

DEVELOPMENT OF HARMONIOUS OCCLUSION FOR COMPLETE DENTURE PATIENT USING FUNCTIONALLY GENERATED PATH TECHNIQUE- A CASE REPORT

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ABSTRACT: The edentulous state represents a compromise in the integrity of the masticatory system . The common treatment option for rehabilitation of edentulous state is the conventional complete denture. Occlusal paths and Cuspal paths generated on the mechanical articulator often differ from those that are actually generated in the mouth . Functionally generated path technique is one such approach which aids in the automatic determination of the geometric harmonious relation between the functional occlusal path and condylar paths at chosen vertical dimension . This technique permits the registration of the cusp movements as determined by the functional mandibular movements and thus helps in development of harmonious occlusion. This article describes a case report in which a step by step approach was used to develop functionally generated occlusal path in fabricating a complete denture.

KEYWORDS: *Functionally generated path way, Occlusal Path, Cuspal path, Condylar Path, Occlusion*

INTRODUCTION

Harmonious occlusion is a critical requirement for successful oral rehabilitation. A perfect adjustment of the stomatognathic system is the goal of every prosthetic restoration.. One of the continuing problems in restorative dentistry is the reestablishment of natural occlusion by the new restoration , whether it is a simple inlay , a single crown or a fixed partial denture or a complete denture. The functionally generated path (FGP) offers the most effective aid , as it permits the registration , on wax ,of the cusps movements as determined by the functional mandibular movements.

Frederick S. Meyer , who could be called the father of reconstructive dentistry , gave us the functionally generated path and wrote,"..we may cast aside all modern articulators.. .for we are going to employ the human jaw as an articulator", and he described how the "functional occlusal path is reproduced on the wax pattern."¹

Meyer ,who also studied engineering at the University of Minnesota , wrote at the age of 83 that ,"Prosthetic dentistry calls for the knowledge of some of the most difficult and fundamental principles of engineering."² Functional occlusal path is the automatic determination of the geometric harmonious relationship between the occlusal path (the functional occlusal path)and the

condylar paths at a chosen vertical dimension. Then he discussed the relationship of cusp height to sulci and of marginal ridges and inclined planes to the balanced occlusion ("cuspalpath") which he established with compound and then mounted with waxonaplane linearticulator.³

This technique was also adapted for use in complete occlusal rehabilitation by Mann and Pankey.⁴ Recently, FGP has also been used for the fabrication of implant-retained fixed partial dentures.⁵ This paper describes the use of FGP for the fabrication of complete denture.

Case report

A 57 yr. old female patient came to the Department of Prosthodontics with a chief complaint of missing teeth. She expressed a desire to improve her appearance, mastication and speech. On extra oral, intra oral and radiographic examinations nothing abnormal was detected. After making impressions and casts, a set of wax occlusal rims modelling wax (Hindustan Dental products, Hyderabad, India) are constructed on stabilized Denture bases (Autopolymerising acrylic resin cold cure DPI, Mumbai, India). The rims are adjusted to chosen vertical dimension, to be in facial harmony to a chosen



Fig.1. A tentative jaw relation made to the chosen vertical dimension, to be In facial harmony



Fig.2. The wax rims are transferred to the Articulator with the aid of a facebow.



Fig.3. The modeling compound occlusal rims are constructed



Fig.4. A balance of the occluding surfaces of the modeling compound occlusion rims is generated in carding wax by gliding them together in mouth



Fig 5..Modelling compound rims transferred to the articulator.



Fig.6.Functional occlusal wax path poured in stone



Fig.7.The outline of the upper occlusion rim is marked on the stone path



Fig.8. Upper teeth are set to this marking with proper Bucco lingual relation



Fig 9:The articulator, with the upper denture is closed against the soft compound



Fig.10.Imprints of the upper teeth in the modeling compound at chosen vertical dimension



Fig. 11. Centric can be confirmed by the buccal cusp of the first bicuspid closing into the V-shape notch



Fig .12.The patient is asked to move the mandible in lateral movements and the path recorded.

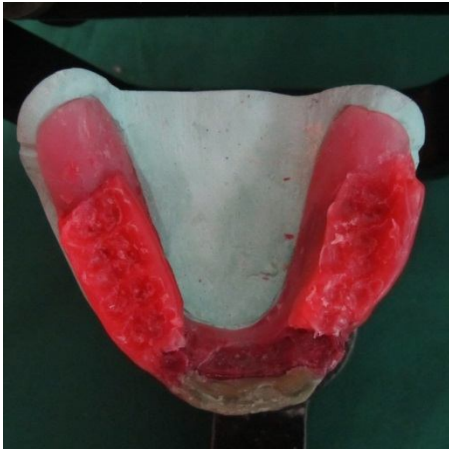


Fig. 13. The lower compound cuspal path is used as a base for generating wax cuspal path that will determine the shape of occlusal surfaces



Fig. 14. stone cuspal path is poured against The wax cuspal path



Fig.15. The teeth of opposing lower restoration are set and ground to this cuspal path



Fig. 16. The completed dentures will exhibit balanced occlusion and function in all excursions of the mandible

relation to the upper lip line and to approach balanced occlusion in centric relation as well as in all excursive movements of the mandible (**Fig.1**). The wax occlusal rims are transferred to the semi adjustable articulator (Hanau WideVue; Waterpik Technologies Inc., Fort Collins, CO, USA)with the aid of a facebow (Hanau Spring-Bow, Waterpik Technologies, USA) (**Fig.2**). Modeling compound (Y-Dent, MDM dental corporation, New Delhi, India) occlusal rims are constructed (**Fig.3**).

