

## Full Mouth Rehabilitation- A Review

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### Abstract:

This article discusses the main ideas and debates about the various full mouth rehabilitation occlusion concepts. When many of those problematic concepts were first presented, they were done so with good intentions. Upon examination, though, it becomes clear that many of them severely damaged healthy tooth tissue while falling short of many of their advertised benefits. Since each patient's scenario is different, restoring occlusion in patients with badly damaged dentition can be difficult. There is a significant deal of risk when reconstructing a dentition that has been severely compromised because opinions regarding the best occlusal scheme to use for achieving full mouth rehabilitation are very different. A review of numerous occlusal ideas in full mouth rehabilitation is provided in this article, which will assist the dentist in choosing the best occlusal scheme for a given patient.

### Introduction:

In addition to rebuilding and restoring the damaged dentition, complete mouth rehabilitation aims to preserve general stomatognathic system health. Full mouth rehabilitation aims to regain both biological and efficiency of function, with the masticatory muscles, temporomandibular joint (TMJ) mechanisms, and teeth and their periodontal structures all working in combination.<sup>[1]</sup> Due to the complex and diverse aetiology of severe occlusal tooth wear, a proper evaluation and precise diagnosis are essential. Appropriate treatment planning requires a careful evaluation of the patient's eating habits, diet, and gastrointestinal problems in addition to the current state of occlusion.<sup>[2]</sup> Although several classifications have been put forth to categorise patients in need of full mouth rehabilitation, the most often used categorization is that proposed by Turner and Missirlian.<sup>[3-6]</sup>

They state that the following categories can be used to broadly classify patients with occlusal wear:

**Category A:** loss of the vertical dimension of occlusion, interocclusal gap is more than 4 mm, patient's nearest speaking space is more than 1 mm, and there is some drooping of the corners of the lips and a loss of facial shape as result of severe wear. Following the final choice, a single arch's teeth must all be prepared at once. This improves aesthetic control and lessens the abruptness of the VDO increase.

**Category B:** Excessive wear with adequate space but without loss of VDO The continual eruption maintains the occlusal vertical dimension (OVD), but patients usually have a long history of progressive attrition brought on by bruxism, oral habits, or environmental causes. Due to the reduced crown length, retention and resistance form may be difficult to accomplish,

and gingivoplasty may be required. The restorative material may have some room if the opposing posterior teeth are polished.

**Category C:** Excessive wear with little space but no VDO loss Over an extended length of time, the anterior teeth experience considerable wear, while the posterior teeth experience minor wear. Having a nearest speaking space of 1mm and an interocclusal spacing of 2-3 mm, centric occlusion and centric relation are coincidental. In these situations, vertical room for restoration is required. Orthodontic movement, restorative repositioning, segmental surgery, and programmed OVD modification can all be used to achieve this.

In order to enhance patient's dental health and overall well-being, restoring tooth to its normal natural functioning and look while maintaining biological principles in balance with surrounding soft and hard tissues is the goal. For full mouth recovery, the following goals must be met:

- Complete recovery from illness in all masticatory and related structures.
- Healthy periodontium that is maintained.
- Stable temporomandibular joint.
- Steady occlusion.
- Consistently good teeth.
- Comfortable functionality.
- Optimal aesthetic appeal.

**The first signs that the entire dentition will be restored are:** <sup>[7]</sup>

1. The restoration of worn-out teeth is one of the first signs of a full dentition restoration.
2. To replace the bridge framework and crown that were poorly planned and built.
3. TMD disorganisation therapy is also suggested.

**Aspects of Function in Complete Rehabilitation of the Mouth** <sup>[8]</sup>

Complete rehabilitation of mouth is a passionate and successful endeavour that unites all of the component parts into a single, functional unit. Reconstruction and rehabilitation of the entire dentition should be the goal, meeting all related requirements. The field of full mouth rehabilitation is based on three established and proven principles:

1. The mandible's pre-existing, stationary physiologic rest position.
2. Identifying vertical dimension.
3. Acceptance of a functionally oriented, dynamic occlusion.

