

An organized start to implant-supported prosthesis

SUMA KARTHIGEYAN, SEYED ASHRAFF ALI, KALARANI MOHAN, MANGALA DEIVANAI

Abstract

Various treatment options are available for rehabilitating the complete edentulous patients with implants. However, due consideration for the prosthesis is not given prior to implant surgery. This can result in implant being placed in locations that do not provide the best esthetic and functional result. Incorrect implant localization and angle are the primary cause of non-axial loading and may contribute to loss of Osseo-integration. For predictable outcome, the treatment should begin with visualizing the end result. A step-wise pre-implant surgery evaluation is necessary to achieve the objectives. This is a case report of a completely edentulous patient who was treated with fixed implant prosthesis following various steps in the pre-implant surgery evaluation.

Keywords: Diagnostic, implant, radiographic, surgical, template

Introduction

The rehabilitation of the completely edentulous patient is a major responsibility for the prosthodontist. Though, conventional complete dentures provide reliable service, the anatomic limitations, tissue changes underneath the denture and the psychological make-up of the patient contribute to the poor performance of the prosthesis. Implant dentistry provides different treatment options for the completely edentulous arch by providing multiple abutment sites for support of the prosthesis that enhances its performance. Optimal implant placement is critical to the esthetic and functional success of implant supported^[1] restoration. Incorrect implant localization and angle are the primary cause of non-axial loading and may contribute to loss of Osseo-integration. Various treatment options are available for the complete denture patient, Fixed implant supported prosthesis, Cement-retained prosthesis, Screw-retained prosthesis, Implant over-dentures, Hybrid prosthesis.

A proper pre-implant surgery evaluation is an essential step in the treatment planning process. It helps the clinician to decide

on the prosthesis and also decide upon the location, dimension, and type of implants, based upon the prosthetic restoration to achieve the best esthetic and functional outcome. A step by step procedure in the pre-implant evaluation, Mounted casts and arrangement of teeth for try-in, Selection of the prosthesis type, The location and number of the implants, Fabrication of radiographic template, Fabrication of surgical template, Selection of the implant size and type, Diagnostic casts are also, Helpful in bone sounding procedures, Fabrication of provisional restoration

Case Report

Following this sequence of pre-implant evaluation, a patient by name, Mr. Natarajan was treated in the Department of Prosthodontics at Rajah Muthiah Dental College and Hospital, Annamalai University. After the routine examination, he was diagnosed as clinically completely edentulous in the maxillary and mandibular arches.

Mounted diagnostic cast and tooth arrangement

The Implant treatment for complete edentulous arch begins with the end result in mind.^[2] The fabrication of a complete denture till wax trial stage was the first step. Diagnostic casts were made. Accurate impression, Jaw relation records and wax try-in was done according to standard protocol. This arrangement helped to determine appropriate tooth positions with respect to esthetics and function. Information regarding the jaw relations, inter-arch distance, location of the occlusal plane and location of the teeth in relation to underlying bony contour was obtained.^[3]

Selection of the prosthesis type

From the diagnostic cast, it was found that the jaws were normally related and the inter-arch distance was 24 mm and favorable tooth position in relation to the bone. It was decided to fabricate full arch fixed metal ceramic restoration – cement retained, in both the arches. The choice of the abutment can be decided at this stage.

Department of Prosthodontia, Rajah Muthiah Dental College and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India

Correspondence: Dr. Suma Karthigeyan, Department of Prosthodontia, Rajah Muthiah Dental College and Hospital, Annamalai University, Tamil Nadu, India.
E-mail: aishuhrudaya@gmail.com

Access this article online	
Quick Response Code:	Website: www.contempclindent.org
	DOI: 10.4103/0976-237X.111611

Implant location

For the maxillary arch

Implant sites were located for ovoid arch as two implants in the incisor, two in the canine and two in the molar region.

For the mandibular arch

Key implant positions were two first molars, two canines, secondary implants in the second premolar and tertiary implant in the first premolar position. All implant in the anterior and one posterior side was planned to be splinted together and the other posterior of the other side to be restored independently, to prevent the effect of mandibular flexure^[4]

Radiographic template

A radiographic template was used to visualize the outline of the planned restoration in relation to the anatomic contours. Hence, it is not only used to accurately select implant dimension but also to plan implant position, angulation in advance, according to the available bone, vital structures. The clinician can conform or modify the implant axes according to prosthetic and radiographic requirement.

An acrylic resin template impregnated with 5mm balls also was used for this case Figure 1. This kind of a template only provides information regarding the height of available bone and proximity to anatomical structures. The amount of magnification error was calculated from the radiographic image of the balls. The height of the bone was calculated from this radiograph.

