

An Appraisal on Occlusal Philosophies in Full-mouth Rehabilitation: A Literature Review

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ABSTRACT

Restoration of occlusion in patients with mutilated dentition is a challenging situation as every case is unique in itself. There is a great apprehension involved in reconstructing worn-out dentition due to widely divergent opinions regarding the choice of an appropriate occlusal scheme. A critical assessment and subsequent scientific validation of available literature on occlusal philosophies in full-mouth rehabilitation require an understanding of their evolution in the formative years and the subsequent development of effective models for clinical practice. This study overviews the various occlusal concepts/philosophies in full-mouth rehabilitation, which will help the clinician to select an appropriate occlusal scheme for an individual case.

Keywords: Centric occlusion, Centric relation, Functionally generated path, Occlusal vertical dimension, Pankey-Mann-Schuyler concept, Temporomandibular joint disorder.

How to cite this article: Parmar A, Choukse V, Palekar U, Srivastava R. An Appraisal on Occlusal Philosophies in Full-mouth Rehabilitation: A Literature Review. *Int J Prosthodont Restor Dent* 2016;6(4):89-92.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

The restoration of normal healthy function of masticatory apparatus is the ultimate aim of full-mouth rehabilitation. Full-mouth rehabilitation seeks to convert all unfavorable forces on the teeth, which inevitably induce pathological conditions into favorable forces that permit normal function and therefore induce healthy conditions.¹ Occlusion plays a key role in establishing the synchronous harmony between the components of stomatognathic system, i.e., teeth, muscles of mastication, and temporomandibular joints. So, the selection of proper occlusal scheme is the most important step in prosthetic rehabilitation of a patient with mutilated dentition.

An understanding of occlusion must be based on knowledge and understanding of physiology of masticatory system and insight into the dysfunctional adaptation.²

After thorough clinical examination and diagnosis of patient with worn-out dentition, appropriate occlusal scheme should be chosen that would not only restore the occlusal surface of teeth but also provide optimal muscle and joint function.

A critical assessment requires a review of the historical evolution of concepts and philosophies of full-mouth rehabilitation in formative years and its subsequent scientific validation, which is the aim of this review (Flow Chart 1).

This study critically analyzed the existing literature about various occlusal concepts to help absolve the difficulties related to the treatment planning for patients requiring full-mouth rehabilitation.

A PubMed/MEDLINE search was performed to identify English-language peer-reviewed literature along with hand search. Electronic searches of the literature were performed in MEDLINE using the following keywords: Occlusal concepts/philosophies in full-mouth rehabilitation, occlusion in worn-out dentition, dental occlusion, dental occlusion research, centric relation (CR), occlusal vertical dimension (OVD), and occlusion, in various combinations to obtain potential references for review. Many of these articles were duplicates due to multiple searches and were subsequently eliminated. Articles other than in English language and articles other than reviews were excluded.

VARIOUS OCCLUSAL CONCEPTS

The early concepts of occlusal philosophies originated from gnathological concept. The term gnathology was first coined by Stallard in 1924. McCollum³ founded gnathological society in 1926; Stuart became associated with gnathological society and published their classic "research report" in 1955. The fundamentals of gnathology included the concepts of CR, anterior guidance, OVD, the intercusp design, and the relationship of the determinants of mandibular movements to the occlusion in fixed dental prosthesis.⁴

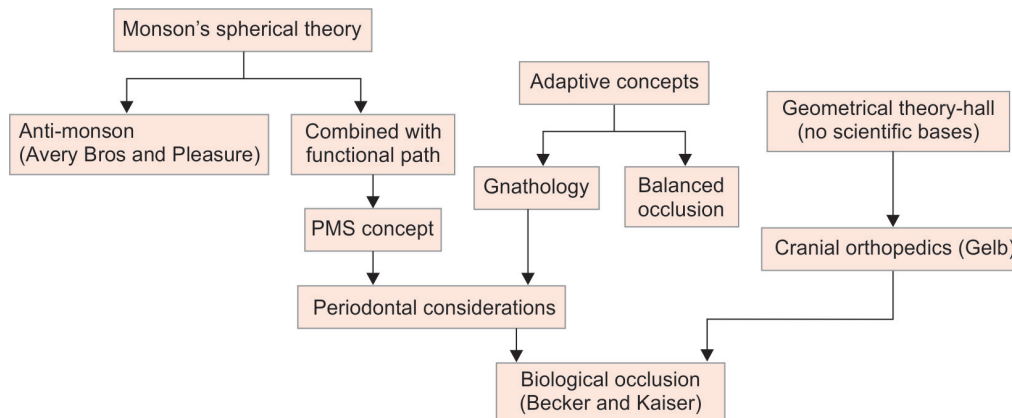
The early gnathologist believed CR as the most posterior relation of mandible to maxilla. Further investigations led them to believe that CR is the rearmost,

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Flow Chart 1: Evolution of occlusion



uppermost, and middlemost position of condyles in the glenoid fossa.

