

Implementation of Functionally Generated Path Technique in Fabrication of a Balanced Complete Denture Prosthesis: A Case Report

Shilpa Dandekeri^{1*}, Chetan Hegde², Krishna Prasad. D³, Manoj Shetty⁴, Rakshith Hegde⁵, Haifa. B⁶

¹Reader, ²⁻⁵Professor, Department of Prosthodontics, AB Shetty Memorial Institute of Dental Sciences, Mangalore, Karnataka

⁶Reader, Department of Prosthodontics, Srinivas Dental College, Mangalore, Karnataka, India

*Corresponding Author:

Name: Dr. Shilpa Dandekeri

Email: dandekeri@gmail.com

Abstract: The treatment of the edentulous state is one of the most challenging to the dental practitioner. The conventional complete dentures are the most common treatment option for rehabilitation of the edentulous state. Occlusal paths and Cuspalpaths 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, Bees wax, Stone path.

INTRODUCTION

The stomatognathic system is a highly complex functional unit of the body. The system is made up of ones, joints, ligaments, teeth and muscles. In addition, an intricate neurologic controlling system regulates and coordinates all the structural components [1]. A sound adjustment of the stomatognathic system is the prime requirement of every prosthetic rehabilitation. A harmonious occlusion hence is important for a balanced stomatognathic system. So to replace the lost natural occlusion is challenging and difficult while restoring with a new restoration. With a proper knowledge and skill FGP is a practical method to obtain harmonious occlusal anatomy with static representation of the opposing cusps dynamic eccentric movements from a centric position in coordination with the neuromuscular system [2].

Meyer developed the concept of functionally generated path for complete dentures and claimed to obtain balanced occlusion in construction of complete dentures without the need of an adjustable articulator [3-4]. In the present case the same principles were used to obtain a balanced occlusion for a complete denture unlike the conventional gothic arch tracing techniques.

CASE REPORT

A fifty nine year old male patient reported to the Dept. of Prosthodontics with a chief complaint of

missing teeth. Extra oral, intra oral and radiographic examination was done and conventional complete denture prosthesis was planned for this particular patient.

Procedure

After making impressions and casts, a pair of modeling wax occlusal rims (Hindustan Dental products, Hyderabad, India) is constructed on autopolymerizing resin base plates (DPI, Mumbai, India). The rims are adjusted to chosen vertical dimension, to be in facial harmony to a chosen vertical dimension, and approach balanced occlusion in centric relation as well as in all excursive movements of the mandible. The casts with wax occlusal rims are mounted in an semi adjustable articulator (Girbach, Artex Articulator) by means of a face bow (Fig. 1a). The modeling compound (Y-Dent, MDM dental corporation, New Delhi, India) occlusal rims are constructed. The compound occlusal rims also adjusted to desired vertical dimension in the patients mouth. The upper modeling compound rim was cut down to 2mm, to accommodate functional bees wax, which was used to generate a balance of the occluding surfaces of the modeling compound occlusion rims, by gliding them together in mouth (Fig. 1b). This is the first fundamental principle that is to obtain a "Functional Occlusal path".

The maxillary and mandibular modeling compound occlusal rims with their functional occlusal wax paths are stapled together and seated on the lower cast on the articulator (Fig. 1c). Maxillary cast is resealed in the upper occlusal rim and the transfer is completed. 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 (Fig. 1d). 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. 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. 2a & 2b). Upper denture is processed and it is checked against the stone path for the correction of processing errors in occlusion. With the set vertical control, the stone is removed from the stone path. The remaining base is built up with softer modeling compound. The articulator, with the upper denture still on the cast is closed against the soft compound at chosen vertical dimension (Fig. 3a). This leaves the imprints of upper teeth in the modeling compound. The buccal and lingual sides of the base of the compound ridge which extends into the sulci of the upper posterior teeth is removed. The compound is cut down 2mm, below the incisal edges of anterior teeth and is built up with the soft modeling wax. The upper anterior teeth rest against the modeling wax. This is a preliminary work for recording centric relation of the mandible to maxillae when occluding surfaces are in contact. The patient is made to protrude and retrude mandibular movements several times without contact between the compound cuspal path and the upper teeth and finally when the patient retrudes and takes the jaw back as far as it will go, patient is asked to close very lightly and to hold the position without any pressure. This closing of the jaw is stopped just before the inisor teeth contact the soft wax on the anterior segment of the occlusion rim. This is centric occlusion. The compound is reduced to 1mm above the first bicuspid contact, leaving a V- shaped depression which fits the buccal cusp of the maxillary bicuspid. When the patient closes into soft compound, centric relation was confirmed by the buccal cusp of the first bicuspid closing into the V-shape notch.

