

Fabrication of Mandibular Single Complete Denture Opposing Natural Maxillary Dentition with Deranged Occlusal Plane Restored Using a Custom Made Occlusal Plane Template: A Clinical Report

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Abstract: *It is challenging to fabricate a single complete denture opposing natural dentition which is not in normal plane of occlusion. Usually due to loss of opposing dentition, teeth are either supraerupted or mesially tilted leading to abnormal plane of occlusion. Establishing harmonious occlusion is the primary goal of any restorative procedure. This clinical case report describes restoration of severely attrited and malpositioned maxillary teeth by establishing normal plane of occlusion with the help of customized occlusal plane template followed by construction of mandibular complete denture.*

Keywords: single complete dentures, occlusal plane template, custom made template, occlusion

1. Introduction

Single complete dentures fabrication is a challenge when planned to be fabricated opposing natural dentition with deranged occlusal plane.¹ It is important to correct malaligned, tilted or supra-erupted teeth in the opposing arch prior to fabricating single dentures.¹ Creating an occlusal balance in the opposing arch improves stability of the single denture during functional and parafunctional movements.^{2,3} Lack of occlusal harmony can lead to instability of the denture, soreness of mucosa, changes in the tissue and an accelerated resorption of ridges.⁴ An uneven occlusal plane is a common clinical situation in the natural dentition specially when opposed by edentulous arches due to supra-eruption of unopposed teeth. In such cases establishing a normal occlusal plane becomes the pre-requisite for fabricating single dentures.⁴ The plane of occlusion is a curve that is formed by the occlusal and incisal surfaces of the teeth.⁵ An ideal occlusal plane is established by restoring the dentition according to an anteroposterior curve of spee and mediolateral curve of Wilson. Curve of monson is a combination of this anteroposterior and mediolateral curve which helps in achieving ideal occlusal plane in which each cusp and incisal edge conforms to a segment of the surface of a sphere of diameter eight inches with centre in the region of glabella.⁵ Various techniques have been suggested in the literature in order to achieve ideal plane of occlusion and different tools have been introduced of which widely used are Broderick's occlusal plane analyser (BOPA), Yurkstas metal template and custom made occlusal templates.^{6,7,8}

The three most commonly used methods for establishing an acceptable plane of occlusion are direct analysis on natural teeth through selective grinding, indirect analysis of Facebow mounted casts with properly set condylar paths, and indirect analysis using the PankeyMann-Schuyler method with the BOPA.⁹ It requires special holding devices to make BOPA compatible with different articulators.⁹ Yurkstas template cannot be adjusted according to different jaw sizes and may not fit in relatively smaller or asymmetric arches.⁸ Custom made occlusal templates can be adjusted according to various

jaw shapes and sizes and can facilitate easier examination of occlusal plane.⁸ Adapting an abrasive paper to the surface of the custom template facilitates trimming of the uneven surfaces on a diagnostic cast in order to identify potential occlusal areas for modification in the mouth.¹⁰ There have been very few studies describing the use of customized occlusal plane templates with abrasive paper and further evaluating the clinical outcomes of its use.^{8,11} This clinical report aims to describe restoration of maxillary teeth with severe attrition and deranged occlusion by establishing normal plane of occlusion with the help of custom made Occlusal plane template (OPT) and abrasive paper adapted to it followed by construction of a Single Complete Denture (SCD) in the mandibular arch.

Case History: A 55 years old male patient reported in March 2020 with a chief complaint of missing lower teeth and desired replacement. Medical history of the patient revealed that he is on Antihypertensive (Atenolol 10 mg once daily) since five years, and his blood pressure has been within normal range, other than that patient was healthy with no history of any known allergy. Dental history of patient revealed that patient was partially edentulous since many years as his mandibular teeth were removed due to caries and periodontal problems.

