

Rehabilitation of a Patient with Marked Alveolar Defect Following Ameloblastoma with an Implant-supported Fixed Prosthesis using Hobo's Twin Stage Concept: A Case Report with 2-year Follow-up

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Abstract

A 20-year-old male patient reported with a need for prosthodontic rehabilitation following an alveolar defect in the mandible, Cantor and Curtis Class I. Fabrication of porcelain fused to metal implant-supported fixed prosthesis (FP-2) was planned for the mandibular arch, on five implants. For the development of occlusion, Hobo's twin-stage technique was applied in which the posterior and anterior segments were fabricated with differential angulations, as directed in the concept. An FP-2 prosthesis was the treatment of choice in this patient, as there was the loss of bone structure following the surgical procedure, thereby increasing the crown height considerably. A stable occlusion scheme was required for the rehabilitation of this, for which Hobo's twin-stage occlusion philosophy was applied. Hobo had suggested that the incorporation of posterior disocclusion helps in avoiding harmful lateral forces. In a case where the crown height is more, lateral forces tend to decrease the life span of a prosthesis. Hobo's technique uses the cusp angle as the main determinant of the scheme; hence, it is not necessary to record the condylar path. This helps in reducing the need of complicated armamentarium, increasing the efficiency and productivity of the prosthesis.

Keywords: Ameloblastoma, Cantor and Curtis, Cement retained Fixed prosthesis-2 prosthesis, Hobo's twin stage

INTRODUCTION

Ameloblastoma is a benign, locally aggressive odontogenic tumor of epithelial origin. It is said to form from the odontogenic epithelium within a mature fibrous stroma devoid of odontogenic ectomesenchyme. It constitutes about 14% of all jaw tumors and cysts, and it is the most prevalent odontogenic tumors in developing countries. Ameloblastoma is common between ages 30–60 years.^[1] Resection of such tumors leads to defects of the mandible, classified as continuity defects or discontinuity defects.^[2] The widely followed classification of mandibular defects was given by Cantor and Curtis.^[2]

Facial form, speech, and mandibular movement are severely affected in cases of discontinuity of the mandible because it is a single bone which also forms the floor of the mouth.^[3] Reconstruction of the defects helps rebuild function, aesthetics, and the confidence of the patient. Various treatment modalities are applicable starting from removable prosthesis to fixed prosthesis (FP) involving teeth or implants. In young patients with favorable bone conditions, an implant-supported FP

is the treatment of choice. For the success of the prosthesis establishment of a favorable occlusion is mandatory. Different schemes have been developed, such as Pankey-Mann Schulyer concept, Hobo's Twin tables concept, Youdelis concept, and Nyman and Lindhe concept, out of the above-mentioned techniques, Hobo's Twin tables technique gives one of the most methodical approaches.^[4] It helps establish the occlusal morphology of the posterior teeth without the anterior segment, so the effective cusp angle is formed according to the condylar guidance. Followed by the production of anterior morphology which establishes a standard amount of disocclusion.^[5]

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CASE REPORT

A 20-year-old male patient reported with a need for prosthodontic rehabilitation following an alveolar defect in the mandible. The patient had undergone two surgeries at the age of 8 years and 12 years for recurrent ameloblastoma.

Alveolar bone loss extended from 34 to 46 regions, crossing the midline (Cantor and Curtis Class I). Extra-oral findings showed the absence of asymmetry and deviation of face along with adequate mouth opening. There was minimal loss of muscular support of the lower lip. Intraoral findings revealed missing teeth from 34 to 46, with an obliterated lingual and buccal sulcus opposing a full complement of teeth in the maxilla. Preliminary orthopantomogram revealed adequate bone and the absence of any underlying pathology within the respective area (Figure 1).

The patient had decided to seek specialty care for the completion of his treatment and wanted a FP fabricated, as at the age of 12, he had an acrylic removable partial denture fabricated. Fabrication of cement-retained implant-supported FP-2, porcelain fused to metal, was planned for the mandibular arch, given that most of the growth and facial development had completed. The treatment options also presented to the patient included the fabrication of hybrid prosthesis or an implant-supported over-denture, but the patient's desire was to eliminate any acrylic prosthesis in the mandible. The following clinical and laboratory procedures were performed.

Fabrication of radiographic and surgical stent

Initially, a temporary partial denture was fabricated to assess the position of the artificial teeth, using heat-polymerized poly-methyl methacrylate (DPI-RR; Bombay Burmah Trading Corporation, India). Radiographic markers were placed in the prosthesis and the patient was sent for Cone Beam Computed Tomographic scan. The position of the implants and implant dimensions was assessed accordingly. From the temporary denture, a guided surgical stent was fabricated in clear heat-polymerized poly-methyl methacrylate (DPI-RR; Bombay Burmah Trading Corporation, India).

Stage I implant surgery

A full-thickness mucoperiosteal flap was raised in the mandibular arch from distal to mental foramen on one side to mental foramen on the other side. A total of five two-stage implants were placed in the mandibular arch; 44 (3.8 mm × 11 mm), 45 (4.5 mm × 8 mm), 43 (4.5 mm × 8 mm), 32 (4.5 mm × 8 mm) and 33 (4.5 mm × 8 mm) regions; with a help of the guided surgical stent. The flap was closed using the horizontal interrupted sutures. After 1 week, the sutures were removed.

Stage II implant surgery

After a waiting period of 3 months, an orthopantomogram was obtained to evaluate the bone-to-implant contact percentage, and later Stage II surgery was performed under local anesthesia wherein the cover screws were exposed and healing abutments were placed and the flap sutured (Figure 2).