The lower compound rim is returned to the mouth and the patient, sitting erect, is asked to close his teeth. The buccal cusp of the first bicuspids should close into the V-shaped openings created by it with pin point accuracy on the first closure, and no gliding movements after first contact. In reconstruction work, this final checking of centric occlusion is one of the most important steps. A soft generating wax is melted over the lower compound rim (Fig. 3b & 3c). 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 (Fig. 4a & 4b). 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. 5a). 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. 5b). Articulating paper is placed on the stone cuspal path marks the parts of each tooth which must be ground.

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 (Fig. 6a & 6b).



Fig. 1 a: Wax occlusion rims are mounted in determined vertical; dimension; **Fig. 1 b:** Functional occlusal wax pathways are generated in the mouth using bees wax; **Fig. 1 c:** The functional occlusal wax pathways are transferred to a Semi adjustable articulator and positive vertical stop is maintained; **Fig. 1d:** The counterpart of the upper occlusal wax path is replicated using stone on the lower wax rim.

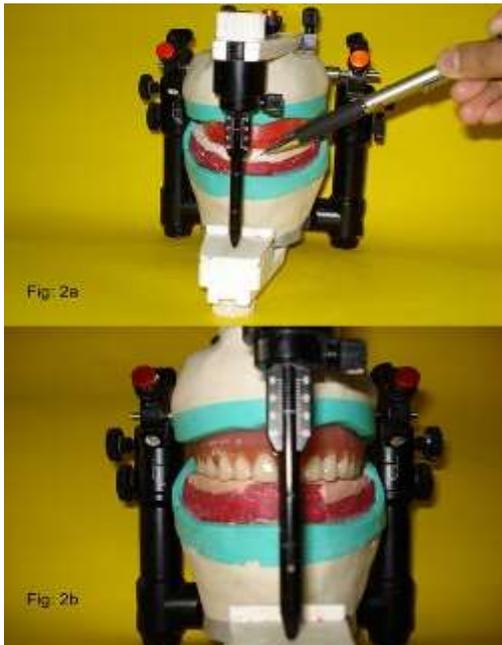


Fig. 2a: The anterior outline of the upper wax occlusion rim is outlined in pencil on the stone path to serve as a guide for arranging the teeth; **Fig. 2b:** The upper anterior teeth are arranged to the outline on the lower stone path.

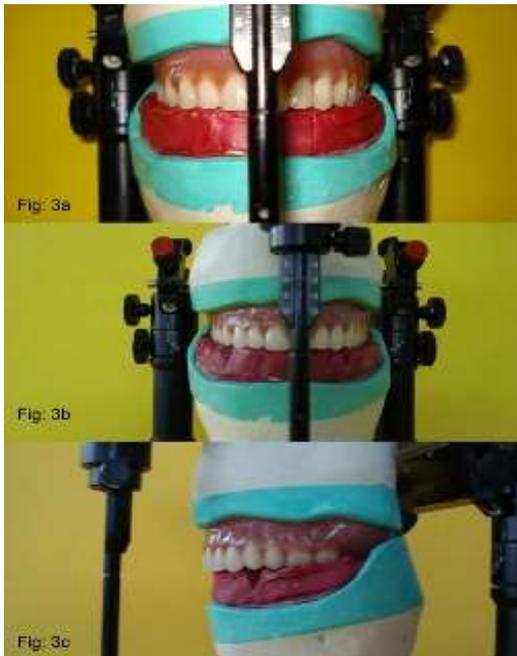


Fig. 3a: The vertical dimension of occlusion is maintained by the upper teeth contacting the lower occlusal rim; **Fig. 3b-**The buccal cusp of the upper first bicuspid fitting into the V-shaped depression in the lower compound cuspal path is the guide used to verify centric relation in the mouth (Frontal view); **Fig. 3c:** The buccal cusp of the upper first bicuspid fitting into the V-shaped depression in the lower compound cuspal path is the guide used to verify centric relation in the mouth (Side view).



