

CASE REPORT

Edentulous Case with an Implant-supported Prosthesis for a Patient with Severe Atrophy

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ABSTRACT

An edentulous patient with severe residual ridge resorption with existing complete denture prosthesis desires improvement in function and comfort. This is a case report of step by step procedure for an implant-supported prosthesis for mandibular arch with severe resorption.

Keywords: Completely edentulous, Mandibular hybrid denture, Implant-supported denture.

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PATIENT EXAMINATION

History

Mr CS (patient) presented with complaint of ill fitting and worn dentures that were made approximately 8 years ago. He complained of the lower denture, in particular, that was very loose, moved a lot when he spoke and could not chew food well. He needed to use copious amounts of denture adhesive regularly to be able to function with the existing dentures. The lower denture had in particular required frequent adjustments in the recent past due to sore spots. Occasionally, in the posterior mandible the patient experienced severe pain on biting. The existing dentures were relined a couple of times, the last reline was approximately 2 years ago. He had been wearing complete dentures for the last 40 odd years. He has had at least five sets of dentures fabricated over the last 40 years and observed that the fit, comfort and chewing ability had been getting poorer over the last few sets. Due to age and general health, he found the compromise in comfort and efficiency of the existing dentures difficult to bear with, affecting his dietary intake in terms of the quality and quantity. He was also aware that due to advancing age,

health and present medical conditions, undergoing any extensive treatment would be more challenging.

He wished to have new dentures. He desired to have, in particular, the lower denture made to fit better, if possible fixed. He was happy to continue with the upper denture made in the same manner, which had never been a problem.

Mr CS is a controlled diabetic. Recent laboratory tests show CBC, BT CT, BSL within normal limits.

Clinical Examination

Mr CS was a 77-year-old small built Indian male and was totally edentulous.

The edentulous areas exhibited generalized extreme alveolar resorption, in maxilla and mandible; the mucosa covering was healthy. The attached keratinized mucosa was very thin in the mandibular arch. The crest of the residual ridge was thin on palpation in the maxillary arch. The buccal labial mucosa was healthy. The tongue was very large and showed no abnormality. A notch was palpable in the mental foramen area. Digital pressure in this and posterior to this areas resulted in severe pain.

The complete dentures had poor adaptation to the supporting mucosa, the mandibular prosthesis in particular had very poor retention and stability. However, the prosthesis were esthetically and phonetically acceptable with the use of denture adhesive to retain them.

The temporomandibular joint (TMJ) function was normal, showed normal range of movement, there were no clicks or sounds on opening or closing. He had no parafunctional habits.

Radiographic Examination

Panoramic radiograph showed mandibular arch with extreme resorption. The genial tubercles were prominent. The inferior alveolar canals appeared on the surface of the mandible in the premolar and molar region and a concavity was visible in mental foramen region. The bone showed normal trabecular pattern in the mandibular anterior region. The mandible in posterior region was very short in height and appeared highly dense and corticated (Fig. 1).

Dentascan images showed residual basal bone of the body of the mandible with total loss of the alveolar

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Fig. 1: Presurgical orthopantomograph

processes. Genial tubercles were higher than the residual body of the mandible. The residual basal bone in the anterior mandible measured 6 to 7 mm in height and 9 to 10 mm in width. Three-dimensional reconstruction of the mandible showed a groove like depression on the oral surface extending from the anterior border of the ramus to the mental foramen region suggestive of inferior alveolar canal completely surfaced.

Maxillary alveolar process showed extreme resorption. Maxillary anterior region showed normal trabecular pattern. The maxillary sinuses were enlarged and appeared mostly clear.

Preoperative Diagnosis

Mr CS was totally edentulous with extensive residual ridge resorption in the maxillary and mandibular arch.

The prosthesis had very poor retention and stability but acceptable esthetics.

DEVELOPMENT OF TREATMENT PLAN

Treatment Goals

Mr CS desired to have new prosthesis with improved comfort and function. He was satisfied with the appearance of the existing prostheses. Having worn removable prosthesis for 40 years, he was not adverse to continuing with the same. Due to age, physical and medical constraints, he was aware of the limitations in the number and extent of procedures, specially surgical procedures that he could undergo and, therefore, wished to have only lower prosthesis addressed. He desired to be able to get a mandibular prosthesis to retain well and to function efficiently for mastication.