On intraoral examination, a partially edentulous mandibular arch with only one tooth remaining, 47 was seen. Mandibular edentulous ridge in the right posterior region revealed recent extraction sockets. On examining of the single tooth present, it was found to be of Grade III mobility with poor prognosis, hence patient was advised to get it extracted. Later, the patient was given an option of single conventional denture opposing maxillary natural teeth. On examining maxillary arch, all teeth were present except 18 and 16. (**Fig 1**) Severe generalized attrition was noted in the remaining maxillary teeth. Extrusion was noted with respect to 17, 26, 27. An orthopantomograph (OPG) was taken to check for any underlying pathology.

Severe attrition of maxillary anterior teeth and extrusion of posterior teeth resulted in an irregular occlusal plane which could lead to unfavourable force distribution to the mandibular complete denture after rehabilitation. Based on the treatment difficulty level, patient was classified as class III according to Prosthodontic Diagnostic Index.¹²⁻¹³

Various treatment options were given to patients including implant supported removable or fixed prosthesis. Apart from that conventional complete denture was suggested as an alternative option for rehabilitation of edentulous mandibular arch. Due to financial constraints, patient agreed to proceed with the treatment that does not include implant placement, hence the mandibular conventional complete denture was chosen as the treatment option. To evaluate and correct the occlusal plane, a customized occlusal plane template was planned to be fabricated. Patient was explained the whole treatment plan and an informed consent was taken before starting with the procedures. OPT fabricated for this patient was a modification of OPT described by Muley et al,⁸ and Foong and Patil¹¹ by attaching an abrasive paper to the concave surface of OPT to facilitate trimming of uneven surfaces on the diagnostic cast in order to identify potential areas for modification. This modified occlusal template was based on the guidelines by Patil Petal.¹⁰

Technique to fabricate the OPT: A volleyball with a diameter of 20.7 cm (8 inches) was used for fabricating OPT as its dimension was closely matching to the Monson's sphere which also has a diameter of 8 inches. Boxing wax was adapted into a circle to prepare a wax box of approximately 10 cm in diameter and type III gypsum was poured into it. (Fig 2) After the stone was set, cast was separated and surface irregularities were smoothed carefully without changing its original curvature to prepare a concavo-convex cast form. Adaptation of autopolymerising resin on the cast to form a template of even thickness, keeping the original circular form of the cast was done. An abrasive paper (silicone carbide water proof abrasive paper) after cutting it in a circular manner was adapted. Acut was made along the radius of circular shaped abrasive paper and was stuck on the concave surface of the OPT with a quick setting cyanoacrylate adhesive. Even a single cut made along the radius helps in accommodating to the concavity of OPT.

Use of OPT: A conventional impression of both maxilla and mandible was made followed by the fabrication of primary cast. (Fig 3) Diagnostic jaw relation was carried out and then the casts were mounted on the semi-adjustable articulator. To evaluate the maxillary occlusal plane, OPT was placed on the cast and interfering cusps and amount of reduction required were identified. It was decided to reduce as minimum as possible and to keep the reduction within the enamel. Hence selective grinding was planned to be done in patient's mouth as dictated by the mock grinding on the cast. For mock grinding, 4 points were identified first namely distobuccal cusp tips of 17 and 26 and cusp tips of 13 and 23. Since 17 and 26 were supraerupted, first the distobuccal cusp tips of these two teeth were trimmed to ensure that the identified four points were in even occlusal plane to provide a plane of

reference. After achieving a plane of reference dictated by these 4 points, the identified cusp tips were protected by applying a thin layer of adhesive glue so that the accidental wearing off could be avoided. Occlusal and axial surfaces of all teeth on the cast was painted using blue paint, blue was selected to have contrast with the cast. (Fig 4) Mock grinding was then performed on the cast by keeping the self-grinding OPT and trimming premature contacts with the abrasive until OPT touched the 4 identified points. The trimmed surface areas were easily identified on the occlusal surface of the cast. This modified cast would be used to identify the corresponding areas in the mouth for modification. In the missing area of 16, edentulous space was measured and found to be insufficient, which was left untreated as patient was not keen to undergo any fixed restorative procedure to rehabilitate it.