Fig. 4a: The central ridge of the lower compound cuspal path is used to maintain the vertical dimensions while the wax cuspal path is generated; **Fig. 4b:** The lower wax cuspal path is completed.



Fig. 5a: A stone cuspal path is poured into the wax cuspal path, **Fig. 5b:** The lower teeth are ground to fit the stone cuspal path. Articulating paper is used;



Fig. 6a: Pre-operative photograph, Fig. 6b: Post-operative photograph

DISCUSSION

Generated path principles are extremely sophisticated method of capturing, the precise border pathways that the lower posterior teeth follow. This method was first described by Meyer as a means of obtaining the “functional occlusal path”. The technique has the distinct advantages of being able to record all dimensions of such border movements at the correct vertical as they are directly influenced by both condylar guidance and anterior guidance [3-5]. The FGP technique can be performed easily excellent results. But it demands great care and meticulous attention to detail with proper knowledge about the technique. The complete denture fabrication utilizing the functionally generated path technique can be easily performed in a dental office without requiring specialized equipment [6]. On the other hand gothic arch tracers, used for making complete denture prosthesis, add to the bulk inside and outside of the mouth and tend to make the patient conscious of our efforts. As a result the patient will try to help out and, thereby, emphasize their mandibular movements. For this reason most of the time dentures are constructed back of centric relation. This gives patient a great deal of discomfort [4, 5].

The patient’s own functional jaw movements were used to form a three-dimensional opposing cast or template to obtain the accurate occlusal relationships rather programming the relationship using a semi- or fully-adjustable articulator that matches the patient’s mandibular movements [7]. Occlusal paths and cuspal paths generated on mechanical articulators are different from those generated in the mouth. Occlusal paths and cuspal paths generated in the mouth provide records which are in complete harmony with condylar paths and neuromuscular system. Occlusal interferences resulting

from processing errors can be eliminated by grinding occlusal surfaces of the teeth to conform to stone cuspal path [2, 7]. Hence a balanced denture which functions harmoniously with movements of the condyles in the glenoid fossae is achieved.

CONCLUSION

The principles and procedures involved in the generated path technique are in harmony with anatomic, physiologic, and neurologic factors involved in occlusion. The procedure can produce accuracy with fairly simple inexpensive instrumentation, and also demands a minimum of chair time. The generated path technique provides the records which are guided by the automatic nerve control of the muscles of mastication and are in complete harmony. The complete denture prosthesis fabricated with generated path principles feels more natural and is more firmly seated in position and completed dentures hence fabricated will exhibit balanced occlusion and function in all excursions of the mandible.

REFERENCES

1. Okeson J; Functional anatomy and biomechanics of the masticatory system. In Okeson J editor; Management of temporomandibular disorders and occlusion. 4th edition, St. Louis: Mosby Inc., 1998: 2-6.
2. DuVall NB, Rogers PM; Application of the functionally generated path technique to restore mandibular molars in bilateral group function occlusion. J Prosthodont., 2013; 22(3): 226-232.
3. Meyer FS; Dentures-causes of failures and remedies. J Prosthet Dent., 1951; 1(6): 672-691.
4. Meyer FS; The generated path technique in reconstruction dentistry. Part V. J Prosthet Dent., 1959; 9(3): 354-366.
5. Ravi Rakesh Dev J, Swetha Hima Bindu O, Aparna G, Ravi Kanth A, Sushma K; Development of harmonious occlusion for complete denture patient using functionally generated path technique- A case report. Annals and Essences of Dentistry, 2013; V(4): 11-16.
6. Meyer F; The generated path technique in reconstruction dentistry. Part I: Complete dentures. J Prosthet Dent., 1959; 9(3): 354-366.
7. John W, Guinn III, Christensen LC; Stabilizing functionally generated recording tables. J Prosthet Dent., 1998, 59(4): 518.