The gnathological concept believes in concentricity of CR and maximum intercuspation coinciding with CR. The treatment of patients with worn-out dentition starts with the cast metal provisional restorations. Mutually protected occlusal scheme with point-centric concept is used in this philosophy. Cast metal provisionals have limitations related to cost, inability to increase the OVD, and change in mandibular position that cannot be equilibrated easily to a newer position.⁵

D'Amico⁶ suggested the concept of canine guidance as a part of mutually protected occlusion where anterior teeth protect the posterior teeth in excursions, and posterior teeth protect the anterior teeth in maximum intercuspation. In canine guidance concept, maxillary canine serve to guide the mandible during eccentric movements, thus preventing off axis forces on other teeth.

The development of OVD is due to growth of maxilla and mandible along with eruption of teeth and growth of alveolus. Desjardins⁷ noted that vertical dimension of rest and occlusions are some of the most difficult positions to record. Thompson⁸ and Dawson⁹ advocated that OVD can never be lost; it is compensated by alveolar bone expansion, muscle action, and tooth eruption. Muscles tend to restore the OVD to its original level by tooth intrusion or extrusion.

Schuler described the concept of "freedom from centric" considering CR as biological area rather than a point. Dawson⁹ used the term "long centric" for the same and said that it is rarely more than 0.5 mm.

Becker and Kaiser¹⁰ had given the concept of biological occlusion to maintain the health and function of stomatognathic system. According to this concept, there should be no interferences between centric occlusion and CR, no balancing contacts, cusp to fossa occlusal scheme, cuspid protected or group function occlusion, no contacts in posteriors during protrusion, no cross tooth balancing contacts, and elimination of all possible fremitus.

A simplified occlusal design was given by Wiskot and Belser¹¹ based on the philosophy that in natural dentition, occlusal contacts are few and not ideally placed. According to them, one occlusal contact per tooth usually a cusp–fossa relation is sufficient instead of a tripod contact, all interproximal contacts should be proper and tight as they stabilize the tooth mesiodistally, anterior disocclusion mechanics should be applied so that posteriors do not experience any interference on lateral excursive movements, and anteroposterior freedom of movement should be provided which is achieved by having concave internal slopes on the cusps of posterior teeth.

One of the most practical and organized philosophies is originally organized into a workable concept by Dr LD Pankey utilizing the principles of occlusion espoused by Dr Clyde Schuyler.^{12,13} This philosophy is based on spherical theory of occlusion by Monson and functionally generated path (FGP) technique described by Meyer in 1933.¹⁴

The Pankey-Mann-Schuyler (PMS) philosophy aims at achieving the following principles of occlusion advocated by Schuyler:

- Maximum number of contacts on posterior teeth in CR.
- Posterior teeth disocclusion during protrusion.
- Functionally harmonious anterior guidance.
- Absence of interferences on the nonworking side during lateral excursions.
- Group function occlusion on the working side during lateral excursions.

In order to accomplish these goals, the sequence advocated by the PMS philosophy¹⁵ is as follows:

- *Part I:* Examination, diagnosis, treatment planning, prognosis.
- *Part II:* Harmonization of the anterior guidance for best possible function, esthetics, and comfort.
- *Part III:* Restoration of the mandibular posterior occlusion after selecting an acceptable occlusal plane so that

it will not interfere with condylar guidance and is in harmony with anterior guidance.

- *Part IV:* Restoration of maxillary posterior occlusion so that it is in harmony with anterior and condylar guidance. The FGP is an important aspect of this technique and is often considered a part of it.

Early gnathological concepts focused primarily on the condylar path and it was believed that anterior guidance was independent of the condylar path. However, Hobo and Takayama¹⁶ in their study revealed that anterior guidance influenced the working condylar path and concluded that they were dependent factors. This technique utilizes two different customized incisal guide tables. First table is fabricated with only the posterior segments and the second table is fabricated with the anterior and the posterior segments.