The use of a complete denture as a radiographic or surgical template is described in literature.^[5] The patient's existing denture, after evaluation for adequate esthetics, phonetics, horizontal and vertical dimension, can be duplicated using duplicating flask, plastic box or reline jig.^[6,7] In this case, the patient's existing complete denture was duplicated, using the box technique with Alginate. Alginate and polyvinylsiloxane impression materials are commonly used for duplication.^[8] Radio-opaque materials such as gutta-percha and zinc-oxide eugenol, vertical lead strips, metal sleeve guides, set-up disks^[9] are used to indicate ideal implant location. Alternatively, barium sulphate based radio-opaque duplicate made using 1part barium sulphate and two parts of acrylic resin powder mixed with monomer can be used.^[10] In this case, Guttapercha points were softened and placed in the holes made at the proposed implant sites in the duplicate denture. This radiographic template was worn and computerized tomography images were made [Figure 2].

Surgical template

Surgical templates allow the restorative dentist and the surgeon to accurately pre-determine the position of and prepare the osteotomy site for the dental implant in both

bucco-lingual and mesio-distal dimensions. It transfers the positional information in the diagnostic cast to the patient for accurate surgical placement of implants.^[11] The surgical guide can be fabricated from a diagnostic tooth arrangement or from duplicated dentures. Clear vacuum-formed matrices, auto-polymerized acrylic resin, light polymerizing composites resins are used as materials.^[12] Methods for placing guide holes are grouped as free hand, milling and using CAD/CAM technology.^[13] Free-hand technique like Guide holes in a clear vacuum formed guide does not prevent inadvertent deviation of the angle of placement. Milling is more accurate technique. Implant placement through surgical guide of 4mm height is more accurate than free-hand placement into the guided osteotomy.^[14] Channel guides, metal tubes placed with surveyor, disks, and incremental tubes or channels placed in acrylic resin guides have been used to guide drills sequentially and are more restrictive and precise. Templates fabricated using CAD_CAM and rapid prototyping are more precise and are helpful in precise implant placement. However, most of them require a large amount of mouth opening and inter-occlusal distance to accommodate the hand-piece, the implant carrier, the surgical guide, the drill guide, and are expensive. In this case, a clear auto-polymerizing resin tray with 2 mm guide holes was used to mark the initial perforation. A surgical guide can be used as a radiographic guide. In this case, the radiographic template was modified by enlarging the guide holes to the proposed implant dimension.

Bone sounding procedures

The mucosa was anesthetized and probed with an endodontic instrument at the proposed implant sites, which was then placed against the sides of the sectioned diagnostic cast. The thickness soft tissue was deducted and the width of the available bone was measured. This procedure can be a reliable alternative when CT scan images are not available.

Selection of the implant size and type

Threaded root form implants of the following dimension were chosen Table 1.

Surgical phase

After routine investigations and obtaining informed consent, implant surgery was performed using standard surgical procedure under local anesthesia. The implant site was first marked using the surgical guide and followed by the surgical template for preparing the implant osteotomy. The implants (EZ Hi-Tec Implants, Life Care Devices Private Limited) were placed following standard protocol. Routine second stage surgery, Implant level impressions, Abutment connection [Figure 3]. Provisional restorations were made.

After 6 weeks, abutment level impressions were made.



