Case Report

# Full mouth rehabilitation with fixed teeth supported prosthesis following hobo twin stage technique – A Case Report

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## Abstract

**Background:** Worn dentition is a common problem encountered by most people in the last decade. Rehabilitation of a full mouth needs individual attention and proper treatment planning, which is very challenging for partial edentulous cases where bilateral teeth are missing and collapsed vertical dimension leaves inadequate restorative space. Treatment of these cases is complex and needs to apply standard principles while designing and fabricating prostheses. **Case presentation:** A 41-year-old female presented with a history of difficulty in chewing and poor appearance. Examination revealed that the patient had missing teeth in the maxilla (12, 13, 14, 15, 23, and 24), in the mandible (46 and 47), and in teeth 11, 21, 22, 25, 36, 37, 43, 44, and 45 were root canal treated, of which 21, 22, and 25 did not have any coronal structure and 36 had a discharging sinus. The periodontal condition of the remaining teeth was good and the vertical dimension was reduced. This patient had multiple missing and badly damaged anterior teeth. Hence, Hobo and Takayama twin stage method was used to re-establish the anterior guidance for full mouth rehabilitation. **Conclusion:** Worn dentition requires a very careful and calculative approach due to its complex nature. Hobo twin stage technique is based on case studies from which the mathematical values for anterior guidance and posterior disocclusion are determined and thus minimizes the clinical procedure duration and produces good masticatory function.

**Keywords:** Full mouth rehabilitation, Hobo twin stage, Mutilated dentition, Occlusion

## 1. INTRODUCTION

The tooth wear occurs on the masticatory surfaces of posterior teeth throughout life. It leads to damage to the pulp, poor esthetics, improper occlusion, and impairing the masticatory function [1]. Shilpa Nag mentioned that the prosthodontist should understand, capture, and replenish the movements of the mandible to recreate the biomechanical simulation of the patient for the fabrication of the prostheses [2]. The wear and depletion of tooth material happens on the occlusal surfaces of teeth throughout life. However, uncontrolled occlusal wear may give rise to trauma to the pulp, occlusal disharmony, esthetic imperfection, and impairment of masticatory function [2]. Philosophies of full-mouth rehabilitation are commonly attractive, but the appearance and function of the prosthesis should be satisfactory. Anterior guidance is critical to natural dentition because posterior disocclusion might control the lateral and horizontal forces. Molar disocclusion is dictated by the shape of the cusp and hinge angle rotation [3]. Rehabilitation of worn-out dentition needs proper diagnosis and treatment sequence [4].

The Hobo twin-stage method was advocated by Hobo and Takayama and was applied to create the molar disocclusion and the anterior guidance is pre-planned to create a harmonious disocclusion with the condylar path. It is recommended for rehabilitation of severe attrition and the lost vertical dimension at occlusion (VDO) [4-6]. This technique is renowned for producing an authenticated posterior disocclusion and the incisal guidance follows the condylar path. This method allows for the accurate development of cuspal inclination and anterior guidance without looking into the other natural teeth. In this method, Condition 1 is planned to incorporate the shape of the cusp, and condition 2 is assigned for hinge angle rotation [4,5]. It is not recommended

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for a person with an abnormal curve of Spee, Wilson curve, rotation of tooth, and abnormal inclination of tooth [5]. Hence, the objective of this case report was to add to the literature about the rehabilitation of the severely mutilated dentition using the Hobo twin-stage method to restore the lost function.

## 2. CASE PRESENTATION

A 41-year-old female reported to the Department of Prosthodontics, SRM Dental College, Ramapuram, Chennai, India, with the chief complaint of difficulty in chewing and poor appearance. The patient gave a medical history of diabetes and using metformin 500 mg twice a day for the past 8 years. Tempero-mandibular joint (TMJ) was examined clinically and the examination revealed no abnormality. Furthermore, no history of bruxism was noticed.

### 2.1. Clinical findings

The patient had a symmetrical face and the mouth opening was three-fingers broad. Hence, the TMJ and the mandibular movements were found to be clinically normal. On intraoral examination, teeth 12, 13, 14, 15, 23, and 24 in the maxilla and teeth 46 and 47 in the mandible were missing. Teeth 11, 21, 22, and 25 in the maxilla and teeth 36, 37, 43, 44, and 45 in the mandible were root canal treated. Of them, teeth 21, 22, and 25 did not have any coronal structure, and tooth 36 had sinus discharge (Figure 1A and B). The periodontal condition of the remaining teeth was good and the vertical dimension was reduced because of loss of posterior teeth. Moreover, soft tissues of the lip, cheek, tongue, pharynx, and oral mucosa appeared to be apparently normal. The patient began using the Hobo and Takayama twin-stage method for rehabilitation after 3 months of splint treatment with elevated VDO. The treatment procedure was started after getting approval from the Institutional Ethical Committee of SRM Dental College, Ramapuram, Chennai, and written informed consent from the patient.

