

## RESTORATION OF MAXILLARY POSTERIOR TEETH BY A CUSTOMIZED FUNCTIONALLY GENERATED PATH TECHNIQUE BASED ON PANKEY MANN PHILOSOPHY

Rahul Patil<sup>1</sup>, Omkar Shetty<sup>2</sup>

1. Specialist Prosthodontist, Ministry Of Health, UAE

2. Specialist Prosthodontist, Professor and Dean, Pad Dr D Y Patil Dental College, Navi Mumbai

### ABSTRACT:

A Biologic and Functional approach to restorative dentistry is essential for the satisfactory performance and fulfillment of those requisites related to prosthodontics. Accordingly, the masticatory organ must be considered as a functional, consolidated unit, with proper attention being directed to all the elements that comprise this unit. All functional factors are interrelated and proper regard for each aspect is essential. Consequently, a comprehensive study and practical approach must be directed towards the interrelation of the teeth and their supporting periodontal structures, the myo-functional aspects of mastication, the intricacies of the temporo- mandibular joint mechanisms, and the functional aspects of vertical dimension, free-way space, centric relation, and centric occlusion. The objective of complete mouth rehabilitation is the reconstruction, restoration, and maintenance of the health of the entire oral mechanism. The accomplishment of this goal requires an understanding and utilization of all available dynamic potentials. The case discussed was completed using one such full mouth reconstruction philosophy called the pankey mann philosophy of full mouth rehabilitation. Few steps of this philosophy were customized and have been discussed in detail in this article.

**Keywords-** Semolina Powder, Fossa Contour Guide, BOPA, Double Casting



### 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 re-establishment 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. Various classifications<sup>[1,2]</sup> have been proposed to

classify patients requiring full mouth rehabilitation, however, the classification most widely adopted is the one given by Turner and Missirlian.<sup>[3]</sup> According to them, patients with occlusal wear can be broadly classified as follows:

Category-1: Excessive wear with loss of vertical dimension of occlusion.

Category-2: Excessive wear without loss of VDO but with space available.

Category-3: Excessive wear without loss of VDO but with limited space.

An organized approach to oral rehabilitation was introduced by Pankey utilizing the principles of occlusion advocated by Schuyler, known as the Pankey–Mann–Schuyler (PMS) Philosophy of Oral Rehabilitation.

One important aspect of Pankey-Mann philosophy is the the Functionally Generated Path (FGP). It offers the most effective aid, as it permits the registration of the cusps movements as determined by the functional mandible movements. Frederick S. Meyer, who could be called the father of reconstructive dentistry, introduced the functionally generated path.<sup>[4]</sup> Meyer wrote - Prosthetic dentistry calls for the knowledge of some of the most difficult and fundamental principles of engineering.<sup>[5]</sup> 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. He then discussed the relationship of cusp height to sulci and of marginal ridges and inclined planes to the balanced occlusion ("cuspal path") which he established with compound and then mounted on a plane articulator. <sup>[6]</sup> This technique was also adapted for

use in complete occlusal rehabilitation by Mann and Pankey.<sup>[7]</sup> Recently, FGP has also been used for the fabrication of implant retained fixed partial dentures.<sup>[8]</sup>

The present case for full mouth reconstruction was treated using a customized pankey mann philosophy with a customized functionally generated path discussed in detail.

### **CASE DETAIL:**

A 52 yr male patient reported to department of prosthodontics with a complaint of food lodgement under old fixed prosthesis placed in posterior region, sensitivity in lower anterior teeth and inability to chew food properly.

- Fixed prosthesis placed on 16,17,24,36,37,38
- There was generalized attrition seen on all remaining teeth
- Patient had no relevant medical history
- Evaluation of vertical dimension was done using Niswonger method and a vertical dimension loss of 2-3mm was revealed.(fig.1)

### Proposed treatment plan

- Scaling , polishing and prophylaxis

- Removal of all old ill - fitting and attrite prosthesis
- Endodontic treatment for all indicated teeth
- Post and core build up for required endodontically treated teeth.
- Crown lengthening procedures wherever desired after analysis of occlusal plane and assessing remaining crown structure for Ferrule.

After evaluation of the entire case and discussing patient problems, it was planned to use pankey mann philosophy to reconstruct his new bite and deliver prosthesis based on this philosophy.<sup>[9]</sup>

#### Proposed prosthodontic treatment

- Restoration of anterior teeth considering esthetics, anterior guidance and function with metal free crowns
- Restoration of mandibular posterior teeth using Broadrick's Occlusal Plane Analyzer (BOPA) and Fossa Contour Guide
- Restoration of maxillary posterior teeth using Functionally Generated Path (FGP) technique

The patient was explained the steps of entire procedure in detail which

would be required to restore his teeth. In this case report, a customized functionally generated path is described in detail. All the remaining procedures and restorations were completed following the pankey mann philosophy.