**Occlusal Method:**

The occlusal consideration in procedure of restoration can take two forms: a reorganised method, which is generally recommended, or a confirmative approach.<sup>[9]</sup>

The confirmative approach uses the patient's present intercuspal position to recreate the occlusion. When only a modest quantity of restorative treatment is done, it is adopted.

**It covers the following two scenarios:**

1. The occlusion remains unaltered during tooth preparation, while minor adjustments to restorations, including removing operative connections, may be made.

2. Localised occlusal adjustments are made to the occlusion prior to tooth preparation. These modifications include removing a deflective contact from the tooth that will be fixed, cutting short the opposing cusp, and eliminating interferences from the non-working side.

New occlusal scheme is achieved in the reorganised method near the centric relation position, an appropriate condylar location. In case the intercuspal position is unsatisfactory and should be changed, if the patient requires extended treatment to optimise their occlusion, the patient's occlusion may need to be rearranged.

Signs for restructured strategy include vertical dimension loss, frequent tooth restoration fractures failures, severe bruxism, occlusion-related trauma, insufficient function and aesthetics, temporomandibular disorders, or developmental anomalies.

### **Occlusal Schemes:**

Three approaches can be used to categorise the optimal occlusion for eccentric motions based on the state of tooth-to-tooth contact. Balanced occlusion, group function, and mutually protected articulation. For individuals with complete dentures, the notion of balanced occlusion is utilised, in contrast group functioning and mutually protected occlusion are used for natural dentition, precursor to comprehensive dentistry was the gnathologic organisation that McCollum established in 1926. <sup>[10]</sup> In the renowned research report published in 1955, McCollum and Stuart introduced the Gnathological idea. On the other hand, they claimed that the condylar path, also known as posterior guidance, is a stable entity and that incisal guidance is entirely independent of condylar guidance. <sup>[11]</sup>

In order to restore the natural dentition, McCullum, Schuyler, and others applied the notion of balanced occlusion, which includes premise that condyle's most posterior position was best functional position for restoring denture occlusion. <sup>[12,13]</sup> In his early professional years, Schuyler was an advocate of balanced occlusion, but he eventually started to notice clinical problems. <sup>[14]</sup> Stuart saw similar problems as a result of uneven lingual and buccal cusp wear, which led to deflective occlusal disturbances and loss of centric-relation, which made patients bite their tongues and cheeks. <sup>[15]</sup> According to Stuart and Stallard the upper lingual cusps stamp into the lower fossae, whilst the lower incisors, canines, and buccal cusps stamp into the higher fossae, which is consistent with D Amico's observations. <sup>[15]</sup> Additionally, they claimed that in laterotrusive, or working side excursion, "Canines" disengaged all other teeth. In their 1960 work, concept of mutually protected occlusion, took place of balanced occlusion. <sup>[16,17]</sup>

During eccentric movements or protrusion, teeth of upper and lower anterior segments protect teeth of upper and lower posterior segments. Teeth of upper and lower posterior segments protect anterior teeth at maximal intercuspation in a mutually protected occlusal arrangement. <sup>[18]</sup>

Cusps of the posterior teeth had to occlude in a centric occlusion with mandible in a centric jaw relationship in order for there to be mutually protected occlusion. Anterior teeth and opposing canines had to make contact during protrusion and lateral excursions, respectively. Von Spee (1890) made reference to the cuspids' vertical overlap, or "overbite," which was completely disregarded. <sup>[19,20]</sup> In 1915, Gysi was the first to explain the idea of canine protected occlusion and the teeth's masticatory activities.

Idea mentioning "canine guided" occlusion was introduced by D Amico in 1958. According to this technique, the mandible's protrusive and lateral motions are controlled by the mandibular first premolar and the upper canine during eccentric movements and contact with the

mandibular canine. Hence, it is impossible to apply any force to the opposing incisors, premolars, or molars other than along the long axis.<sup>[21]</sup> Schuyler introduced the idea of "Freedom in Centric" and supported the viewpoint that the centric relation was not so much a point as it was a biological region of the TMJ.