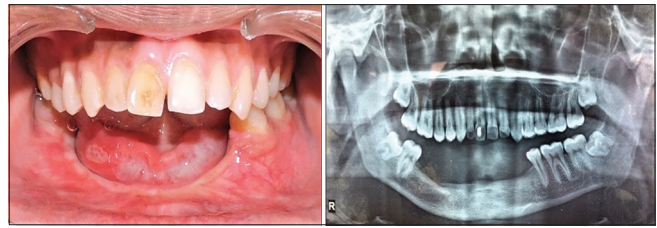


Figure 1: Pre-treatment intraoral picture and preliminary radiograph



Figure 2: Three-month post-implant placement

Prosthetic phase

Using a custom open tray, the final impression was made. A facebow (Hanau Springbow) record was made for the upper jaw, and the maxillomandibular relation relationship was registered. An acrylic template of self-cure acrylic was used for both jig trial and bite registration using a silicone-based material (Jet Bite, Coltene). Master casts were then mounted on a Hanau Wide-View articulator. Stress test was evaluated during the metal trial, and an OPG was made to evaluate the fit between frameworks and implant interface.

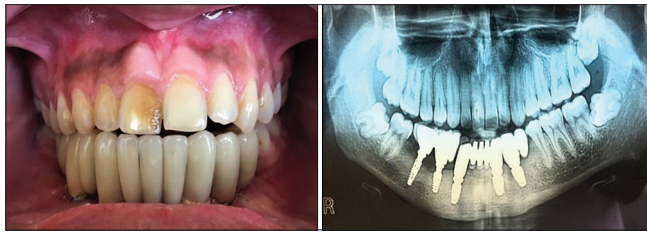
For the development of occlusion Hobo's twin-stage technique was applied in which the posterior and anterior segments were fabricated with differential angulations, as directed in the concept for osseointegrated implants. A group function occlusion was used to keep the lower canine's non-load-bearing during excursive movements. The articulator was programmed to Condition 1, wherein the posterior segment mock-up was done after the removal of the anterior segment. The settings were then changed to Condition 2 for the anterior mock-up after which anterior guidance was checked to achieve disocclusion in the posterior segment (Table 1).

Post-metal trial, a bisque trial was conducted to verify the occlusion at centric and eccentric positions. A clinical remount was performed to allow for refinement of occlusal contacts. The prosthesis was then finished, polished, and cemented to the abutments. Hygiene techniques were reviewed, and the patient was scheduled for recall and maintenance.

At the prosthetic and surgical follow-up, the patient showed the achievement of a comfortable condition, good esthetics, and recovery of mastication. At 2-year follow-up, steady levels of

Table 1: Articulator adjustment values for osseointegrated implant cases

Type of supra-structure Implanted portion of the fixture	Occlusal scheme	Condition 1 Condition 2					
		Condylar path adjustment values		Incisal guide table adjustment values			
		Sagittal inclination		Sagittal inclination		Lateral wing angle	
		(1)	(2)	(1)	(2)	(1)	(2)
Edentulous							
Anterior and posterior area	Group function	25	40	25	45	10	0

**Figure 3:** Final prosthesis with 2-year follow-up radiograph

bone around the fixtures, and healthy peri-implant tissue were reported (Figure 3).

DISCUSSION

As mentioned by Chalian *et al.*, “Every human has the divine right to look human”.^[1] Any patient who undergoes resection in any form or loss of a part of the mandible, has to face complex treatment regimens and a range of choices, especially if they are young. The correct diagnosis, and treatment plan will help provide the best possible prognosis.^[2]

In the present situation, the patient was rehabilitated using dental implants as the supporting elements, on which a FP was placed. Dental implants have generally shown good success rate and survival rate on long term in reconstructed jaws, thereby which makes them highly recommended not only in reconstructed but also resected mandibles.^[3] As compared to a removable prosthesis, which is completely tissue-supported, an implant-supported FP will prevent further bone loss, making them the first choice in the treatment of both a resected or a reconstructed jaw.^[4] An FP-2 prosthesis was selected in this patient, as there was loss of bone structure following the surgeries that had happened, thereby increasing the crown height considerably. The material of choice for the prosthetic rehabilitation is generally a porcelain fused to metal restoration.^[5]

A stable occlusion scheme was required because not only was there a loss of anterior teeth which crossed the midline but it extended to the posterior aspect. The final prosthesis would be made such that minimal eccentric forces would be present. Hence, Hobo's twin-stage occlusion philosophy was applied. Hobo had suggested that incorporation of posterior disocclusion helps in avoiding harmful lateral forces.^[6] In a case where the crown height is more, lateral forces tend

to decrease the life span of a prosthesis. Hobo's technique uses the cusp angle as the main determinant of the scheme; hence, it is not necessary to record the condylar path, thereby, reducing the need of a complicated armamentarium. The twin-stage technique follows gnathological principals but it is simpler.^[7]

In using this technique, disocclusion increases if the condylar anatomy of the patient is steeper than the articulator adjustment that is 40°. The disocclusion will decrease if the path of the patient is <40°. On the other hand, when a patient has a condylar inclination of <16° the interferences along the cuspal inclines increases.^[8,9] The twin-stage technique helped achieve a standard disocclusion of 0.5 mm on the working side, 1 mm on the non-working side, 1.1 mm on protrusion when giving an eccentric movement of 3 mm from centric position to protrusive position.^[7]

CONCLUSION

For the successful outcome of any treatment, a proper diagnosis and multidisciplinary treatment planning are of utmost importance. The planned procedure needs to rehabilitate function as well as esthetics in young adults. Use of FP on implants to restore lost tooth structure helps avoid restrictions caused by the flanges of a denture. The patient feels more independent and satisfies in terms of usage and looks, especially in young adults. In this case Hobo's philosophy helps provide predictable outcomes. The methodology is relatively simpler and can be done without the use of sophisticated instruments.

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