatment was completed. Satisfactory results were obtained.

Keywords: Cone-beam computed tomography, Digital IOPA, Gingival porcelain, Osseointegration, Pattern resin, Radiographic stent, Titanium framework.


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Conflict of interest: None

INTRODUCTION
Older patients visiting a dental office have a constellation of medical, dental, social issues that challenge the diagnostic and therapeutic capabilities of dental clinician.1

Various treatment options for the edentulous arch include: (1) conventional implant-supported fixed partial dentures, (2) implant-supported overdentures, and (3) conventional complete dentures. One should consider the patient’s needs, perspectives and resources before finalizing the treatment plan.2,3 Implant prosthesis is more in demand in the last decade with reliable long-term results.4

Systemic conditions of the patient should not be ignored as implant prosthetic treatment involves surgical procedure.

CASE REPORT
A 54 years old female patient presented to the department of prosthodontics complaining of unsatisfactory mandibular denture and wanted a fixed prosthesis.

The existing complete denture was examined for retention, stability, support, vertical dimension. Intraoral examination revealed completely edentulous state with resorbed mandibular ridge. Necessary investigations, such as complete blood count, bleeding time, clotting time, blood sugar levels and orthopantomograph (OPG) was done. Pretreatment photographs of the patient were made. Mounting of diagnostic models was also done (Figs 1 to 3).

TREATMENT PLANNING
Various treatment protocols were discussed.3,5 Radiographic examination revealed that there was no abnormality wrt to the mandibular bone. Hence, a rehabilitation with implant-supported fixed prosthesis was planned.

The existing denture was duplicated and used for fabrication of radiographic stent. The radiographic stent was fabricated using autopolymerizing clear acrylic resin. The implant position was then transferred to the stent. A channel was then made through the center and filled with gutta-percha. The stent was provided to the patient and a cone-beam computed tomography (CBCT) of the mandible was made to assess the bone width, bone height, bone quality, proximity to vital structures, etc.6-8

It was decided to place six implants in the mandible, four in the interforaminal region and two in the molar region9 (Figs 4A to G).

Fig. 1: Pretreatment frontal profile of the patient
Surgical procedure was carried out under local anesthesia using the surgical guide. Six implants were placed in the region of 46, 44, 42, 32, 34 and 36. All the implants used were titanium, tapered, self-thread implants. The implant dimensions used were:
- 32 and 42 region—3.3 × 13 mm
- 34 and 44 region—3.3 × 10 mm
- 36 region—3.75 × 10 mm
- 46 region—3.75 × 8 mm

Mucoperiosteal flap was elevated and after the bone was exposed, the bone was penetrated using a pilot drill (2 mm diameter with internal irrigation). The paralleling tool was then used to evaluate the angulation and length. This was then followed by the 2.50 and 2.80 internal irrigation drill to the determined length for the 3.3 mm width implant. In cases of the 3.75 mm implant, the final drill used was the 3.30 mm internal irrigation drill. Each osteotomy site was rechecked using multiple parallel pins. To ensure the parallelism of implants, 32 and 42 region were done together, followed by 34 and 44 region and finally 36 and 46 region. Implant placement also followed the same sequence. Cover screws were then placed and continuous sutures were made using vicryl 3-0 resorbable material. Necessary medications were prescribed following the surgery (Figs 5 to 15).

After the healing period of 4 months, the second stage surgery was carried out (Fig. 16). During the second stage surgery, it was found that the implant in the 46 region had failed to osseointegrate. The other implants had successfully osseointegrated. Healing abutments of 3 mm length (decided based on the thickness of gingiva) were placed for the remaining implants (Fig. 17).

After 10 days of healing, preliminary impression was made using hydrocolloid. A custom tray was fabricated for the open tray impression. Impression copings were positioned on to the implant intraorally and final impression was made using polyether monophase (3M ESPE) impression material. Master casts were prepared with impression analogs and soft tissue replica to duplicate soft tissue contour (Figs 18 to 21).

Universal castable long abutments (UCLA) abutments were chosen. The abutments were joined using pattern resin and checked for passivity. Temporary denture base and occlusal rim were fabricated and jaw relation was done using the patient’s old denture. Vertical dimension was measured. A tentative trial was done for the lower denture to estimate the vertical dimension. It helped in estimating the total height of the framework and also to assess the freeway space (Figs 22 to 28).

Once the trial was done, the titanium framework was casted and tried in the patient’s mouth. Shade selection was done using VITA 3D shade guide. The framework seated passively. Passivity was evaluated using the fit checker pressure indicating paste. All the abutment screws were tightened using a hex driver and a diagnostic OPG was taken to ensure that there was no marginal gap between the titanium framework and implants (Figs 29 to 31).