Interarch Relationships

Mr CS had a normal overbite and overjet with existing prosthesis, normal occlusal plane with flat curve of spee and minimal cuspal angles. The existing prosthesis showed moderate wear specially in posteriors. The occlusal plane divided the interridge space favoring

the maxillary prosthesis and the height of mandibular occlusal plane from the denture foundation was excessive. He had normal temporomandibular joint function on clinical examination. The vertical dimension and centric occlusion in the existing prosthesis was acceptable.

Evaluation of Edentulous Ridge

The mandibular alveolar ridge and the basal bone were severely resorbed exposing the inferior alveolar canal. The edentulous areas were flat. The genial tubercles were extremely prominent. The height of mandible available for placement of implants appeared to be inadequate. The mental foramen was not distinct and appeared on the surface of the denture bearing area.

The alveolar mucosa appeared thin, mildly inflamed and inadequate in width.

Prosthetic Restoration Selection

Since the bone quantity available was inadequate to place sufficient number of implants of acceptable length in the mandible, it was not possible to plan a fixed prosthesis, without extensive augmentation procedures to gain adequate volume of bone.

Since, the patient did not wish to undergo extensive bone augmentation procedures, I planned to fabricate a milled bar retained and supported complete prosthesis for the mandible. A screw retained milled bar with a distal cantilever up to approximately 15 mm and a custom fabricated cast housing incorporated in the denture would allow the prosthesis to be implant supported. For additional retention, a few balls cast simultaneously to the bar and O-ring housings in the prosthesis were also planned. As the patients desired, it was planned to simultaneously make a conventional removable prosthesis for the maxilla.

The maxillary and mandibular dentures were planned with full extensions for comfort. Occlusion was planned with minimal overbite for esthetics, phonetics and incisal guidance, posteriors with minimal cuspal angles set in a flat plane dividing the interridge space equally.

Hard and Soft Tissue Modifications

There were no hard tissue modifications or augmentation procedures planned as patient's wished. Since, there was not enough bone available to place implants in the posterior mandible, lateralization of the inferior alveolar nerve was not planned.

Since the attached mucosa was limited in width in anterior mandible, I planned to split the available attached mucosa equally on facial and lingual of the implants, at the second stage procedure of uncovering the implants. This would facilitate hygiene maintenance around the implants and under the milled bar.

Implant Selection Rationale

Two-stage tapered threaded implant with a blasted surface with internal hex prosthetic platform no 4—BioHorizon internal tapered 4.6 mm diameter and 7.5 mm long was selected for placement in the anterior mandibular region. It was planned to place four implants leaving safe distance of 3 to 4 mm from mental nerve and adequate space of at least 3 mm between each fixture. When splinted, this would provide for an adequate bone to implant contact surface area.

It would have been desirable to use single-stage implants, in order to manage the inadequate attached crestal mucosa and avoid a second stage surgical procedure. However, due to the possibility of early loading from the removable prosthesis, two-stage protocol was planned, leaving the soft tissue management for the second stage of uncovering the implants.

SURGICAL AND PROSTHETIC REPORT

Surgical Procedures

Due to higher surgical risk, patient was referred to physician and an anesthesiologist for preoperative evaluation and fitness. It was decided to carry out the surgical procedure in a hospital setup with anesthesiologist as a standby. An OMFS was attending the surgery as well in OT with preparation for management of a possible surgical complication of fracture of mandible.

Standard preoperative instructions were given to the patient regarding the surgical procedure, premedications (2 gm augmentin an hour prior to the surgical procedure) and diet. An informed consent for the surgical procedure was obtained on the day of surgery, i.e. August 21, 2008.

Patient rinsed his mouth with a chlorhexidine solution (Clohex, 0.2% chlorhexidine gluconate oral rinse, Dr Reddy Laboratory, Navi Mumbai, India). The extraoral surfaces were painted with betadine. The patient was then draped with sterile drapes and intraorally Betadine solution (10% povidone-iodine topical solution) was applied with particular attention to the surgical sites. Local anesthesia was administered with bilateral buccal and lingual infiltration using four carpules of 1.8 cc, 2% lidocaine HCl with 1:80,000 epinephrine; Lignospan special (Septodont 58, rue du Pont de Creteil, 94197, Saint-Maur-des-Fosses Cedex, France).