Refinement of occlusion: All the premature contacts were first trimmed off, then the trimmed modified cast was used as a guide to create the even occlusal plane. The incisal edges or cusp tips of the attrited teeth were built using composite layering technique with OPT serving as guide. Interfering cusps or incisal edges of the supraerupted teeth were trimmed according to the modification made on the mounted cast using OPT. All restored teeth were then refined occlusally using fine grit diamond bur. After all adjustment, a final impression of the maxillary arch was made for the fabrication of mandibular complete denture.

Fabrication of complete denture: The final maxillary impression was poured and the cast with all the adjustments was obtained and it was then mounted opposite the mandibular cast maintaining the previously obtained jaw relation record. Teeth arrangement was then done and clinical try in was carried out in patient's mouth to verify the vertical dimension and also to confirm the freeway space desired to be provided. (Fig 5 and 6) Mandibular complete denture was then processed, finished and polished. (Fig 7 and 8) Patient was then called for denture insertion and the desired occlusion was confirmed. Patient was recalled after a week for review. Patient was pleased with the outcome with respect to esthetics and expressed satisfactory masticatory efficiency.

2. Discussion

The mandibular complete denture was fabricated in conventional manner following the maxillomandibular relationship. Single denture was fabricated using heat polymerized acrylic resin and acrylic teeth to minimize the occlusal stress on the opposing natural teeth. A metal mesh was used to reinforce the denture base to avoid any incidence of fracture as fracture of the prosthesis is a common complication seen when the opposing natural teeth are present.¹⁴

Fabrication of single denture opposing natural teeth comes with a challenge in achieving balanced occlusion. The techniques given in past either require a specialized equipment such as Broadrick occlusal plane analyser or the procedures were time taking such as described by Meyer in 1932. Functionally generated technique given by Stansbury, a modification of Meyer technique was simple

and efficient but it loses its advantage when modification of existing natural teeth is to be made with reconstruction to a more normal occlusal plane and outline.¹⁵ Often the existing natural teeth are either attrited, supraerupted or tilted leading to an uneven occlusal plane where modification becomes the necessary prerequisite to achieve the stability of single complete denture opposing these natural teeth. In those cases either Yurkstas metal template can be used for analysing the plane or a customized occlusal plane template can be used. Customized templates have an added advantage that not only analysing the occlusal plane but also modification of the plane is possible just by attaching an abrasive paper to the customized template.

This clinical report demonstrates the effective management of severely attrited and supraerupted teeth in the maxillary arch and re-establishing the occlusal plane before prosthodontic rehabilitation of an edentulous mandibular arch.

3. Conclusion

- Use of a customized occlusal plane template helps clinicians in analysing and developing a harmonious occlusal plane from a deranged one
- It can be used either for pre-treatment planning or directly during treatment intraorally
- Customized OPT technique described in this report is a quick, easy and cost effective method

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List of Abbreviations:

Abbreviation	Definition
OPT	Occlusal plane template
BOPA	Broderick occlusal plane analyser
SD	Single denture

