

A 2D Panoramic Surgical Stent Imaging: Complete Arch Mandibular Implant Fixed Prosthesis along with Bar Supported Maxillary over Denture

Abstract

Successful rehabilitation of a patient should restore function, esthetic, and speech by prosthesis. Treatment modalities vary from patient to patient. Semi-precision attachments and implants offer several advantages over the traditional approach. The aim and objective of this report was to assess a case of a 55-year-old female patient who had lost all her teeth, except maxillary canines #13 and #23 and with severe bone loss in the mandible. Tooth-supported bar attachment was planned for maxilla, and a total of five dental implants were placed in the mandible using a flapless approach aided by radiographic gutta-percha surgical stents over panoramic two-dimensional imaging. Customized, radiographic stents help for the placement of implant in the view of paralleling and flapless surgery, completely. An immediate loading protocol is adopted as from day of the surgery to 6 weeks along with implant supported full arch fixed dentures after 4 months. The outcome of the treatment was impressive, and the patient gave a positive response with superb esthetics and functions.

Keywords: Customized radiographic gutta-percha surgical stent, fixed implant prosthesis, flapless surgery, semi-precision bar attachment

Introduction

Ever since the advent of dentistry, it has been a challenging task for a dentist to fabricate a prosthesis which can provide adequate stability, support, and retention to rehabilitate the completely edentulous patient. The job becomes even tougher when the ridges are grossly resorbed. Standard treatment for the edentulous patient has been the provision of complete denture. However, complete denture wearers face problems with oral function due to compromised retention and stability of the mandibular prosthesis as they rest on the moving foundation provided by the mandible and its associated musculature. The conventional treatment option of replacing missing teeth has been replaced by new techniques such as placement of implant-supported prosthesis and attachments for overdentures. Surgical placements of dental implants have proved to be a well-documented treatment for edentulism. Treatment success rates are quite highland; postoperative complications are relatively less.^[1-3] Further, advancements in treatment modalities have progressed

to immediate loading and placement of implants without flap elevation to increase patient comfort and acceptance. Flapless procedures decrease postoperative patient discomfort and intraoperative bleeding.^[4,5] Although flapless implant surgery distinguishes as a blind procedure because of the difficulty in evaluating alveolar bone shape and angulations.^[6] The loss of bone width cannot be determined on a two-dimensional (2D) traditional radiograph and can be difficult to evaluate clinically. Successful implant treatment involves osseointegration of implants that are placed in ideal positions for fabrication of a dental prosthesis. Treatment planning is crucial for successful treatment outcome.^[7] Computerized tomography scanning software such as DentaScan helps in providing important information and can be used to more accurately a plan implant placement. The role of panoramic radiographic surgical stent aids in accurate placement of implant in view of paralleling as the near exact location for implant in relation to future prosthesis can also be determined. Many a times, abnormal

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placement of implants leads to difficulties in fabricating prosthesis. To avoid such circumstances, proper treatment planning has to be evaluated and done.

Going by the principles of “preventive prosthodontics,” retained natural teeth should not be extracted and completely edentulous situation can be avoided by successful rehabilitation by the use of the procedure called “overdenture therapy.”^[8,9] Overdenture is any removable dental prosthesis that covers and rests on one or more remaining natural teeth, roots of natural teeth, and/or dental implants (GPT-8).^[10] Overdentures provide a better function than conventional complete dentures, such as increased biting force, chewing efficiency, and increased speed of controlled mandibular movement.^[11] Besides providing superior retention, overdenture attachments act as shock absorbers and stress redirectors. Bar attachment retainers play dual role of acting as splints for root spanning the edentulous space and providing overdenture retention. As bar is positioned close to the alveolar bone, torquing forces applied through the bar will be less than the torquing forces applied through the occlusal rest given in removable partial denture.^[12]

The current case report describes a technique for the fabrication of overdenture on maxillary canines, by the incorporation of too extraradicular semi-precision attachment over the canine while the corresponding components in the tissue surface of the maxillary complete denture. Although flapless implant surgery distinguishes as a blind procedure because of the difficulty in evaluating alveolar bone shape and angulations.