The midline of the face was recorded and transferred to the crest of the ridge, intraorally. The locations of the depression on the alveolar crest suggesting inferior alveolar canal and an elevation in the mental region was confirmed by palpation and marked on the mucosa. Patient's duplicated removable prosthesis in clear acrylic, was placed on the ridge, midline of the face and locations of the mental foramina transferred to it.

An incision was made on the crest of the edentulous ridge starting from the midline and extending to 25 mm distal on either side. A releasing incision of 10 mm was made in the labial vestibule in the midline. Full thickness mucoperiosteal flaps were raised to visualize the edentulous ridge and approximately 5 to 6 mm beyond the facial and lingual of the body of the mandible.

The midline was transferred to the ridge by scoring the cortical plate by 2 mm depth osteotomy made with 1.5 diameter round bur on a 1:8 speed reduction handpiece at 1,500 rpm with saline irrigation (sodium chloride injection IP 0.9%, Nirlife Healthcare-Nirma Ltd, Sachana, Gujarat-382157, India).

The duplicated clear acrylic denture was tried on to confirm that the possible locations for implant osteotomies were lingual to the dental arch form.

Starter drill of 1.5 mm diameter was then used to make osteotomies at a distance of 4 mm from the midline osteotomy on the left and right at 1,500 rpm with saline irrigation to a depth of 2 mm. The direction of the osteotomy was confirmed to exit lingual to the dental arch from the surgical guide prepared. Two more osteotomies were initiated 8 mm distal to the paramidline osteotomies and were made to a depth of 8 mm. The central osteotomies were then increased to a depth of 8 mm as well. Paralleling pins were inserted in all these osteotomies and confirmed for parallelism.

Twist drills of 2.5 and 3.2 mm were successively used to widen the osteotomy to a depth of 8 mm for all the four osteotomies. About 3.7 and 4.1 mm wide increasing drills were used to finish the osteotomy.

Appropriate sized thread tap of 4.6 mm was used at 25 RPM to 6 mm depth and reversed from all the osteotomies.

BioHorizons tapered internal hex implant 4.6 × 7.5 mm were then placed in at 15 RPM and 35 Ncm with abutment level handpiece adapter for the four sites. The implant mount (3 in 1 abutment) was then removed by unscrewing the fastening screw. Coverscrews were then placed over with 0.5 mm handpiece adapter.

The mucoperiosteal flaps were then sutured with 5-0 Vicryl interrupted sutures NW 2442-absorbable surgical suture USP (synthetic), coated polyglactin 910 violet (Ethicon, Johnson and Johnson Ltd, Aurangabad 431136, India) to achieve primary closure.

The mandibular prosthesis was relieved in the surgical site completely, the patient was asked to wear the prosthesis sparingly for esthetic reasons only.

The patient was then given a frozen cold pack (Nexcare Reusable Cold/Hot Pack, 3M Healthcare St Paul, MN 55144-1000, USA) to apply intermittently for the following 2 hours.

The patient was given postoperative instructions and discharged from the daycare after 4 hours.



Fig. 2: Postsurgical orthopantomograph

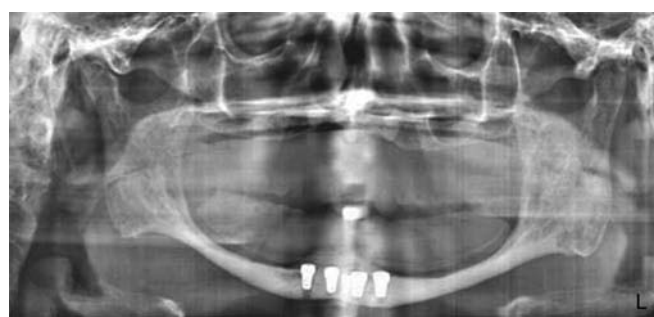


Fig. 3: Postsurgical orthopantomograph (preprosthetics)

The sutures were removed on 8th day postoperatively (Figs 2 and 3).