Source of support: NIL

Conflicting Interest: NIL



Figure 1: Pre-treatment Intraoral view of the maxillary and mandibular arches

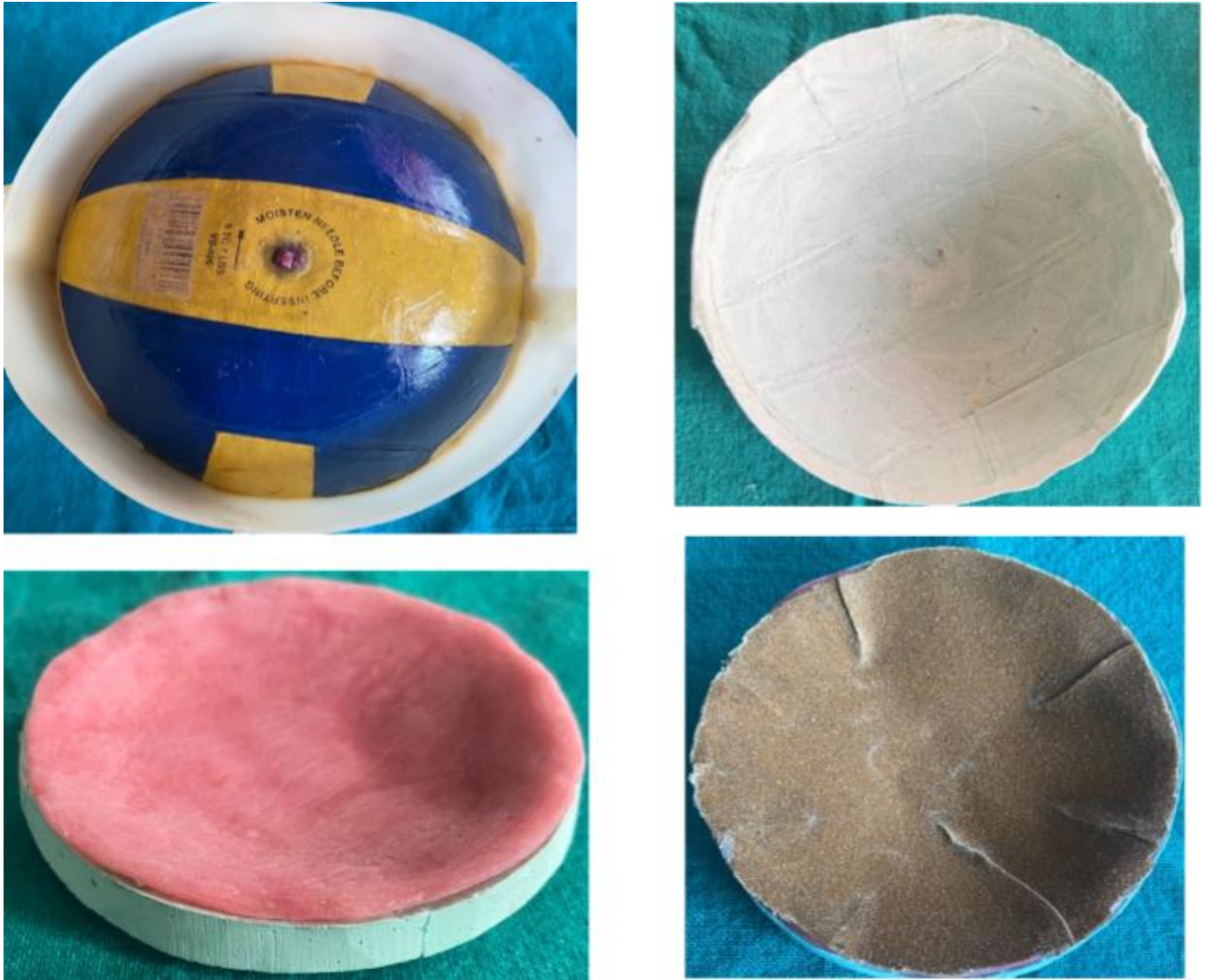


Figure 2: Fabrication of customized OPT with abrasive paper

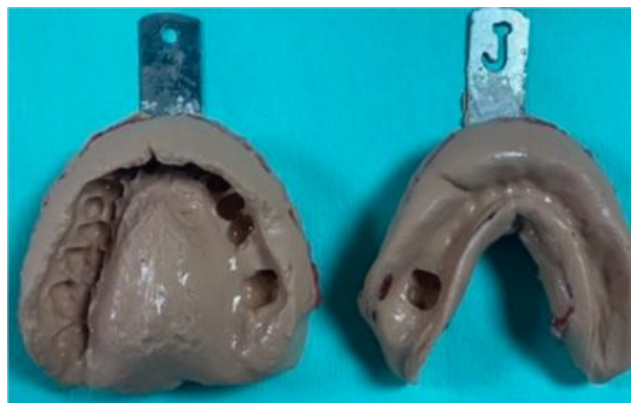


Figure 3: Alginate impression of the arches



Figure 4: Analyzing the occlusal plane using OPT



Figure 5: Arrangement of mandibular teeth after correction of the occlusal plane intraorally



Figure 6: clinical try in



Figure 7: flasking and dewaxing followed by adaptation of the metal mesh to the mandibular cast



Figure 8: Polished and finished denture