The anterior teeth were restored with all ceramic crowns (fig.2) considering esthetics and function along with the anterior guidance which was in harmony with patients new occlusion.<sup>[10]</sup>

The lower posterior metal ceramic crowns were fabricated using the customized broadricks flag<sup>[11]</sup> and fossa contour guide (fig.3,4,5).

As per the pankey mann philosophy, the upper posterior teeth were planned to be restored using patients dynamic occlusion with the help of a customized functionally generated path technique. After restoration of all remaining teeth, except the upper posterior teeth, provisional acrylic prosthesis for the upper posterior prepared teeth was removed and occlusal clearance space was evaluated (fig.6,7). Double casting procedure was used to fabricate prosthesis for FGP. The first step in a double-casting method is fabrication of a base crown or bridge prosthesis made according to the conventional indirect method on a stone die. Wax

pattern for the teeth was fabricated on the stone die cast leaving sufficient occlusal space for the second layer of metal which was to be added on to it after double casting (fig.8). Proximal contact was established in the base casting pattern. Space was left on the buccal surface to layer ceramic to make it look more esthetic. To create retentive feature for bite registration material, *semolina powder* was used as an alternative to metal beads. It was sprinkled on the occlusal surface of the wax pattern (fig.9). The pattern was then sprued and casted in base metal alloy which had high fusion temperature (fig.10). The finished casting was carefully inspected for fit and the retentive occlusal surface. Pattern wax which is hard in consistency was used to record the FGP bite. Wax was layered on the retentive occlusal surface. Base casting along with the softened wax was placed on patients teeth. Patient was instructed to initially bite on the wax till anterior teeth come in contact in centric occlusion. Then patient was instructed to perform eccentric movements, right lateral, left lateral and protrusive movements in succession. The indentations of the lower prosthesis were seen on the upper wax (fig.11). During eccentric movements patient was instructed to always maintain contact on posterior

teeth (fig.12, 13). If the below metal was visible at some places, it was trimmed in that area and wax was added again. Same procedure was performed until a uniform dynamic bite registration was obtained. Excess wax extending out laterally was trimmed and removed carefully.

The prosthesis was invested and double casting was performed. Ceramic was layered on the final prosthesis on buccal surface for esthetic purpose. Shade was matched with the anterior all ceramic prosthesis (fig.14). The prosthesis was placed in oral cavity to check whether it felt comfortable. High points were checked and minimal eccentric interference was noted. High points were reduced and occlusion was verified to be group function on right (fig.15) and left sides (fig.16) eliminating the balancing side contacts as described by pankey mann. There was posterior dis-occlusion present on protrusion. The prosthesis was luted using glass ionomer type-1 luting cement. Flossing was done between the prosthesis where ever required to remove all excess cement. Post insertion care instructions were given to the patient and recall was done after a week and then few months.

#### **DISCUSSION:**

The FGP technique is highly versatile and has been employed with equal

efficacy in fabrication of crown, bridge, complex full mouth reconstructions, complete, and RPDs as well as dental implant restorations. This technique has the distinct advantages of being able to record all dimensions of border movements at the correct vertical as they are directly influenced by both condylar guidance and anterior guidance. The FGP technique can be performed easily with excellent results. But it demands great care and meticulous attention to detail with proper knowledge about the technique. It is recognized that the Pankey–Mann philosophy of occlusal rehabilitation was originally a combination of the Monsoon spherical theory and the Meyer’s functionally generated path technique, where they attempted to gain bilateral balance in eccentric movements. The Pankey–Mann–Schuyler philosophy retains the FGP technique, except that the balancing side contacts are eliminated due to their traumatic effect on the masticatory system. If the FGP technique is properly accomplished, only minor intra oral occlusal adjustments are necessary. Besides, the availability of the sophisticated fully adjustable articulators, the FGP still remains a technique that is simple, reliable, and unsurpassed in accuracy.<sup>[12]</sup>In this technique, the patient chewed on a kinetic record of

his own jaw movements in gliding and masticatory mandibular excursions. Occlusal paths and cuspal paths which are 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 cuspal path.<sup>[13]</sup>

The merit of a double casting method is inclusion of the error compensation step that enables achievement of a highly precise occlusion by eliminating inherent dimensional errors. Error sources that affect the accuracy of occlusion –

(1) distortion of impression, (2) distortion of occlusal registration material, (3) incorrect mounting of a cast to an articulator, (4) poor fit of cast prosthesis to an abutment, and (5) improper occlusion of the prosthesis. In double-casting method, errors that originate from these sources can be addressed before occlusal surfaces were fabricated on the base-crown. Therefore errors that could affect final accuracy of the occlusion of double-cast restorations included only errors related to investing and

casting of the second casting and the polishing process.<sup>[14]</sup>

As with any technique, the FGP technique also has certain demerits.

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 record of FGP bite.

2. The occlusal details are not similar to the ideal anatomical configuration although the surface is functionally ideal.

3.Patient's who lack proper neuromuscular control cannot be selected for this technique.