Case Report

A 55-year-old female reported for replacement of missing teeth. On intraoral examination, there were only two natural teeth present in the oral cavity #13, 23 in the maxilla. Mandibular arch was completely edentulous [Figure 1]. Clinical and radiographic examination revealed that maxillary canines were periodontally sound with no mobility and periapical pathology. Various prosthetic treatment modalities were explained to the patient. The patient was not willing to extract #13 and #23, and due to severe gag reflex and presence of sufficient interarch space for the placement of metal bar, copings, denture base, and teeth arrangement, it was decided to fabricate maxillary palateless bar-supported overdenture. For mandible, treatment option decided was implant-fixed prosthesis as retention and stability are compromised in the mandible to greater extent than maxilla.

Proper case history was recorded for the patient including medical history which was noncontributory, with routine blood investigations and dental and oral examination. Diagnostic impressions and casts were prepared. DentaScan was carried out to evaluate the dimensions of available bone and appropriate-sized implants were selected [Figure 2].

Template in the form of conventional complete denture was prepared for mandible, and the positions of implants were decided before the surgery. Radiographic template was fabricated with the help of gutta-percha cylinders inserted in the expected location of implants and an orthopantomogram (OPG) 2D image was taken [Figure 3]. It helped in determining height of the available bone at the site of implant placement. At the time of surgery, radiographic template was converted to surgical template.

Surgical phase

Flapless surgical protocol was planned as there was adequate amount of bone, 1 mm bone buccolingually, and sufficient attached mucosa was present at the surgical site such that at least 2 mm of attached gingiva would remain around the implant site. Preoperative antibiotics and analgesics were given to the patient. With the help of template placed on the crest of the ridge, Lance and Pilot drill was carried out [Figure 4]. Paralleling tools were placed and checked for angulations of the implant. Sequential drilling was done for placing implants at site #36, #46, #34, #43, #31 in the osteotomy site. The respective implant sizes (Touareg –S, ADIN DIS, Israel) were selected as 4.2 w/8 L, 4.2 w/8 L, 4.2 w/11.5 L, 3.75 w/13 L, and 3.75 w/13 L. Perimucosal extensions were placed. Postoperative care has been administered with antibiotics, analgesics, and mouthwash. Maintenance of oral hygiene was emphasized. Immediate loading was done by converting surgical template into conventional denture by sealing holes of template with autopolymerizing resin and relining it with tissue conditioner.

Prosthetic phase

For mandible, after 4 months, the patient was recalled and postoperative OPG was made and checked for proper osseointegration [Figure 5]. After confirming osseointegration, closed impression analogs were placed. Closed tray impression was made with elastomeric impression material (Photosil DPI, India) with double mix technique. Implant analog was threaded to the impression analog in the impression tray and cast was poured. Maxillary canine tooth preparation was performed on #13 and #23. The rubber-based elastic impression was poured into the die material to obtain cast, on which dome-shaped pattern of copings and plastic bar (Ceka-Preci-Line, Swiss-made) was placed after evaluating parallelism with the help of a surveyor. The pattern were then spruced, invested, burnout, and casted into base metal alloy. After retrieving casting from the investment, it was finished and its fit was evaluated in the patient mouth. Copings and bar assembly was cemented on the abutments. Secondary impression was made with light body after blocking out undercuts of bar. Master cast was obtained by pouring the secondary impression into die stone (Type IV – Kalabhai, Bombay).

Jaw relations

Occlusal rims were fabricated on maxillary and mandibular casts. Horizontal and vertical maxillomandibular records were obtained with record bases and occlusion rims and transferred to a semi-adjustable Hanau Wide-View articulator using a face bow. Abutments were placed on the cast and wax pattern was fabricated for mandibular-fixed prosthesis. Casting was done with induction casting (Ducatron, Ugin, France), and metal trial (Wironium Plus, Bego, Germany) was carried out. Later on, ceramic (VITA VMK Master,

Germany) build-up was done and final prosthesis was fabricated and cemented.