According to this theory, "opposing cusps contact on a flat area in the central fossae which permits a degree of freedom (0.5–1 mm) in eccentric movements uninfluenced, by tooth slopes." Schuyler states that "lock in" posterior occlusion will eventually occur from incisal guiding if there is no release of motion from centric relation to a more anterior tooth intercuspation.<sup>[22,23]</sup> Dawson referred to freedom in centric as "long centric." Changes in postural closure and head position were healed by long centric. The gap between centric-related closure and postural closure, which is minimally greater than 0.5 mm, is detectable amount of lengthy centric required.<sup>[24]</sup>

Using the occlusion principles promoted by Schuyler, Pankey developed an organised method of oral rehabilitation also known as PMS (Pankey–Mann–Schuyler) philosophy of Oral Rehabilitation.<sup>[25,26]</sup> Spherical theory of occlusion, "wax chew-in" as explained by Meyer and Brenner, and D'Amico's explanation of significance of cuspid teeth form foundation of their occlusion philosophy.<sup>[27,28]</sup> PMS philosophy modified canine disocclusion by having just anterior teeth contact during protrusive excursive movement and synchronous contacts between canine and posterior teeth during the working excursion (group function). In order to satisfy both practical and cosmetic requirements, incisal guidance in the PMS method was made intraorally using acrylic resin. The mandibular posterior teeth can be positioned in harmony with anterior and incisal guidance to avoid interfering with posterior and condylar guidance, and monson curve should be followed while choosing the plane of occlusion. (Table 1)

Following the completion of mandibular restorations, maxillary posterior occlusal surfaces are created using the functionally generated path approach (FGP). Even if the type of contacts was not given much weight, Nyman and Lindhe's occlusal plan for exceptionally progressing periodontitis instances states that even closeness should be provided in the maximal inter-cuspal location. Anterior disocclusion is necessary when there is distal support. When there are long span cantilevered tooth-supported prostheses, the cantilevered prosthesis should have side contacts that are both balancing and operating simultaneously, similar to balanced occlusion.

**Table 1:** Condylar path and anterior guide table based on condition

Condition	Condylar Path		Anterior Guide Table	
	Sagittal Condylar Path Inclination	Bennett Angle	Sagittal Inclination	Lateral Wing Angle
<b>Condition 1: Without Anterior Teeth</b>	25	15	25	10
<b>Condition 2: With Anterior Teeth</b>	40	15	45	20

## **Discussion:**

Out of all the ideas explored in the literature, two—the "gnathologic" and the "freedom-in-centric" concepts—have gained traction for natural dentitions and fixed prostheses. McCollum used the bilateral balanced occlusion system for natural dentition; however, after clinical failures with bilateral balance, Stuart and Stallard proposed mutually protected occlusion.

Dentist thought that anterior guidance and that the condylar path remains unchanged throughout adulthood. Schuyler identified the significance of anterior guidance on the functional occlusion of natural teeth. He claimed that anterior guidance affected occlusal morphology just as much, if not more, than TMJ guidance and that poor incisal guidance frequently resulted in aberrant functional movements of the condyles. Additionally, he developed the idea of flexibility in centricity and stated that incisal guidance that does not allow for movement from a centric relation occlusion to a more anterior tooth intercuspation will "lock-in" the posterior occlusion. Based on the occlusion concepts promoted by Schuyler, Pankey and Mann provided a systematic clinical approach to whole mouth rehabilitation in 1960. In contrast to the gnathologic notion, the PMS occlusal scheme promoted many occlusal contacts during protrusive motions (long centric, a crucial component of this approach) and lateral movements (group function or broad centre). Tooth wear may increase as a result of this. In the majority of occlusal restorations, the PMS-promoted FGP approach is no longer required due to the idea of posterior disocclusion.

