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Fabrication of maxillary single complete denture opposing deranged mandibular occlusion using customized broadrick occlusal plane analysis (BOPA): A case report

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Abstract

Fabrication of a single complete denture (SCD) is a difficult especially when the opposing natural plane is deranged. There are various problem associated with opposing arch like Mal-aligned, attrition, tilted or supra-erupted teeth with makes it difficult to achieve balanced occlusion which is important for stability of the SCD. Primary objective of any restoration is to achieve harmonious occlusal plane to facilitate natural mandibular movements without interference and ease of mastication. This clinical report describes restoration of mandibular teeth (with severe attrition and deranged occlusion) by establishing normal plane of occlusion with the help of broadrick occlusal plane analysis (BOPA) followed by construction of a complete denture in maxillary arch with metal occlusion.

Keywords: Single complete denture (SCD), occlusal plane, broadrick occlusal plan analy, metal occlusion

1. Introduction

Single complete denture (SCD) is a challenging treatment modality especially when the opposing natural dentition has a deranged plane of occlusion. The plane of occlusion should be treated first to achieve balanced occlusion for stability of the single complete denture [1]. Balanced occlusion is of more important in SCD as improper occlusion result in fracture of denture and uneven resorption of the residual bone [2]. The plane of occlusion is a curve that is formed by the occlusal and incisal surfaces of the teeth. Curve of Monson is a combination of antero-posterior curve of Spee and the mediolateral curve of Wilson. Curve of Monson helps to achieve a proposed ideal curve of occlusion in which each cusp and incisal edge touches or conforms to a segment of the surface of a sphere, 8 in. in diameter with its center in the region of the glabella [3]. BOPA is a tool which helps to established the plane of occlusion based on monsoon curve. Originally BOPA had some definite attachments which used to fix only to few Category of semiadjustable articulators. So, to overcome this, a customized BOPA was used to fabricate maxillary complete denture [4].

2. Case Report

A 67 years old male patient was reported to Department of Prosthetic dentistry. His chief complaint was difficulty in chewing due to missing teeth. The intraoral findings revealed completely edentulous upper arch (Figure. 1). On the mandibular arch, all teeth were present except for 36 (Figure 2). There were sever attrition on the teeth, amalgam restorations on the 45 and root stumps were present with 31 32 41 42 with poor radiographic prognosis. Hence, extraction of that teeth was planned. Intraoral periapical radiographs of mandibular teeth were taken for overview of the root canal treatment planning, periodontal evaluation and to check for any other radiographic findings. Pulp sensitivity test was done, and several teeth were found to be non-vital. Severe attrition of the mandibular anterior teeth resulted in an irregular occlusal plane, and that could have consequently caused unfavorable force distribution to the

maxillary complete denture. Various treatment options were discussed with patients including upper implant supported fixed prosthesis and lower fixed prosthesis, Upper tooth retained overdenture and lower fixed prosthesis and upper

single complete denture and lower fixed prosthesis. Due to financial constraints, patient agreed to proceed with upper complete denture and lower anterior metal-ceramic prosthesis and posterior metal prosthesis.



Fig 1: Intraoral view of maxillary arch



Fig 2: Intraoral view of mandibular arch

2.1 Treatment procedure

Impression of the upper and lower arch were made (Figure. 3) with a irreversible hydrocolloid impression material and

diagnostic cast were poured (Figure 4).

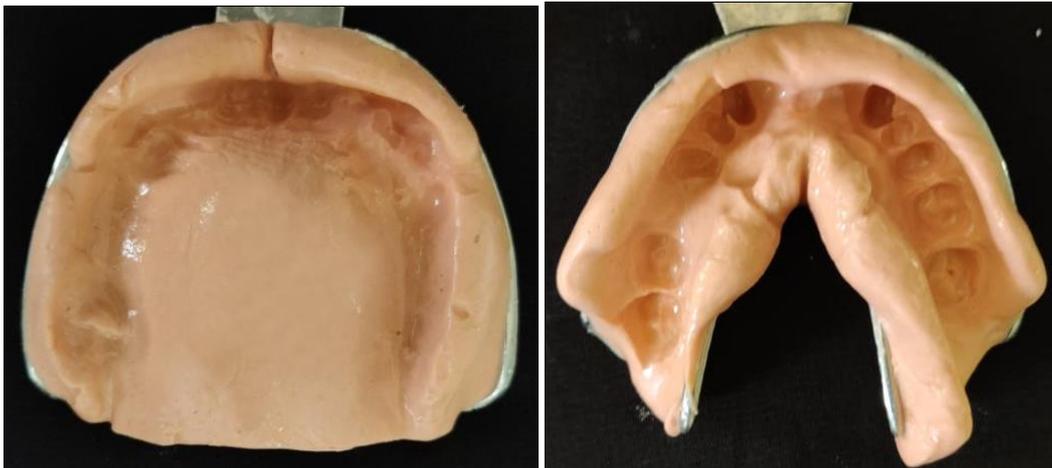


Fig 3: Maxillary and mandibular diagnostic impression



Fig 4: Maxillary and mandibular diagnostic cast

Maxillary special tray was fabricated, border moulding was recorded & final impression of maxillary arch was made

(Figure-5). Final cast was retrieved (Figure-6) from final impression.