### 2.2. Goals of rehabilitation

To restore collapsed dentition to functional harmony with the masticatory system, make a specific amount of posterior disocclusion during lateral movements and derive canine-guided occlusion.

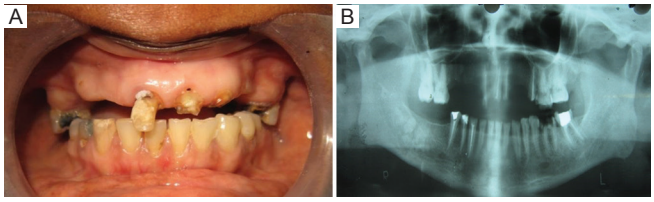


**Figure 1.** (A) Pre-treatment clinical photograph and (B) pre-operative orthopantomogram.

### 2.3. Treatment procedure

(1) Extraction of 36 followed by increasing vertical dimension by 3 mm within 3 months was planned
(2) Impressions of the maxilla and mandible were made with alginate (Zelgan Plus Alginate Impression Material, Dentsply) and the diagnostic cast was made with dental plaster (Golden Stone, Golden Stone Ramaraju Traders, Chennai, India)
(3) Teeth 11, 21, 22, and 25 were prepared for post space. Cast posts were fabricated and luted with GIC luting cement. (GC Corporation, Tokyo, Japan) (Figure 2). Then the orientation jaw relation was done (Figure 3)
(4) Maxillary and mandibular cast was articulated on a semi-adjustable articulator (Hanau wide vue) with face bow transfer. Then the Lucia jig was prepared and the bite was recorded intra-orally (Figure 4)
(5) An interocclusal splint was fabricated as per the new VDO using auto-polymerized acrylic resin (Dental Products of India, Mumbai, India) on the diagnostic cast and the patient was put under observation for 12 weeks to check for the neuromuscular adaptation of the patient to the increased VDO before the definitive rehabilitation

**Figure 2.** Cast post-cemented in teeth 11, 21, 22, and 25.

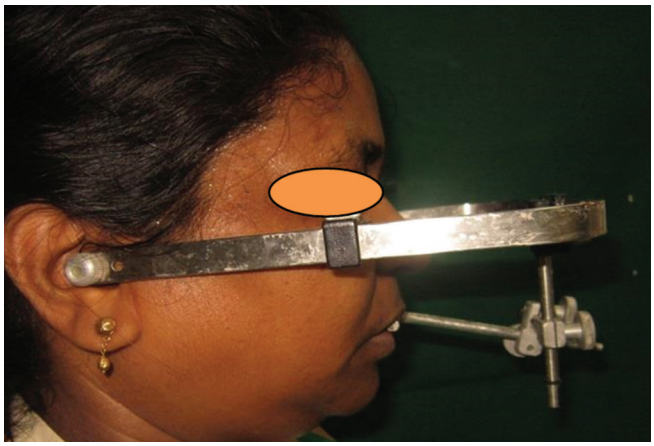

**Figure 3.** Face bow transfer.

(6) The occlusal plane was evaluated using a custom-made Broadrick flag occlusal analyzer [7] and an outline of a desirable occlusal plane was obtained (Figure 5)

(7) Diagnostic wax-up of posterior teeth was made at the newly established vertical dimension without the anterior segment of the mandibular cast. Standard effective cusps were made using condylar and incisal guidance values, adjusted as per condition 1. Diagnostic wax-up was brought into balance in all excursive movements. The anterior segment of the cast was re-oriented the incisal and condylar guidances were adjusted as per condition 2 (Table 1) and the wax-up was finished to create the posterior disocclusion

(8) A full arch single unit fixed dental prosthesis (FPD) for maxilla and four-unit FPD involving teeth 34, 35, and 37 on the left side and teeth 43, 44, and 45 on the right side, with the first molar as a cantilever, were planned. Composite build-up was planned for teeth 31, 32, 33, 41, and 42

**Table 1.** Articulator adjustment values

| Condition | Condylar path | | Anterior guide table | |
|---|---|---|---|---|
| | Sagittal condylar path inclination | Bennet angle | Sagittal inclination | Lateral wing angle |
| Condition 1 | 25 | 15 | 25 | 10 |
| Condition 2 | 40 | 15 | 45 | 20 |