Following the framework trial, porcelain buildup was done which included the buildup of gingival porcelain. The implant in the region of 44 was placed slightly buccal. This precluded the access from the occlusal surface. Hence, the access was made on the buccal surface. The porcelain in the region was made as a single crown. The maxillary complete denture was also processed. The fit of the framework was again checked with the help of an OPG and digital intraoral periapical (IOPA) and it was satisfactory. The abutment screws were torqued to 30N using a torque wrench. The access holes were blocked with beading wax and finally restored using composite resin (Figs 32 to 45).
Figs 4A to G: (A) Cone-beam computed tomography report for the mandible, (B) for region 46, (C) for region 36, (D) for region 44, (E) for region 34, (F) for region 42 and (G) for region 32.
Fig. 5: Local anesthesia given to the patient before starting the surgery

Fig. 6: Crestal incision was made

Fig. 7: Buccal and lingual flaps reflected

Fig. 8: Pilot drill done with the aid of surgical stent

Fig. 9: Sequential drilling was done

Fig. 10: Placement of paralleling pins to confirm the direction of osteotomy

Fig. 11: Hi-tech implant along with the implant mount

Fig. 12: Implant being placed in the oral cavity
Fig. 13: Cover screw placed

Fig. 14: Other implants placed

Fig. 15: Continuous sutures made using vicryl 3-0 resorbable material

Fig. 16: Orthopantomogram after 4 months of implant placement

Fig. 17: Healing abutments placed after a healing period of 4 months

Fig. 18: Impression transfer copings positioned into the implant bodies

Fig. 19: Orthopantomogram made to verify the placement and fit of the transfer copings

Fig. 20: Custom tray was positioned in the mouth and evaluated for ease of placement and over extensions of the flanges
DISCUSSION

Full mouth rehabilitation of a patient with implants should be considered only under favorable systemic conditions. Patient’s cooperation and affordability is important as it involves long-term treatment planning.21 Presence of more number of implants provides a more favorable outcome. In case of failure of one implant, the other implants can be used to take up the load.3 In this case, the implant in the region 46 had failed. This limited the prosthetic replacement till the 2nd molar region. Hence, the replacement was done only till 1st molar to avoid a long unsupported cantilever.22

An important observation in the treatment of such a case is use of digital radiography.23 When the framework was tried and the fit was checked with the digital OPG, there was an apparent micro-gap. To verify this, digital IOPAs were taken and it was found that there was no marginal gap. This difference could have been because of the angulation in the canine-premolar region.
Fig. 25: Jaw relation done using existing complete denture to assess the vertical dimension and freeway space.

Fig. 26: Extraoral profile of the patient during the tentative jaw relation with two points marked on the tip of the nose and the chin to measure vertical dimension at occlusion and rest.

Fig. 27: Teeth arrangement done for a tentative trial to assess the vertical dimension and esthetics.

Figs 28A to C: Trial of arranged acrylic teeth done for viewing the esthetics and visibility: (A) frontal view, (B) right side occlusion and (C) left side occlusion.

Figs 29A and B: Casted titanium framework: (A) occlusal view and (B) tissue surface.
Fig. 30: Titanium framework placed intraorally on the implants to verify the passivity and the fit

Fig. 31: Orthopantomogram made to verify the placement and fit of the titanium framework

Fig. 32: Titanium framework with the porcelain buildup done. All access holes are occlusal except the access hole in region 44 which is placed buccal. Hence, it is covered with a single crown

Fig. 33: Single crown in the region 44 removed to show the access hole for region 44

Fig. 34: Occlusal view of the processed maxillary denture and the framework

Fig. 35: Tissue surface view of the processed maxillary denture and the framework

Fig. 36: Framework placed intraorally on the implants to verify the fit and passivity

Fig. 37: Orthopantomogram made to verify the placement and fit of the framework
Fig. 38: After confirmation from OPG, all the abutments of the framework are torqued to 30N using a torque wrench.

Fig. 39: All the access holes of the framework are blocked with beading wax before restoring, to prevent composite resin from flowing on the implant screw.

Fig. 40: Occlusal view of the framework after restoring the access holes with composite resin.

Fig. 41: Frontal view of occlusion after placing the denture and framework.

Fig. 42: Right lateral view of the occlusion.

Fig. 43: Left lateral view of the occlusion.

Fig. 44: Extraoral frontal profile of the patient after placement of prosthesis.

Fig. 45: Extraoral side profile of the patient after placement of prosthesis.
For such a kind of prosthesis, maintenance of oral hygiene is of utmost importance. The patient was advised to use super floss to remove any accumulated debris below the framework. Regular recall visits were scheduled. Patient gave a positive feedback.

A similar case was reported by Pratyusha et al but they had not used the titanium framework for the prosthesis.

One should understand that if the metallic framework is not seating passively, the best solution is to section the framework and attach the framework by soldering technique. If this is not possible, one should not hesitate to repeat the impression procedures because an ill-fitting metal framework will create more load on the underlying implants which may have an indirect effect on the prognosis of the entire prosthesis. The framework can be made of either titanium or cobalt chromium. However the weight of the titanium framework is less as compared to cobalt chromium framework and also reduces the chances of galvanic corrosion. Hence, the overall load on the implant is reduced. The disadvantage of the titanium framework is that it is expensive and technique sensitive. Hence, all these factors should be considered during treatment planning.

REFERENCES