The mandibular denture was relined by GC Reline Soft (GC Corporation, Tokyo, Japan) a week after the sutures were removed.

The implant uncovering procedure was carried out under local anesthesia. The coverscrews were located by palpation. A crestal incision was made to divide the attached mucosa equally on the facial and lingual side. A partial thickness releasing incision of 5 mm was made in the midline. The implants were located ~2 mm facial to the crestal incision. A full thickness flap was raised to expose the facial limits of the implants and then a partial thickness dissection was carried out to release the flaps labially so that they could be approximated around the healing screws without tension. Coverscrews were removed, internal 4.5 regular emergence healing abutments, 3 mm height were placed with 0.05 hex driver. Interrupted sutures with 5-0 Vicryl sutures were used to approximate the released flaps without movement around the healing screws.

Mandibular denture was relieved, and relined with GC Reline Soft. Sutures were removed 10 days later.

Prosthetic Procedures

The prosthetic steps were initiated with a primary impression of the implants by indirect transfer using 3 in 1 abutments and a balltop screw placed on the implant after removal of the healing abutments. The impression was made in a stock tray using polyvinyl siloxane (Express STD Putty and Light body, 3M ESPE, St Paul, USA). The impression was poured using type IV improved dental stone (KalRock, Kalabhai Dental, Mumbai, India) by the laboratory. After recovering the model from the impression, all the abutments were fastened with the abutment screws and a dental floss was tied around all of them. GC pattern resin (GC Corporation, Tokyo, Japan) was then applied on the dental floss to cover it completely and allowed to set. The pattern resin was then sectioned in the center, in between two abutments.

An open custom tray was fabricated by the laboratory using light polymerizing tray material after providing

for adequate space for the impression material with modelling wax with full extensions.

At the final impression appointment, the direct transfer abutments with the sectioned GC pattern resin were seated on the implants with balltop screws after removal of the healing screws, confirmed for its complete seating with the use of a probe and radiographs. GC pattern resin was then used to join all the sectioned pieces together with a minimal amount in the sectioned areas, allowed to set completely one at a time. The custom tray was then tried for a passive fit. Border molding procedure was carried out using low fusing impression compound. On completion of the border molding, polyether tray adhesive was applied on this custom tray and allowed to dry for 5 minutes.

Polyether impression material (Impregum Penta, Medium-bodied consistency, 3M ESPE AG, D-82229, Seefeld, Germany) was mixed, dispensed in injection syringe and into the special tray. The injection syringe was used to inject the impression material in difficult to reach areas along the tissues and the tray was then seated with a vertical seating pressure. The impression was recovered from the mouth after set of material and the balltop screws unscrewed from the abutments.

The laboratory poured the impression, recovered the cast, fabricated temporary denture bases and wax rims for recording jaw relation record. The wax rims were modified to an appropriate dimension to establish adequate lip support, buccal corridors and vertical dimension of occlusion after removing the healing screws and transferring the wax rims on temporary denture bases to the mouth. Centric jaw relation record was made on the wax rims with softened Alu Wax. The casts were mounted on a semiadjustable articulator Denar II with a face bow transfer. The laboratory then completed setup of denture teeth and returned the setup for tryin. The wax setup was tried on for esthetics, phonetics and confirmation of the jaw relation record. The approved tryin was returned to the laboratory. The laboratory indexed the position of the mandibular anteriors. Fabricated a milled bar with Rhein 83 attachments on the distal extensions of the bar (Figs 4 to 6).

