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Maxillary Complete Denture Buttressed with Metal Denture Base and Amalgam Stops Opposing Deranged Occlusal Plane: A Case Report

Manu Rathee, Sujata Chahal, Anamika Ahlawat, Maqbul Alam, S Divakar, Sandeep Singh

ABSTRACT

Fracture of a single maxillary complete denture is a common occurrence in patients with opposing retained natural mandibular teeth. Factors like flexural fatigue caused by cyclic deformation, as well as those that aggravate the deformation of the denture base or change its load, have all been linked to the midline fracture. This case report presents oral rehabilitation of a completely edentulous maxillary arch opposing natural mandibular dentition using metal denture base and reinforcing acrylic teeth using amalgam stops along with establishing plane of occlusion with the help of a customized template to improve the longevity of the prosthesis. Single complete denture opposing natural dentition is a challenging job for the prosthodontist due to the biomechanical differences in the supporting tissues. As a prosthodontist, we must provide the patient a stable and functional prosthesis.

Keywords: Amalgam stops, Han Kuang Tan technique, Metal denture base, single complete denture.

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I. Introduction

Occlusal problems and fracture of denture-base in a single complete denture are caused by one or more of the following factors: occlusal stress on the maxillary denture and underlying edentulous tissue from teeth and musculature accustomed to opposing natural dentition, the position of the mandibular teeth, which may not be properly aligned for the bilateral balance required for stability [1], occlusal form of the remaining natural teeth, which will inevitably determine the occlusal form of the denture [2], and flexure of the denture base.

To overcome these issues, the forces acting on the denture must be decreased as much as possible by strengthening the denture base and appropriate preparation or restoration of the remaining natural teeth.

This case report presents the oral rehabilitation of a completely edentulous maxillary arch opposing natural mandibular dentition using a metal denture base, establishing a normal plane of occlusion by removing the interferences using the Han-Kuang Tan technique [3], and reinforcing acrylic teeth using amalgam stops to improve the longevity of the prosthesis.

II. Case Presentation

An 81-year-old patient reported to the Department of Prosthodontics with the chief complaint of difficulty in

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chewing food due to loss of the teeth in the upper arch. He also had a complaint of a previously fractured maxillary denture. Intra-oral examination revealed a completely edentulous maxillary arch with low frenal attachment and a dentulous mandibular arch with generalized abfraction.

A. Pre-Prosthetic Phase

Labial frenectomy was performed and healing was uneventful (Fig. 1). Glass Ionomer Cement restoration was advised to the patient regarding the abfraction in the mandibular teeth.

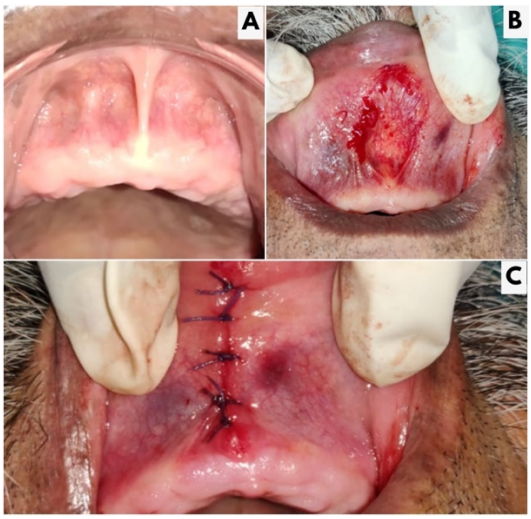

Fig. 1. A) Maxillary ridge showing low frenal attachment, B) Simple excision technique for frenectomy, C) Suture placement after frenectomy.

B. Prosthetic Phase

The primary impression of the maxillary arch was made using a low fusing impression compound. The impression was poured using dental plaster and a special tray was fabricated using auto-polymerizing resin. Definitive impressions of the maxillary and mandibular arch were made. A definitive impression of the maxillary arch was made using zinc oxide eugenol paste after border molding with green stick wax. The final impression of the mandibular arch was made using irreversible hydrocolloid impression material. Final impressions were poured using dental stone (Fig. 2).

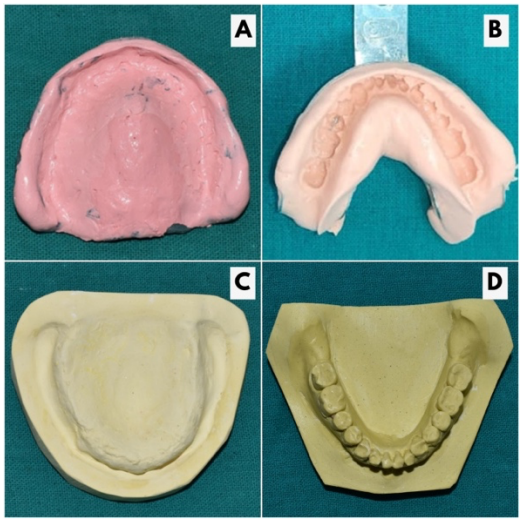

Fig. 2. A) Definitive impression of maxillary arch, B) Definitive impression of mandibular arch, C) Maxillary master cast, D) Mandibular master cast.

