# TITLE: Patient-Specific Fixed Partial Denture with a Precise Approach: A Case Report

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### Abstract:

Occlusal harmony is fundamental to maintaining balanced musculature and optimal oral function. One of the common reasons for the failure of fixed partial dentures (FPDs) is occlusal interference, which can lead to discomfort, prosthesis instability, and eventual dislodgment. Achieving proper occlusion in both static and dynamic states is therefore critical for the long-term success of FPDs. The functionally generated pathway (FGP) technique offers a precise method for customizing occlusal surfaces to the patient's unique mandibular movements, minimizing the risk of interferences. This article discusses one such technique with respect to fabrication of a fixed partial denture to ensures unaltered existing dentition.

Keywords: Functionally generated pathway, occlusion, fixed partial denture.

# Introduction:

Achieving harmonious interaction between the maxillary (upper) and mandibular (lower) teeth is essential for maintaining proper occlusion, effective mastication, and overall oral health. This harmony ensures that the teeth, temporomandibular joints (TMJs), and masticatory muscles function in coordination during both static and dynamic activities.

In balanced occlusion, teeth contact evenly at rest, allowing stable force distribution and reducing the risk of trauma or wear. During functions like chewing or speaking, mandibular teeth should glide smoothly against maxillary teeth without deflective interferences, preventing muscle strain and joint stress. The TMJ guides these movements, and any imbalance can lead to issues such as muscle fatigue, joint pain, or TMD. Achieving maxillary-mandibular harmony is essential in restorative and prosthodontic dentistry for functional efficiency, stability, and patient comfort.

Standard fabrication methods often rely on static articulator movements, which may not replicate the patient's true functional jaw movements. This can lead to deflective contacts during chewing or speaking. Repeated occlusal stress and interference may contribute to chipping, loosening, or fracture of the prosthesis. Patients may report discomfort, difficulty in chewing, or a feeling that the prosthesis "does not fit right," even if clinically acceptable.

Newly trending concept called functionally generated pathway which was discovered in 1959 by Frederick S. Meyer is for recording the dynamic movement of teeth during occlusion, aiming to create a static representation of these movements for accurate restoration fabrication. This article highlights the role of FGP in minimizing interferences and improving the longevity and comfort of FPDs.

# **Case Report:**

A 50 year old male patient reported to the Department Of Prosthodontics with the chief complain of dislodged prosthesis and a missing molar. Initially the dislodged prosthesis was checked for the purpose of re-cementation, as the ceramic was chipped off from the prosthesis and it was ill-fitting we decided to go for a new prosthesis. Preliminary impressions were made with irreversible hydrocolloid impression material and the cast was poured with Type II dental stone. Further the casts were mounted on a semi-adjustable articulator with the help of the facebow and a protrusive bite was made with elastomeric impression material.







**Fig 2: Tooth Preparation** 



Fig 3: Metal Coping With Retentive Beads

Next, as the patient came with dislodged prosthesis the abutment teeth were already prepared so after a little refinement of the abutment teeth gingival retraction was performed and final impression was made and the master die was prepared by following all the principles (Figure 1 & 2). A three-unit wax pattern was then fabricated with retentive beads, maintaining an occlusal clearance of 1 mm from the retentive beads. The beads were made for retentive purpose in case of adherence of pattern resin during the recording of the functional generated path. After the casting and sandblasting was done, crowns were checked on the model for adequate clearance.

As the patient arrived for the next appointment the first step was to accustom the patient with the maximal inter-cuspal position (MIP) and the movements to be performed for recording the functional path. Then the metal casting was checked inside the patient's mouth and the adjustments were done till the existing occlusion was achieved along with sufficient occlusal clearance in the area of interest. The fit of the casting was also checked before moving ahead (Figure 3).

### Registration of the occlusal anatomy using functionally generated path:

Pattern resin was used to record the occlusal anatomy. Pattern resin was mixed according to the instructions applied on the beaded casting and placed inside the patient's mouth. The patient was made to do all the movements, firstly to close in MIP followed by left lateral, right lateral, protrusive and ending with MIP quite a few times in the same fashion till the pattern resin sets. The excess pattern resin was trimmed off using an acrylic trimmer. The occlusal surface was examined for any exposure of the metal and if this was present the metal in the area was trimmed, pattern resin was added in that area, and the movements were performed once again. This was repeated till the point occlusal registration was done without any metal exposure. The overhanging resin was trimmed off with acrylic trimming bur.



Fig 4: Functionally Generated Pathway with Pattern Resin



Fig 5: Occlusion Check with The Pattern Resin

Once the pathway was recorded a thermoplastic sheet (2mm) was adapted with a vaccum press on to the cast. Further it was cut on the line angle formed by the buccal and the occlusal surface that made the buccal surface of the metal and resin visible which led to the formation of an index with negative replica of the occlusal morphology. This made the occlusal morphology visible. The resin on the metal surface was taken out with acrylic trimmer and the ceramic build up was done using the stent as a guide to replicate the occlusal morphology.



Fig 6: Adapted Thermoplastic Sheet Used



Figure 7: Ceramic Build-Up Using the Index



Fig 8: Final Prosthesis

# **Discussion:**

The concept of the Functionally Generated Pathway (FGP) plays a critical role in achieving occlusal harmony and long-term success in restorative dental procedures. By capturing the dynamic occlusal movements of the patient, FGP allows for the creation of restorations that are highly individualized, ensuring minimal interference with natural mandibular function. This technique represents a significant evolution from static bite registration methods, focusing on a more physiologic approach to occlusion.

One of the key advantages of the FGP technique is its ability to replicate functional movements such as protrusion, retrusion, and lateral excursions. This reduces the likelihood of occlusal discrepancies post-restoration, which are often responsible for complications such as muscle soreness, temporomandibular joint discomfort, and restoration failure. In essence, FGP supports the creation of restorations that are in harmony not only with centric occlusion but also with the patient's functional envelope.

In this particular case, functionally generated pathway was recorded with help of resin same as the double casting technique, although the general technique leads to an all metal prosthesis or a ceramic facing prosthesis which seemed concerning to the patient. So going ahead an index was made with the thermoplastic sheet which allowed the negative replication of the recorded FGP. This index was then used for ceramic layering which allowed for the functionally generated path to be replicated in the same pattern aquired by the resin with eliminated interferences.

This technique helped in achieving a fully tooth coloured restoration without any occlusal interferences and in harmony with the stomatognathic system.

### **Conclusion:**

If the FGP is recorded correctly, it can be a superior technique when compared to the conventional technique. Further incorporation of the index as a guide can facilitate in achieving esthetic and better function along with the occlusal anatomy leaving us with minimal chairside adjustments and patient satisfaction.

### **Consent for Publication:**

Informed consent for the publication was obtained from the patient.

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