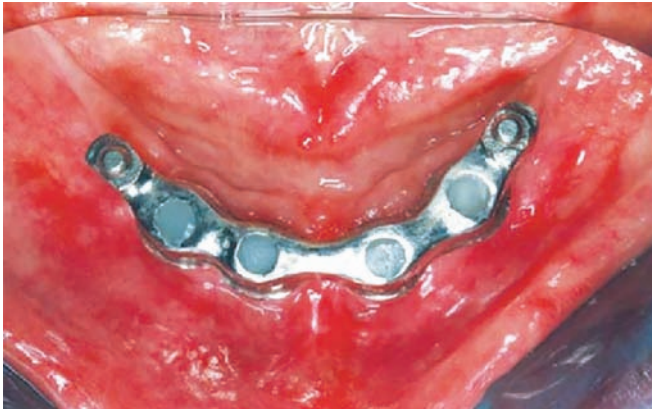


Fig. 4: Occlusal view of the superstructure without the prosthesis in place



Fig. 5: Frontal view of the superstructure without the prosthesis in place

The fit of the bar was confirmed by an aerosol indicator marking spray, occlude (Pascal, USA), single screw test and radiographs for its fit (Figs 7 and 8).

The maxillary and mandibular complete dentures along with the milled bar were then delivered. Centric occlusal premature contacts were marked with Bausch 0.008" (200 microns) blue articulating paper strips and eliminated. The abutment screws were tightened with 25 Ncm torque wrenches, and the screw holes filled with teflon tape plugs and cavite (3M ESPE, St Paul, MN, USA) (Figs 9 to 16).

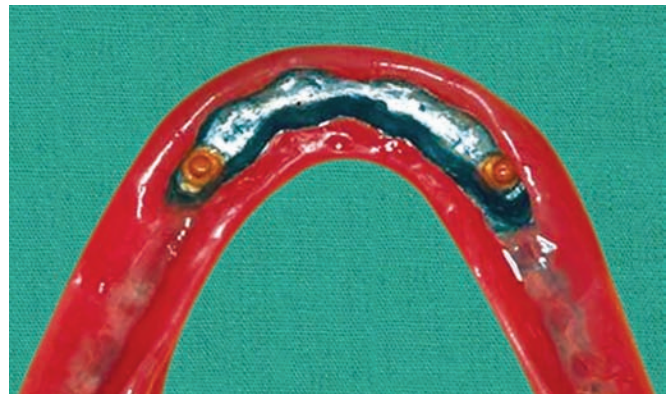


Fig. 6: Intaglio (tissue side) surface of the prosthesis

CLINICAL RESUME

Comparison of Pre- and Postoperative Diagnoses

Conversion of the tissue-borne removable mandibular complete denture to a milled bar retained and supported prosthesis has made a big difference to the patient's function and comfort. He feels confident and assured because of the elimination of problems due to poor retention, stability and function of his earlier mandibular complete prosthesis.

Type of Patient Instructions

Type of patient instructions include preoperative, post-operative, diet, temporization, prosthetic.

Postoperative instructions included plaque maintenance, use of a chlorhexidine 0.2% mouthwash. The patient was asked to apply a cold pack for 2 hours externally and was instructed to avoid consumption of any food, liquids for the duration of the effect of the anesthetic. He was asked to have semisolid or liquid diet for 2 days postoperatively. He was instructed not to use a