The master cast after blocking undercuts (Fig. 3A) was duplicated with a reversible hydrocolloid impression material to get a refractory cast (Fig. 3B). Wax pattern was made on refractory cast invested with phosphate-bonded investment material. Wax pattern covered only the center palate area with relieved retention mesh. To maintain control over the adjustability of the posterior palatal seal, the wax pattern was kept short of the posterior palatal seal area. The pattern of the metal framework was designed and adapted on the refractory cast (Fig. 3C). The wax design was attached with sprues and a crucible former (Fig. 3D). The investment material was then used to invest the sprued wax pattern. A cobalt-chrome alloy was used as the material for the denture base. The metal framework was then finished and polished, and transferred to the master cast, and checked for adaptation (Fig. 3E).

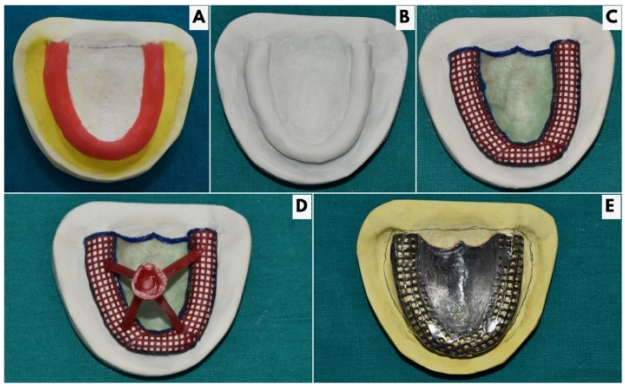

Fig. 3. A) Block out of the maxillary cast, B) Maxillary refractory cast, C) Wax pattern for metal base fabrication, D) Sprue attachment, E) Finished and polished metal base framework after casting.

A permanent denture base incorporating the metal framework was fabricated using heat-cure acrylic resin (Fig. 4B). The orientation jaw relation was recorded and transferred to the Hanau Widevue articulator (Fig. 4D). After recording the centric relation (Fig. 4C), the mandibular cast was mounted on the articulator (Fig. 4E).

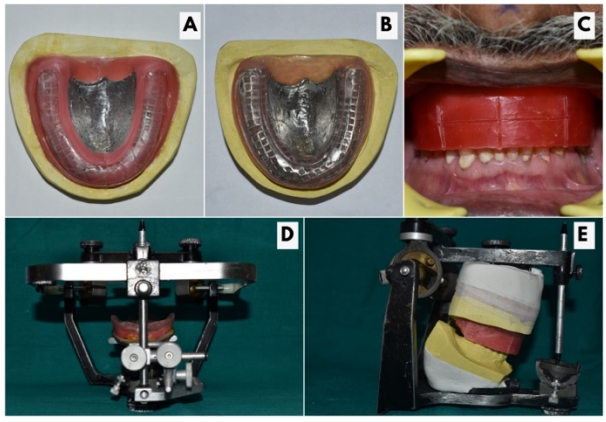

Fig. 4. A) Wax-up for maxillary denture base, B) Finished and polished maxillary permanent denture base, C) Recording of jaw relations, D) Face-bow transfer on Hanau WideVue articulator, E) Mounting of the occlusal rim on the articulator.

Han-Kuang Tan technique [3] was used to remove the interferences in a single maxillary complete denture to achieve a balanced occlusion. A vacuum-formed clear sheet 2 mm thick was used to make a template over the mandibular cast (Fig. 5A). Teeth arrangement was done

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using anatomic acrylic teeth. Judicious grinding of both the denture teeth and stone teeth was done. Modified cusps were marked (Fig. 5B) and the customized template was re-seated on the cast. The template was cut over the prepared areas, making voids on the template (Fig. 5C). These voids created openings for the areas to be prepared on natural teeth when the template was seated in the patient's mouth. Natural mandibular teeth were then prepared using the template as a guide to remove the interferences (Fig. 5E). The try-in of the denture was recorded satisfactorily (Fig. 5F). The maxillary denture was fabricated using heat-cure acrylic resin (Fig. 6A).

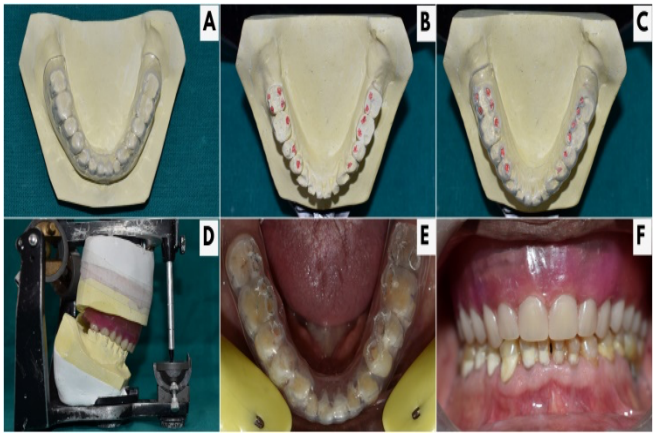

Fig. 5. A) Clear template for the mandibular arch, B) Markings on the cast, C) Template cut over the prepared areas, D) Teeth arrangement after removal of the interferences, E) Odontoplasty done according to the voids in the template, F) Try-in of the denture.