**Figure 4.** Centric relation recorded using Lucia jig.

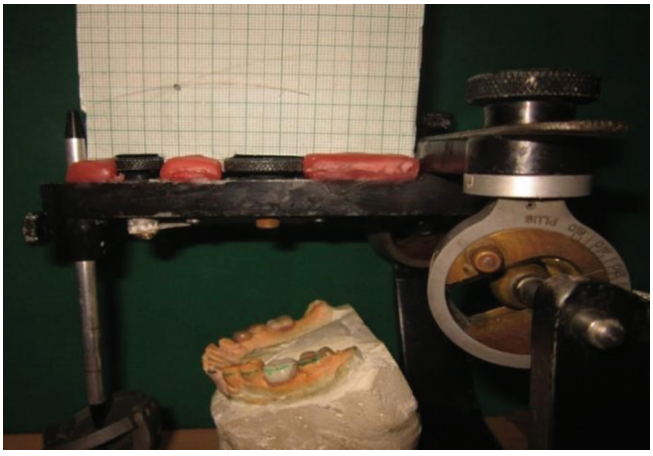

**Figure 5.** Broadrick occlusal plane analysis.

(9) Teeth 11, 17, 26, 34, 35, 43, 44, and 45 were prepared to receive the full coverage PFM crowns (Figure 6A and B). The minimal occlusal reduction was done as a rehabilitation was done at an altered (increased) vertical dimensions. Maxillary right and left second molars were left unprepared to maintain the VDO. These were prepared later. Preparations were done in appointments and stage 1 provisional was fabricated at the chair-side to reduce the patient's discomfort

(10) Teeth 17 and 27 were prepared and composite buildup of mandibular anterior teeth was done with the help of an index obtained from diagnostic wax-up, and then the stage 2 provisional was fabricated using tooth-color auto-polymerizing resin with the help of an index made from diagnostic wax-up. Provisionals were cemented with ZnO non-eugenol cement (DPI, Gujarat, India) and left for 3 weeks

(11) Then the maxillary and mandibular arch impressions were made with polyvinyl siloxane putty and light body (Aquasil, Dentsply International, INC., New York, USA) and casts were poured with type IV gypsum (Kalabhai, Ultrarock Die stone). This assembly was mounted in a semi-adjustable articulator by face bow, Lucia jig, and inter-occlusal record to the previously determined vertical dimension (Figure 7)

(12) Wax patterns were made with removable anterior mandibular segment following the adjustment of the

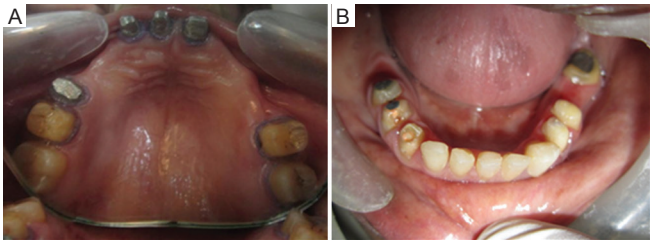


**Figure 6.** (A) Preparation of maxillary teeth and (B) Preparation of mandibular teeth.

**Figure 7.** Mounted maxillary and mandibular casts.

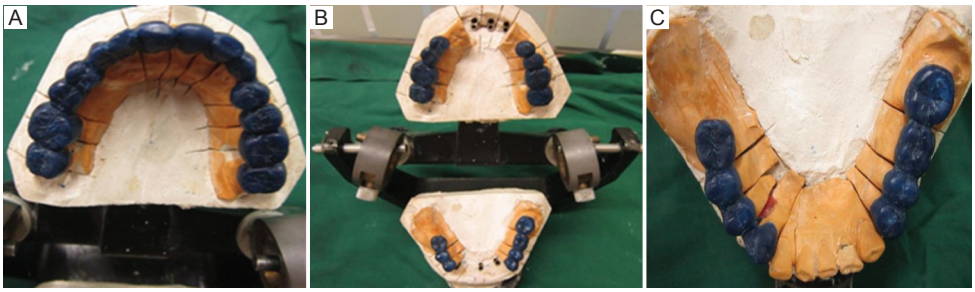


**Figure 8.** (A) Wax-up after condition 1 (cusp shape angulation), (B) Wax-up with anterior segments, and (C) Wax-up with posterior segments, condition 2 (posterior disocclusion).

semi-adjustable articulator to the values of condition 1 [4,5] (reproduce the occlusal morphology of the posterior teeth without anterior segment and produce a cusp angle coincident with the standard values) and condition 2 [4,5] (reproduce the anterior morphology with the anterior segment and provide anterior guidance with the standard value) (Figure 8A-C). The wax patterns were cast and try-in was performed in the patient's mouth.

(13) Definitive restorations of porcelain fused metal were luted with ZnO non-eugenol (DPI, Gujarat, India). Oral hygiene maintenance was explained and three follow-ups were done at an interval of 6 weeks, followed by permanent cementation with GIC luting cement. (GC Corporation, Tokyo, Japan) (Figure 9)

(14) The patient was given a soft splint and instructed to wear it during nighttime.