Teeth arrangement for the maxillary denture was done and try-in was done. Denture was fabricated after placing processing spacer and metal housings at time of curing the denture. After curing, the undersurface of denture will be having metal housings and yellow Hader clips. After evaluating fit of denture, female silicone yellow-colored housing was inserted with the help of insertion tool at the time of denture delivery [Figure 6]. Final prosthesis was evaluated for occlusion and fit [Figure 7]. Postoperative oral hygiene instructions were given to the patient, and proper follow-up was done.

Discussion

Proper diagnosis and treatment planning is key to successful mouth rehabilitation. Treatment modalities have to be modified as per the need of patient. Retention can be increased by means of overdentures

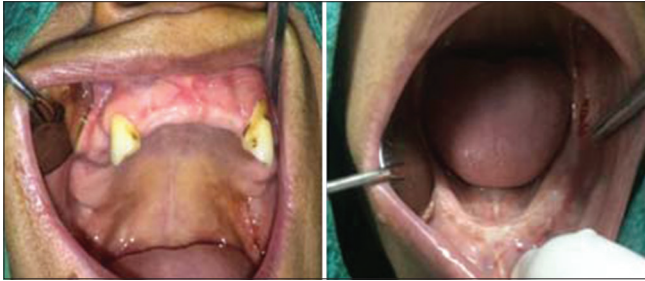


Figure 1: Preoperative

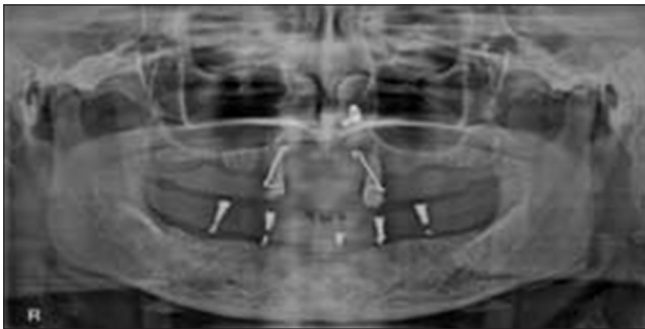


Figure 3: Customized radiographic template

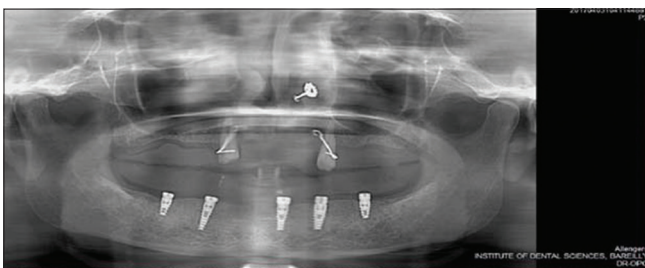


Figure 5: After 4 months of healing

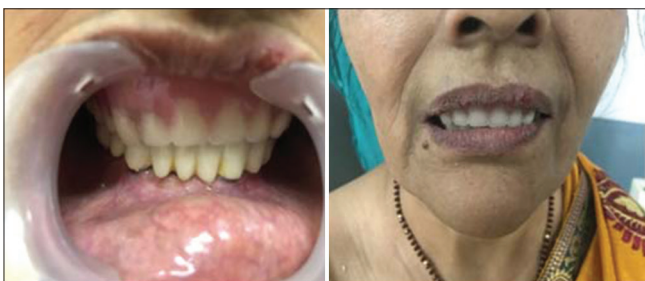


Figure 7: Postoperative

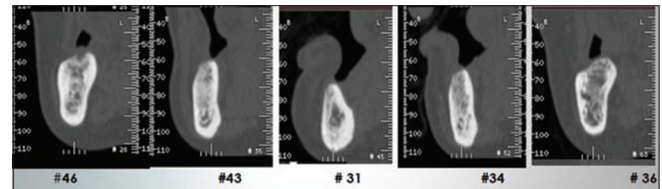


Figure 2: DentaScan report

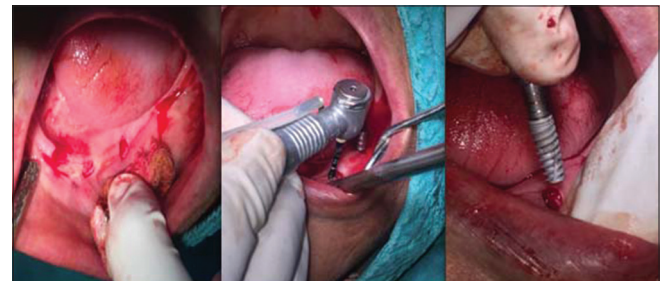


Figure 4: Surgical phase – flapless surgery



Figure 6: Intaglio surface of maxillary denture plastic and metal housing

using attachments. Careful assessment of vertical space was observed, especially with the attachments, i.e. there must be sufficient room for roots, copings, and possible attachments, together with an adequate thickness of denture base material and artificial teeth, without jeopardizing the strength of the denture.^[13] The bar joint denture offers a transitional solution between the class retained removable partial denture and the complete denture. This case involved the preservation of two canines for maxillary overdenture in providing support, retention, stability, and comfort superior to that of a conventional complete denture. A metal bar was used in this case with a female component embedded in the tissue surface of the denture. The use of two canines as abutments splinted together with a bar is more advantageous than using the individual abutments separately. This is due to the splinting effect of the bar. Both teeth become firm and are safer abutments. It also reduces torquing of the remaining root.