The FGP technique has a high chance of inaccuracy since it uses wax to get the record. Furthermore, because FGP cannot be adequately recorded in teeth with poor periodontal tissues, the PMS approach cannot be applied in these cases.

Similar to Schuyler, Hobo and Takayama noted in their investigation that anterior guidance and condylar guidance were dependent, not independent, variables.<sup>[29]</sup> They disagreed with the PMS theory, which holds that group function is produced on working side, and instead supported posterior disocclusion in eccentric motions, they left freedom out of centric. Since cusp angle was primary occlusion factor in the twin-stage procedure, condylar path recording was not required. For this reason, complicated instruments like the pantograph and completely adjustable articulators are not necessary. Although it adheres to gnathological principles, this process is far less complicated than the traditional gnathological procedure.<sup>[30,31]</sup>

With benefit of one occlusal contact per tooth, Wiskott and Belser coupled anterior disclusion mechanics with antero-posterior mobility. The cusp-fossa connection was established in place of tripod contacts, which made mastication easier. In addition to offering occlusal stability and aesthetics, this design might be modified to accommodate anterior guidances and group function. Similar clinical circumstances can benefit from the use of the occlusal ideas addressed for periodontally weak teeth. After examining the numerous occlusal ideas, we believe that in whole mouth rehabilitation, it's preferable to achieve posterior disocclusion in order to prevent damaging lateral stresses in line with Hobo's suggestion.<sup>[32]</sup> While mutually protected occlusion and tripod connections are the foundation of the gnathology idea, which yields stable long-term outcomes, certain patients may demand flexibility in occlusion; hence, the PMS concept cannot be completely discounted. In fact, many of the PMS ideas are integrated into routine occlusal treatment, such as determining a suitable occlusal plane before occlusal rehabilitation. Moreover, cusp-to-fossa connections should be made in the rebuilt occlusion since the tripod interactions are exceedingly challenging to equilibrate. (Table-2)

**Table 2:** Different occlusal concepts in the treatment for full mouth rehabilitation

S. No.	Occlusal concept / philosophy	Salient features	Limitations
1.	Gnathological concept (McCollum, Stuart, Stallard)	<ul style="list-style-type: none"> <li>• Mutually protected occlusion</li> <li>• Point centric concept</li> <li>• Maximum intercuspation coincides with centric relation (RUM position)</li> <li>• Cusp to fossa relationship with tripodism</li> <li>• Narrow occlusal table</li> </ul>	<ul style="list-style-type: none"> <li>• Point centric and cusp-to-fossa tripodization complicate the need to obtain precise gnathologic restorations</li> <li>• Need for a fully adjustable articulator</li> <li>• Cast metal transitional restorations had limitations related to cost, inability to increase occlusal vertical dimension, and changes in mandibular position that cannot be equilibrated easily to a new maximum intercuspation relation.</li> </ul>
2.	Freedom in centric concept (Schuyler)	<ul style="list-style-type: none"> <li>• Balancing contacts are deleterious and must be avoided in natural dentition</li> <li>• Incisal guidance is a predominating factor for selection of posterior guiding tooth inclines than condylar guidance so it should be the first step of occlusal rehabilitation</li> <li>• Antero-posterior freedom of movement must be incorporated in the restoration</li> </ul>	<p>According to gnathologists, the task of adjusting maximum intercuspation contacts in two different positions on an articulator to achieve freedom in centric may result in a lack of precision in both positions</p> <ul style="list-style-type: none"> <li>• Cusp-to-surface rather than cusp-to-fossa relation affects chewing efficiency</li> </ul>
3.	Simplified occlusal design (Wiskott and Belser)	<ul style="list-style-type: none"> <li>• Cusp-fossa relation with only one occlusal contact per tooth</li> <li>• Anterior disclusion during all eccentric movements</li> <li>• Freedom in centric occlusion</li> <li>• Can be adapted to most anterior guidances and varying degrees of group function</li> </ul>	
4.	Pankey, Mann and Schuyler	<ul style="list-style-type: none"> <li>• Maxillary cuspids in good functional contact</li> </ul>	<ul style="list-style-type: none"> <li>• Cusp to fossae marginal ridge contact</li> <li>• Use of</li> </ul>