4. In patients having disharmony in occlusion (malocclusions like deep bite

and crossbite) and temporomandibular joint dysfunction, the FGP technique is destined to fail.

5. Good laboratory support is a basic requirement, without which successful results are difficult to achieve.<sup>[15]</sup>

### CONCLUSION:

The concepts of traditional full mouth reconstruction have been discussed and pankey mann philosophy with modification has been described in detail. The technique has been described combining the chair-side advantages of the programmed quadrant reconstruction with the laboratory advantages associated with the complete mouth simultaneous rehabilitation. Focus was given more on patients comfort and neuromuscular acceptance of the functional bite. The merits and demerits of the technique have also been described.

### REFERENCES:

1. Jones SSM. The principles of obtaining occlusion in occlusal rehabilitation. *J Prosthet Dent* 1963; 13:706–713
2. Brecker SC .Clinical procedures in occlusal rehabilitation W. B. Saunders Co, Philadelphia 1958
3. Turner KA, Missirlian DM .Restoration of the extremely worn dentition. *J Prosthet Dent* 1984;52: 467–474
4. Meyer F.S. Cast bridge work in functional occlusion.*JADA* 1933;30: 1015-1030.
5. Rudd K.D. Dr Fred S .Meyer, A pioneer in prosthodontics. *J Prosthet Dent.* 1966;16: 1165-1169.
6. Meyer FS. The generated path technique in reconstructive dentistry.Part -1 Complete Dentures. *J Prosthet Dent* 1959; 9:354-66

7. Kafandaris NM. A modified functionally generated path technique for making maxillary posterior ceramo metal restorations. *J Prosthet Dent* 1981; 46: 29-31
8. Sutton AJ, Sheets DW Jr, Ford DE. Fabrication of a functionally generated, implant-retained fixed partial denture. *J Prosthodont* 2003;12:260-4
9. Mann AW, Pankey LD. Concepts of occlusion; the P.M. philosophy of occlusal rehabilitation. *Dent Clin North Am* 1963; 9:621–636
10. Schuyler CH. An evaluation of incisal guidance and its influence on restorative dentistry. *J Prosthet Dent* 1959;9: 374–378
11. *International Journal of Advanced Dental Science and Technology* 2013;1(1):17-24.
12. Pankey LD, Mann AW. Oral rehabilitation: part II. Reconstruction of the upper teeth using a functionally generated path technique. *J Prosthet Dent* 1960;10:151–162
13. Pravinkumar G. Patil, Smita P. Nimbalkar-Patil, Rahul S. Kulkarni. Functionally generated pathways to develop occlusal scheme for removable partial denture. *J of Interdisciplinary Dentistry*. 2015; 5(3):155
14. Shogo Minagi, Toshiyuki Tanaka, et al. Double-casting method for fixed prosthodontics with functionally generated Path. *J Prosthet Dent* 1998;79 :120-24.
15. Ravi Rakesh Dev et al. Development of harmonious occlusion for complete denture patients using functionally generated path technique- a case report. *Annals And Essences Of Dentistry* . Dec 2013;5 (4):11-16

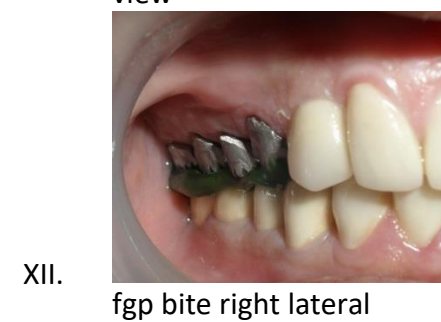
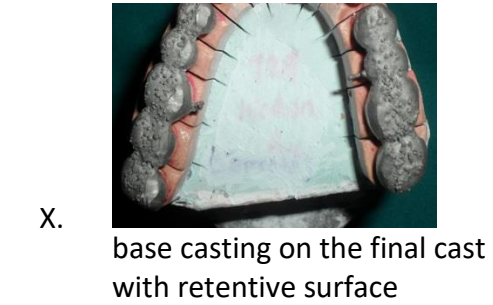
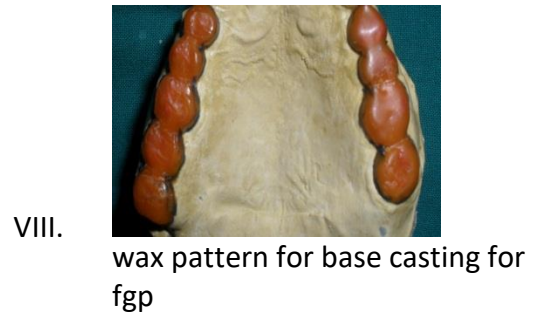
**FIGURES:**



pre operative frontal view



final all ceramic anterior crowns





XIII.



fgp bite left lateral

XV.



group function occlusion-right

XIV.



final maxillary posterior  
prosthesis with facing ceramic

XVI.



group function occlusion -left