Fig 5: Maxillary final impression



Fig 6: Maxillary final cast

Record base & wax rim was fabricated on the final cast and diagnostic jaw relation were recorded (Figure 7), facebow transfer were done (Figure 8) & casts are mounted on the

articulator (Figure 9) and the maxillary teeth are arranged and try-in was done to evaluate esthetic and phonetics of the patient (Figure.10).

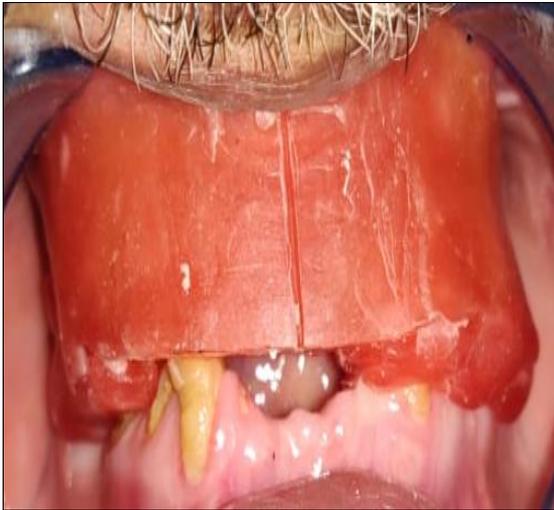


Fig 7: Jaw relation

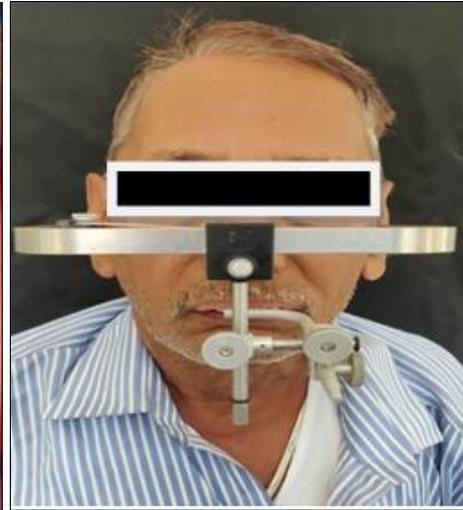


Fig 8: Face bow transfer

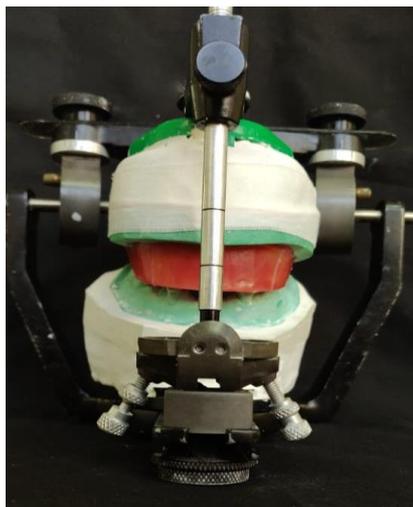


Fig 9: Diagnostic mounting



Fig 10: Maxillary anterior try-in

Treatment of malposed, tipped, supraerupted teeth in the mandibular arch makes it difficult to achieve a harmonious balanced occlusion with the maxillary complete denture. To correct the mandibular plane, arbitrary diagnostic tooth preparation were made on diagnostic cast and mandibular teeth mockup was done. Mandibular anterior teeth mockup

were corrected according to maxillary anterior teeth position. Mandibular canine position were finalized and according to that broadrick plane analysis was used to corrected lower plane (Figure 11) and maxillary posterior teeth were arranged according to mandibular mock up and a harmonious balanced occlusion was achieved.



Fig 11: Broadrick plane analysis

After that putty index of mandibular mockup were made and mandibular tooth preparation was done and adequate space for restoration were evaluated by the same putty index (Figure 12) and gingival retraction were done (Figure 13). Final impression of mandibular arch were made using putty and

light body impression material (Figure 14) and final cast were made (Figure 15). On the same appointment, maxillary try-in and provisional restoration were placed in mandibular arch and checked for the occlusion (Figure 16).