## 4. DISCUSSION

Mastication, phonetics, and esthetics are restored using the Hobo twin-stage method. Opinions vary regarding the segments to be rehabilitated individually or simultaneously so that the treatment can be finished faster and easier, thereby reducing chair-side and laboratory time [8,9].

Dawson mentioned that the incisal guidance was not determined by the condylar path and the anterior path was less important. The working condyle slides toward the non-working condylar path, which allows various paths for the lower anterior teeth to follow [10]. Recent concepts stated that anterior guidance guides the working condylar path and the lateral incisal path, which are mutually dependent [8]. In normal persons, anterior guidance is 5° steeper than the condylar guidance on the anteroposterior plane [5]. While a person brings the mandible anteriorly; the anterior teeth also move downward and create posterior disocclusion. Similarly, during the lateral excursion, the lingual angulation of the maxillary canine is steeper than the condylar path.

The anterior guidance determines the angle of hinge rotation and the condylar path assists posterior disocclusion. The angle of hinge rotation produces 0.2 mm posterior disocclusion during protrusion and 0.5 mm for laterotrusion

**Figure 9.** Post-treatment intraoral view of definitive prosthesis.

for both sides. Literature showed that condylar and anterior guidances are considered primary factors for occlusal rehabilitation [6]. In this case, occlusal rehabilitation of a severely worn dentition was done using Hobo technique, in which the method of reorganizing an occlusion using a cuspal angle worked as the primary factor. The other treatment options were implant-supported fixed partial dentures in the maxilla in relation to teeth from 12 to 15 and teeth from 23 to 24 and attachment-retained removable partial dentures in the mandible in relation to 37 and 46, 47 regions.

According to an investigation, the amounts of mandibular molar disocclusion were 1.1 ± 0.6 mm during protrusive movement, 0.5 ± 0.3 mm on the working side, and 1.0 ± 0.6 mm on the non-working side during lateral movement [5,6]. The actual disocclusion of 0.5 mm on the working side was equal to 0.5 mm created by the angle of hinge rotation. However, the actual disocclusion during protrusive and lateral movements on the non-working side differs from the angle of hinge rotation and leaves residual amounts of disocclusion unaccounted. The residual amounts were attributed to the cusp angle [5].

The anatomy of the cusps is also an important factor for posterior disocclusion. The posterior teeth disocclusion is seen when the molar cusp inclination is parallel to the condylar path and the anterior guidance is steeper than the condylar one. If the shapes of the posterior cusps are less steeper than

the condylar path, the posterior teeth disocclude even if the anterior guidance is parallel to the condylar path. This may be due to [6] abnormal curve of Spee, curve of Wilson, rotation, and inclination of a tooth.

In this case report, the porcelain-fused-to-metal crown was preferred over its Zirconia counterpart because of a long edentulous space and loss of vertical dimension. Implant was not preferred as the patient was diabetic for many years and the financial burden was also a concern. Rehabilitation of a full mouth is a daunting task which involves many critical clinical and laboratory steps. The twin-stage technique formulated by Hobo and Takayama reproduces disocclusion and anterior guidance more precisely and scientifically [5]. In this case, the same procedure was applied to achieve the required esthetics and function. This method has disadvantages such as limitations for achieving ideal occlusion, occlusal plane, and embrasure development when the vertical dimension is altered. The advantages of the method include quadrant and simultaneous full mouth rehabilitation is possible at the same time.

### 4.1. Clinical significance

Anterior guidance is established to facilitate phonetics, the pre-operative use of splint reduces the discomfort to TMJ and associated muscles and the occlusal rehabilitation leads to improved masticatory efficiency.

## 5. CONCLUSION

The amount of disocclusion of teeth dictates the importance of condylar guidance. The average cusp angulation, condylar, and incisal guidance provides a simple way with less skill requirement. Thus, the cuspal inclination and the anterior guidance are important determinants in achieving disocclusion and an average angulation of the horizontal condylar guidance can be used to attain a mutually-protected occlusion.

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## CONFLICT OF INTEREST

The authors declared that there are no conflicts of interest.

## AUTHOR CONTRIBUTIONS

*Conceptualization:* Ahila Singaravel Chidambaranathn
*Investigation:* Rajdeep Tah
*Methodology:* Ahila Singaravel Chidambaranathn
*Writing – original draft:* Ahila Singaravel Chidambaranathan
*Writing – review & editing:* Muthukumar Balasubramanium

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Informed consent was taken from the patient before the study.

## CONSENT FOR PUBLICATION

The patient gave consent to publish the data in this study.

## AVAILABILITY OF DATA

Data used in this work is available from the corresponding author upon reasonable request.

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