Figure 1: Radiographic template

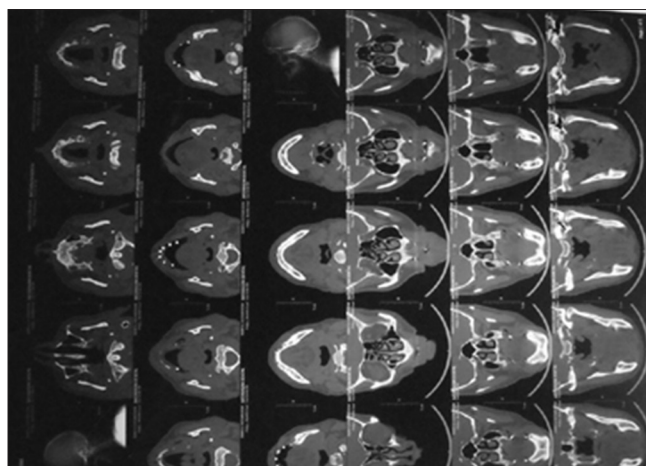


Figure 2: CT scan image with radiographic template

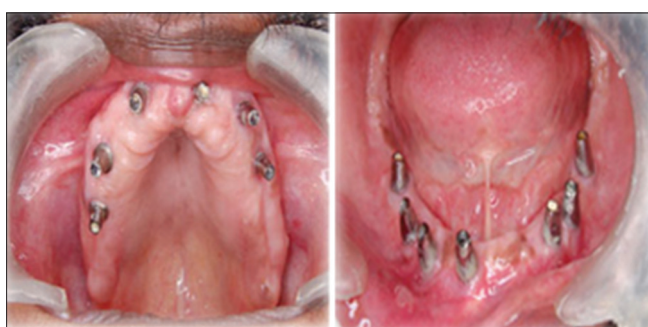


Figure 3: Abutments connected



Figure 4: Fixed implant supported prosthesis in occlusion

Table 1: Implant dimensions

	Implant site (region)	Diameter (mm)	Length (mm)
Mandibular arch (Two stage implant)	46	3.75	13
	45	3.3	10
	44	3.3	13
	43	3.3	13
	36	3.75	11.5
	35	3.3	10
	33	3.3	13
Maxillary arch (Single stage implant)	16	3.3	12
	13	3.7	11.5
	12	3.3	12
	26	3.3	12
	23	4.8	10
	21	3.3	12

Fixed metal ceramic restorations were fabricated and cemented with zinc poly carboxylate cement [Figure 4]. Zinc oxide eugenol cement with EBA cement is desirable so the restoration may be removed easily but not become unluted during normal function. However, this was not retentive for this case and hence, zinc poly carboxylate cement was used. The restorations were cemented 2 years back.

Discussion

A sequence of steps was followed in rehabilitating this patient. As part of the evaluation, both OPG of templates with metal ball and bone sounding procedures were used to evaluate the available bone. These are reliable techniques when CT images cannot be made. The CT images were made with the radiographic template in determining the accurate dimension of available bone. It also gave the details of the angulation of the prosthetic teeth with respect to bone. For the maxillary surgical template all guide holes were placed palatally, in the cingulum of anterior and the palatal cusps of posteriors. In the mandibular arch the guide holes were in the center of the posterior and the cingulum of canines. This placement permitted a more favorable axial loading of implant.

Conclusion

A detailed evaluation prior to implant surgery is necessary to achieve optimal results with implant supported prosthesis.

Acknowledgment

Prof. Dr. Ravi David Austin, Dean, Professor and Head of Oral Medicine, Rajah Muthiah Dental College and Hospital, Annamalai University.

References

1. Shotwell JL, Billy EJ, Wang HL, Oh TJ. Implant surgical guide fabrication for partially edentulous patients. *J Prosthet Dent* 2005;93:294-7.
2. Misch CE. Prosthetic options in implant dentistry. In: *Dental Implant Prosthetics*. 2nd ed. St. Louis: Elsevier Mosby; 2005. p. 43.
3. Atsu SS. A surgical guide for dental implant placement in edentulous posterior regions. *J Prosthet Dent* 2006;96:129-33.
4. Misch CE. Mandibular full-arch implant fixed prosthetic options. In: *Dental Implant Prosthetics*. 2nd ed. St. Louis: Elsevier Mosby; 2005. p. 257-62.
5. Oh WS, Saglik B. A simple method to duplicate a denture for an implant surgical guide. *J Prosthet Dent* 2008;99:326-7.
6. Wulfman C, Hadida A, Rignon-Bret C. Radiographic and surgical guide fabrication for implant-retained mandibular overdenture. *J Prosthet Dent* 2010;103:53-7.
7. Plummer KD, Nahon M. Use of a reline jig to fabricate a complete denture implant surgical guide from an existing complete denture. *J Prosthet Dent* 2004;92:598-9.
8. Sukotjo C, Radics A. Use of vinyl polysiloxane for the fabrication of implant surgical guide. *J Prosthet Dent* 2004;92:596-7.
9. Almog DM, Torrado E, Meitner SW. Fabrication of imaging and surgical guides for dental implants. *J Prosthet Dent* 2001;85:504-8.
10. Basten CH, Kois JC. The use of barium sulfate for implant templates. *J Prosthet Dent* 1996;76:451-4.
11. Meitner SW, Tallents RH. Surgical templates for prosthetically guided implant placement. *J Prosthet Dent* 2004;92:569-74.
12. Kircos LT, Misch CE. Diagnostic imaging and techniques. In: Misch CE, editor. *Dental Implant Prosthetics*. 2nd ed. St. Louis: Elsevier Mosby; 2005. p. 55-65.
13. Arfai NK, Kiat-Amnuay S. Radiographic and surgical guide for placement of multiple implants. *J Prosthet Dent* 2007;97:310-2.
14. Park C, Raigrodski AJ, Rosen J, Spiekerman C, London RM. Accuracy of implant placement using precision surgical guides with varying occlusogingival heights: An *in vitro* study. *J Prosthet Dent* 2009;101:372-81.

How to cite this article: Karthigeyan S, Ali SA, Mohan K, Deivanai M. An organized start to implant-supported prosthesis. *Contemp Clin Dent* 2013;4:90-3.

Source of Support: Nil. **Conflict of Interest:** None declared.