Fig 12: Putty index for tooth preparation



Fig 13: Tooth preparation and gingival retraction



Fig 14: mandibular final impression



Fig 15: mandibular final cast



Fig 16: Maxillary try-in and provisional restoration were placed in mandibular arch and checked for the occlusion

Lower wax-up was done maintaining the same plane of occlusion as decided with BOPA during mock-up. Metal occlusal coping were decided on the posterior denture teeth as it is against metal crown to avoid wear of the denture

teeth. Hence, wax-up was done for maxillary metal coping according to lower wax-up (Figure 17). After that, lower anterior teeth metal try-in and posterior metal occlusion were evaluated (Figure 18).

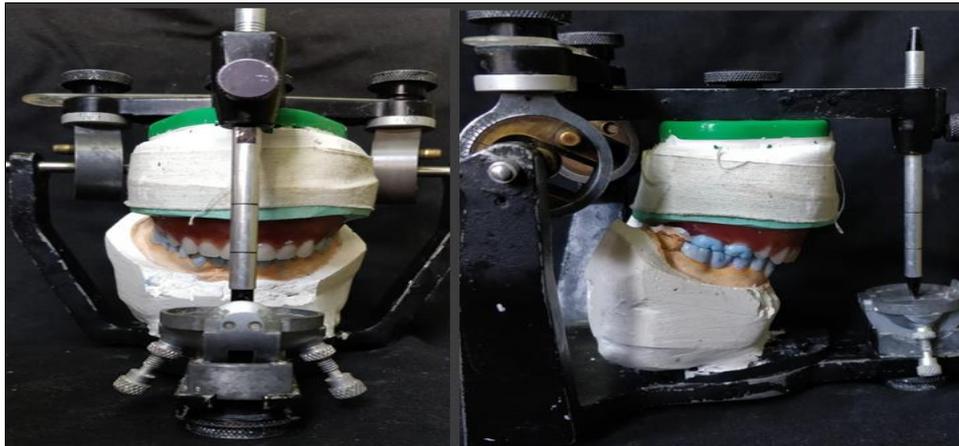


Fig 17: Maxillary mock up were done for metal coping



Fig 18: Maxillary denture try-in and mandibular metal try-in done

Maxillary complete denture were fabricated using heat polymerizing acrylic resin. Reinforcement of PMMA was done with cobalt-chromium mesh to increased rigidity and fracture resistance of the denture. Patient was recalled at suitable time for maxillary denture insertion and mandibular

restoration cementation (Figure 19). The interferences in the denture were eliminated and denture given to the patient. Post insertion instructions were given to the patient regarding its maintenance, nutrition and hygiene.





Fig 19: Maxillary denture insertion and mandibular fixed prosthesis cementation

3. Discussion

The maxillary complete denture was fabricated following the maxillomandibular relationship record in conventional manner where the vertical dimension of occlusion was reestablished. The presented clinical case situation might have worsened to develop a combination syndrome if it would not have been treated on time^[5]. However, in the case presented, there was no severe resorption of the anterior maxillary alveolar bone.

Main goal for single complete denture is to achieve bilateral balanced occlusion for equal stress and force distribution to improve stability of prosthesis. For better stability of the SCD, the occlusal plane in the opposite fully dentulous arch needs to be developed to be in a harmonious occlusal plane so that a balanced occlusion can be achieved to maintain good bilateral stability of the SCD. In this case report BOPA is used to develop the required occlusal plane.^[6] The usage of this instrument offers great help in terms of esthetics and masticatory functions through the proper orientation of the occlusal plane.

As the single complete denture is against the natural teeth or metal/metal ceramic prosthesis, rapid wear of the acrylic denture teeth is seen. Pravin *et al.*^[7] suggested the incorporation of amalgam stops, metal occlusion, onlay, crowns in artificial teeth to improve wear resistance.

The biting force against is higher on SCD as it is against the natural dentition, there are higher chances of fracture of the denture. Thus there is a need to reinforced the denture to resist fracture. A study by Im SM *et al.*^[8] concluded that there is high resistance to fracture with Co-Cr metal mesh compare to glass fiber mesh. Thus Co-Cr mesh was used to reinforced the upper denture.

4. Conclusion

- The main problem in treating patients who need a complete denture to occlude with opposing natural teeth is that natural teeth can transmit larger forces to a denture whose supporting structures are unable to resist them adequately.
- Thus, damage to the edentulous ridges or inability to wear the denture may easily occur.
- Use of customized Broderick Flag helps us to achieve following goals:
 1. Establishing of occlusal plane.
 2. Proper amount of natural tooth preparation required according to the plane of occlusion.
 3. Allows guided intraoral reduction.
 4. It eliminates arbitrary grinding.
 5. Thus the procedure minimizes guesswork and it provides more favorable occlusal plane.

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