The first fundamental procedure is to develop a balance of occluding surfaces of the modeling compound occlusal rims is generated in soft carding wax in the patients mouth (**Fig.4**).The upper and lower occlusal rims

with their functional wax paths are stapled together and seated on the lower cast. Upper cast is removed from the articulator and resealed in the upper occlusal rim and the transfer is completed (**Fig.5**).The counter part of the upper functional occlusal wax path is poured in stone (Type IV dental stone Ultrarock, Kalabhai, Mumbai, India) on the lower compound occlusal rim. The lower stone path to which the upper teeth are set is thus arrived at automatically and it is in geometric harmony with the condylar paths (**Fig.6**). The outline of the upper occlusal rim is marked and the upper teeth are against the stone path in their proper bucco lingual direction (**Fig.7 and Fig.8**). Upper denture is processed and it is checked against the stone path for the correction of processing errors in occlusion. Stone path is removed, remaining

base is built up with more soft modeling compound, the articulator with the upper denture is closed against the soft compound in centric relation (**Fig.9**). This leaves the imprints of the upper teeth in the modeling compound at the chosen vertical dimension (**Fig.10**). The compound is cut down approximately 2mm below the incisal edges of upper anterior teeth so that there is no contact with the upper anterior teeth. Then this part of occlusal rim is built up in soft carding wax so that the incisal edges of upper anterior teeth rest against carding wax for the final checking of vertical dimension later.

This is the preparatory work for determining centric relation of the mandible the maxilla when occluding surfaces are in contact. Patient is asked to move the mandible into protrusion and retrusion and to repeat these movements few times. As the patient makes these protrusive and retrusive mandibular movements, she will never move the jaw laterally and the movement will end in retrusion. This is centric occlusion. The compound is reduced to 1mm above the base of the compound ridge on the first bicuspid contact leaving a 'v' shaped depression which fits the buccal cusp of the upper bicuspid (fig xi). The lower compound rim is returned to the mouth and the patient sitting erect is asked to close her teeth. The buccal cusp of the first bicuspid should close into the 'v' shaped openings created with pinpoint accuracy on the first closure. This final checking of centric occlusion is one of the most important steps in the reconstruction work because of the part played by the automatic nerve control of the muscles of mastication. Gothic arch tracers used in dentistry add to the bulk inside and outside of the mouth and tend to make the patient conscious of our efforts which is not desirable. As a result, she might try to help out and thereby emphasize her mandibular movements. Her voluntary control on the muscles of mastication will take over the function of the automatic control, thus mislead the dentist. A soft generating wax is melted over the lower compound rim (**Fig.12 and Fig.13**). With a few lateral, protrusive excursions of the patient's mandible, the counterpart of the occlusal surfaces and the incisal edges of the upper denture teeth in function are generated automatically in wax which is in harmonious relation with the paths of the condyle in the glenoid fossa. The wax is shaped by the teeth. So, contact is maintained in all positions. The compound base with the completed wax cuspal path is placed on the articulator and a stone cuspal path is poured against the wax cuspal path (**Fig.14**). The teeth of opposing lower restoration are set and ground to this cuspal path. All occlusal surfaces of the lower teeth are ground to fit accurately against the stone cuspal path (**Fig.15**). Articulating paper is placed on the stone cuspal path marks the parts of each tooth which must be ground (**Fig.16**).

After processing, the lower denture is replaced on the articulator the occlusal surfaces are reground to fit against the stone cuspal path. This eliminates errors due

to processing. The completed dentures exhibited balanced occlusion in all functional excursions of the mandible.

Discussion

The FGP technique is simple and can produce excellent results. Because of its simplicity it is sometimes derided by those dentists who do not use it. Simplicity should not be confused with inaccuracy; the technique is capable of producing very accurate results, but it demands great care and meticulous attention to detail.⁶

The described case utilized the functionally generated path technique for the fabrication of complete dentures using simple procedures which can be easily performed in a dental office without requiring specialized equipment. The functionally generated path is a method of developing accurate occlusal relationships on simple instrumentation without using a semi- or fully-adjustable articulator that has been programed to match the patient's mandibular movements.⁷ The patient's own functional jaw movements were used to form a three-dimensional opposing cast or template. Although, this record looked somewhat bizarre, it represented the dynamics of mandibular movement and eliminated the need for an articulator capable of eccentric movements.⁸

In the present case, the time taken for occlusal correction was almost negligible. This may be because the occlusal morphology was being generated directly in the patient's mouth and thus was closer to the normal anatomy of the tooth. Hence, the time taken for correction was also drastically reduced. This has a definite role to play in patient satisfaction and confidence. As with any technique, the FGP technique also has certain disadvantages. Some of the limitations of this technique are as follows

1. The operator needs to have a good knowledge of occlusion and of mandibular movements; otherwise it may lead to an incomplete generation of FGP.
2. The occlusal details are not similar to the ideal anatomical configuration although the surface is functionally ideal
3. Patient's lacking proper neuromuscular control cannot be selected for this technique.
3. In patients having disharmony in occlusion (malocclusions like deep bite and crossbite) and temporomandibular joint dysfunction, the FGP technique is destined to fail.
4. Good laboratory support is a basic requirement, without which successful results are difficult to achieve

CONCLUSION

If the FGP technique is carefully done, only minimal occlusal adjustments are required during the clinical try-in

stage, which is a major advantage over the conventional technique. Clinical trials with long follow-up periods should be conducted to confirm the results obtained in the present case report.

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