Flapless implant surgery is a well-accepted technique for placing dental implants. Successful implant treatment involves osseointegration of implants that are placed in ideal positions for fabrication of a dental prosthesis.^[7] Extensive preoperative planning and treatment coordination are necessary for treatment success. Imaging tools, a diagnostic wax-up and a surgical guide, along with a good understanding of anatomy and surgical principles are essential.

The desire for predictable prosthesis leads to the development of prosthetically guided implantology like author advocated customized radiographic stent used with 2D image as used in above case. The ideal placement of five implants has been determined by definitive restoration as predictable implant FP2 prosthesis requires the determination of final prosthesis in treatment planning stage. This number of implant has been decided by Misch Classification of treatment option no. 1 out of 5 options.^[14] Radiographic templates help in proper positioning of implants; therefore, proper load distribution will occur. It is simplified approach of implant placement. Malaligned dental implants result in complicating the clinical and laboratory procedures employed in fabrication of superstructure prosthesis. Due to improper implant placement, improper load distribution will be resulting in overall increase in stress concentration on supporting structures and implants. This will compromise the maintenance of bone-implant interface.

DentaScan (GE Medical System, Siemens, Germany) proves to be of great help in determining the dimensions of available bone and accurate placement of implants, thereby decreasing the incidence of implant-associated complications and assist the clinician in selecting and applying appropriate treatment options, such as flapless and implant's immediate loading. This technique also reduces

surgery time and the healing time of the mucosa after surgery with minimal trauma to the oral tissues.

Conclusion

Fixed implant-supported prosthesis treatment option is a remarkable advancement in prosthodontics. It is one of the dentistry's most satisfying treatment modalities, but it demands considerable skill, judgment, and enough experience. Consequently, this treatment provides a high degree of patient commitment and understanding. With the help of customized radiographic stent, a preview of definitive restoration, its relationship to adjacent structures, and accurate placement of implants has been evaluated. This stent is very much economical and affordable. The treatment provided to the patient resulted in accurately passive fitting, esthetic, and functionally efficient prosthesis.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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