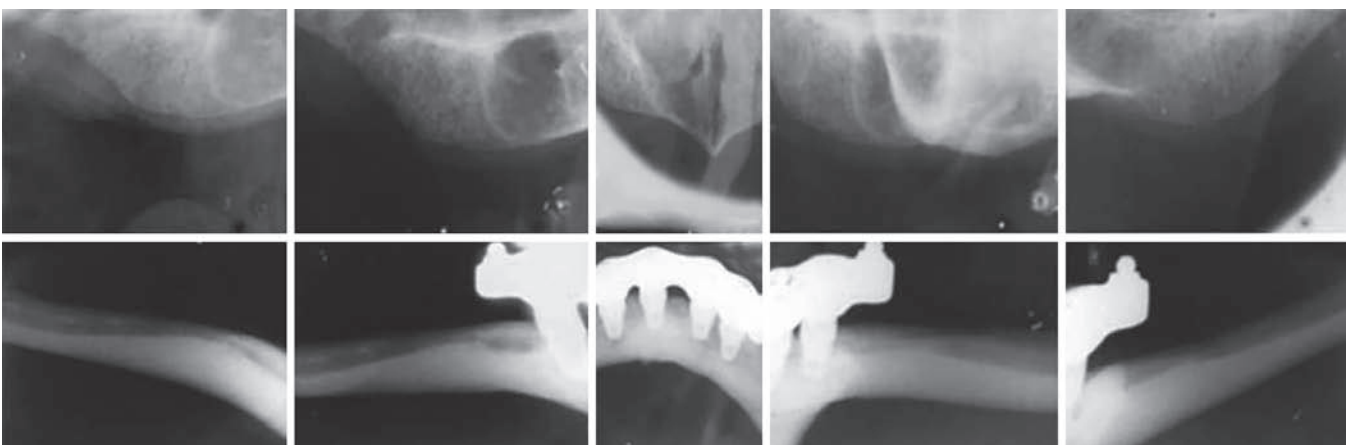


Fig. 7: Postprosthetic periapicals

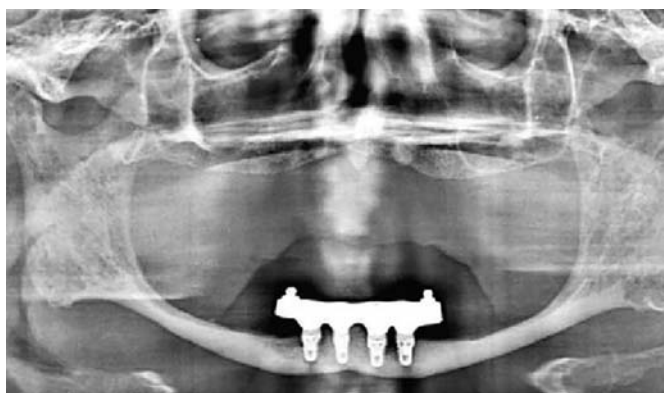


Fig. 8: Postprosthetic (with prosthesis or bar superstructure in place)



Fig. 9: Frontal view



Fig. 10: Protrusive view



Fig. 11: Occlusal maxillary view



Fig. 12: Occlusal mandibular view



Fig. 13: Lateral view in centric occlusion left



Fig. 14: Lateral view in centric occlusion right



Fig. 15: Right working view



Fig. 16: Left working view

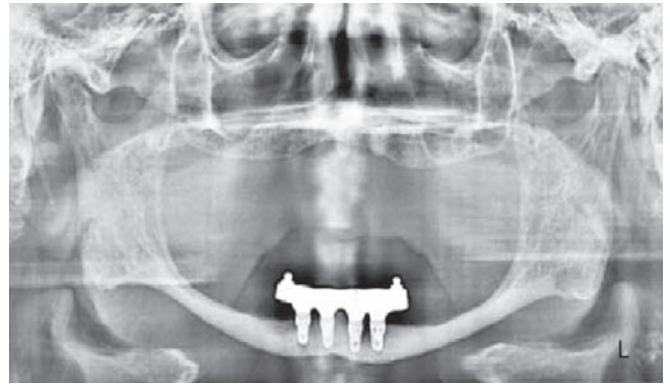


Fig. 17: Completed case radiograph (taken within 12 months of the patient's oral/case examination date)

brush on the surgical site for 10 days and use of chlorhexidine 0.2% mouthwash after every meal for 15 days postoperatively. He was asked not to bite on his front teeth and hard food substances with his relined complete prosthesis.

On delivery of the milled bar and complete dentures, he was given plaque maintenance instructions with toothbrush, dentifrice and interdental brushes for the tissue surfaces of the bar and the interimplant spaces. He was recalled at 15 days, 1, 3, 6 months and 1 year (Fig. 17). He was asked to report immediately, if the prosthesis or the bar felt loose for final tightening of the abutment screws.

Complications

Except for transient ecchymosis intra- and extraorally after the surgical insertion of the implants, the treatment

concluded without any other complications. Postdelivery of the prosthesis and the bar at 15 days and 1 month follow-up, the plaque maintenance was not adequate and the patient had to be motivated, demonstrated and instructed to maintain plaque under the bar.

Patient Acceptance and Prognosis

Conversion from the tissue borne mandibular prosthesis to a bar retained and supported prosthesis has been received by the patient with great joy, he feels extremely secure, can function very well and feels very confident about himself.

The prognosis of the mandibular prosthesis for this patient is good, provided the maintenance of plaque is well monitored.