A selective grinding procedure was used to establish occlusal equilibration in the patient's mouth. While the patient performed all the functional jaw movements, centric and eccentric occlusal contacts were marked intraorally with an articulating paper (Fig. 6B). Using an inverted cone diamond bur, occlusal preparations (1.5-2 mm in depth) were made in the premolar and molar denture teeth (Fig. 6C), extending to encompass as much of the articulating paper traces as feasible. With the use of an amalgam condenser, a mixture of amalgam was triturated and condensed into the occlusal preparations (Fig. 6D).

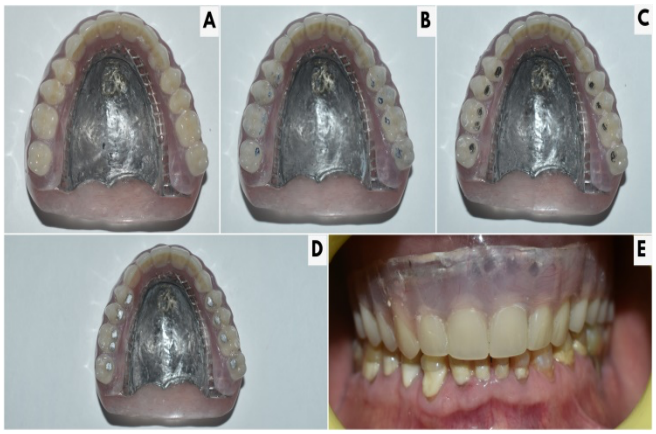

Fig. 6. A) Finished and polished maxillary denture, B) Markings on the occlusal surface of teeth marked with an articulating paper, C) Cavity preparation on the posterior teeth, D) Condensed amalgam after performing all functional jaw movements, E) Final insertion of the maxillary complete denture.

To verify that the margins are entirely filled with well-condensed amalgam, the preparation should be overpacked 1 mm or more using heavy pressure. The patient was directed to perform all functional jaw movements until the amalgam had initially been set. Excess amalgam was removed and the occlusal pattern was scrutinized for any defective margins. The denture was delivered to the patient and post-insertion instructions were given. The patient was recalled after 24 hours and the amalgam stops were polished. The patient was kept on regular follow–up and necessary modifications were done.

III. Discussion

When placed in an environment of heavy occlusal loading, conventional denture base material, polymethyl methacrylate (PMMA) shows weak mechanical properties and tends to fracture. Flexural fatigue is caused by recurrent stress resulting in the production of microcracks in the denture base [4]. A metal-reinforced denture base is commonly used for reinforcement because it decreases the risk of denture fracture caused by strong biting and impact forces while also being easy to fabricate. It improves the retention, accuracy, fracture resistance, and dimensional stability of the definite prosthesis [5].

Metals such as cobalt-chromium, nickel-chromium, and titanium can be utilized to manufacture the metal framework in the prosthesis. High stiffness, strength, fracture resistance, outstanding strength to volume ratio, high thermal conductivity, good adaptability to supporting tissues, and no dimensional change over time are a few advantages of a metal denture base. Metal denture bases have a few drawbacks including laboriousness in fabrication, higher costs, difficulty in relining and rebasing the prosthesis, greater time consumption, and compromised esthetics [6].

In a single complete denture, the occlusal surface of opposing natural dentition may need to be altered to achieve balanced occlusion [7]. Han Kuang Tan technique describes a method for correctly and conveniently transferring the desired quantity of odontoplasty from the cast to the patient's mouth. This technique has the advantage of keeping the preparation guide firmly in place during odontoplasty. The preparation guide is just a few millimeters thick, so the amount of intended tooth reduction may be properly shown on the relevant tooth surfaces. Additional advantages of the technique are the low cost and simplicity of fabrication [3].

The main drawback of acrylic teeth in a single complete denture is that they wear out quickly on the occlusal surfaces. This has an impact on the vertical dimension of occlusion and results in increased horizontal stresses and its deleterious consequences [8]. Amalgam stops were inserted into the resin occlusal surfaces to delay and control this wear. The amalgam is carved directly in the patient's mouth in the plastic stage through a functionally generated path. It allowed the amalgam to be in harmony with the patient's mandibular movements, resulting in a balanced occlusion that is incredibly smooth and efficient. The sole drawback of utilizing amalgam stops is their unesthetic appearance.

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IV. Conclusion

Patients with a completely edentulous arch opposing natural dentition pose a challenge to the prosthodontist due to the biomechanical differences in the supporting tissues of the opposing arches. As a prosthodontist, we must ensure the fabrication of a functional and stable prosthesis to increase the quality of life of the patient.

Conflict of Interest

Authors declare that they do not have any conflict of interest.

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