	Philosophy (1960)	<ul style="list-style-type: none"> <li>• Group function on working side</li> <li>• Absence of nonworking side contacts.</li> <li>• Freedom of movement in centric occlusion is necessary</li> <li>• Long centric is incorporated in the lingual surfaces of maxillary incisors</li> </ul>	<p>wax functionally generated path techniques can cause errors</p> <ul style="list-style-type: none"> <li>• The PM philosophy was developed and its use advocated on a non-arcon articulator, which may not accept interocclusal records made at increased occlusal vertical dimension</li> </ul>
5.	Twin Table technique - Hobo (1991)	<ul style="list-style-type: none"> <li>• Incisal guidance and condylar path are dependant factors</li> <li>• Posterior teeth are restored using two customised incisal tables: without disclusion; and with disclusion</li> </ul>	<ul style="list-style-type: none"> <li>• The cusp angle was fabricated parallel to the measured condylar path, and the cusp angle became too steep</li> <li>• To obtain a standard amount of disclusion with such a steep cusp angle, the incisal path had to be set at an angle that was extremely steep. This made the patient uncomfortable</li> <li>• The customised guide tables were fabricated by means of resin molding. It was technique sensitive</li> </ul>
6.	Twin Stage Procedure Hobo and Takayama	<ul style="list-style-type: none"> <li>• Since cusp angle is the main determinant of occlusion, the measurement of the condylar path is not necessary</li> <li>• The procedure can be indicated for single crowns, fixed prosthodontics, implants, complete-mouth reconstructions, and complete dentures</li> <li>• Suitable for transmandibular disorder patients</li> <li>• It can be incorporated easily with commonly used clinical techniques such as facebow transfer, various centric recording methods, and cusp-fossa waxing</li> </ul>	<ul style="list-style-type: none"> <li>• Contraindicated for malocclusion cases</li> </ul>
7.	Youdelis Scheme	<ul style="list-style-type: none"> <li>• Cuspal anatomy is so arranged that if the canine disclusion is lost through wear or</li> </ul>	<ul style="list-style-type: none"> <li>• Used in advanced periodontitis cases</li> </ul>

		tooth movement, the posterior teeth drop into group function	
8.	Nyman and Lindhe Scheme	<ul style="list-style-type: none"> <li>• When there are long tooth-borne cantilevered restorations, balanced occlusion must be achieved</li> <li>• When distal support is present, anterior disclusion is provided</li> </ul>	<ul style="list-style-type: none"> <li>• For extremely advanced periodontitis cases</li> <li>• Type of contacts not specified</li> </ul>

**Conclusion:**

All functional aspects are connected, universal treatment principles apply, and every attempt can be made to create an occlusal interface that allows the periodontium, masticatory muscles, teeth, and TMJs functions together harmoniously. This necessitates a precise diagnosis that takes into account intra-oral alterations, additional detrimental impacts on jaw relations, and the aetiology of the disturbed condition. In rehabilitation operations, the patient's demands can be taken into account to achieve optimal occlusion. Since there is no one-size-fits-all guideline for occlusal forms and schemes, chewing efficiency might vary greatly across people. Full mouth rehabilitation is a comprehensive treatment plan that has to be completed in accordance with the dentist's treatment modality selection, based on his clinical expertise and understanding the numerous full mouth rehabilitation philosophies. Reconstruction, repair, and preservation of the overall oral mechanism's health require a wide range of topical and applied approaches.

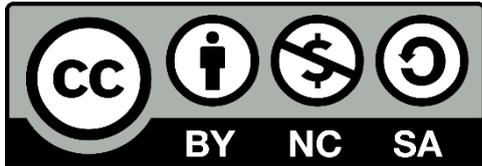
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