First table is to achieve uniform contacts in the posterior restoration, termed as the incisal guide table disocclusion. Next, another customized incisal guide table is made when the articulator is placed in a position to simulate the border movements by placing 3 mm plastic separators behind the condylar elements. This is termed as the incisal guide table with disocclusion.¹⁶⁻¹⁹

- *Stage I:* The sagittal condylar path inclination 25°; Bennett angle 15°; sagittal inclination of the incisal guide table 25°; and the lateral wing angle 10°. The anterior segments of the maxillary and mandibular casts are removed using dowel pins and the cast are adjusted, so they do not disocclude during eccentric movements. Wax the occlusal morphology of the posterior teeth, so that the maxillary and the mandibular teeth contact during eccentric movements (balanced articulation).
- *Stage II:* The sagittal condylar path inclination 40°; Bennett angle 15°; sagittal inclination of the incisal guide table 45°, and the lateral wing angle 20°. The anterior segment of the maxillary and the mandibular cast is replaced. Wax the palatal contours of the maxillary anterior teeth so that the incisors contact during protrusive movement and the canines on the working side contact during the lateral movement. Anterior guidance is established and disocclusion is produced.

Occlusal schemes were also formulated for oral rehabilitation in patients with periodontal diseases. The concepts of Nyman and Lindhe²⁰ and Youdelis²¹ are the most popular among them (Table 1).

According to the scheme of Nyman and Lindhe²⁰, even contact should be provided in the intercuspal position, although no great emphasis is placed upon the type of contacts. When distal support is present, anterior disocclusion should be provided. When there are long tooth-borne cantilevered restorations, aim is to achieve simultaneous working and nonworking side contacts on the cantilever as in balanced occlusion. Supragingival margin placement is advised in this concept.

Table 1: Salient features of popular occlusal concepts in full mouth rehabilitation

Occlusal philosophy	Salient features
Gnathological concept	Bilateral balanced occlusion Point centric Tripod contacts
Pankey-Mann-Schuyler concept	Group function occlusion Absence of nonworking contacts Freedom from centric Functionally generated path technique
Hobo concept	Two customized incisal tables Fixed articulator values for condition 1 and 2 No need to record condylar path suitable for temporomandibular joint disorder patients
Biological occlusion concept	No balancing contacts Cusp to fossa occlusal scheme Cuspid protected or group function occlusion No contacts in posteriors during protrusion No cross tooth balancing contacts Elimination of fremitus
Youdelis concept	Posterior group function, if canine disocclusion is lost
Nyman and Lindhe concept	Cantilevers-balanced occlusion Distal support—anterior disocclusion Supragingival margin placement

The aim of Youdelis concept²¹ was to achieve simultaneous interocclusal contact of posterior teeth in CR position (usually coincident with intercuspal position) with forces directed axially. Anterior disocclusion is provided for protrusive excursions and canine disocclusion for lateral excursions.

DISCUSSION

Rehabilitation of occlusal form and function is the primary goal of full-mouth rehabilitation. Thorough examination, diagnosis, and choice of appropriate occlusal scheme are the key to successful prosthodontic rehabilitation.

Initially bilateral balanced occlusal scheme, which is mainly used for complete denture, was used by McCollum, Schuyler,²² and others. Schuyler²³ supported balanced occlusion during his early clinical years but later began to observe clinical failures.

Similar failures were observed by Stuart² due to unequal wear of the buccal and lingual cusps causing deflective occlusal contacts with a loss of centric-related closure, causing patients to bite their cheeks and tongue.

The PMS system is a very flexible concept. According to Dawson,⁹ the most impressive advantage of PMS philosophy is the latitude it permits. The advantages of this concept include incorporation of freedom from centric,

no need for preparing or rebuilding all the teeth at a time, a well-organized procedure, all posterior occlusal contours are programmed in harmony with both condylar border movements and a perfected anterior guidance, and there is no need for any specific instrument unlike Hobo technique.²⁴

The limitations of this technique include use of FGP technique which utilizes wax, so there is great potential to cause errors. This technique cannot be used in periodontally weak dentition as FGP cannot be accurately recorded.²⁵

The incorporation of posterior disocclusion that avoids harmful lateral forces was suggested by Hobo technique. In the twin-stage procedure, as cusp angle was the main determinant of occlusion, the need to record condylar path was not necessary. Therefore, complicated instruments, such as the pantograph and fully adjustable articulators are not required. This procedure is much simpler than the standard gnathological procedure, yet it follows gnathological principles.²⁵

However, if the sagittal condylar path of the patient is steeper than the articulator adjustment values (40°), disocclusion increases. If the path is less than 40°, then the amount of disocclusion decreases. If the patient has less than 16° (only about an 8% occurrence rate), cuspal interferences will occur.

If the incisal path is more than 5° steeper than the condylar path, patients complain of discomfort.¹⁷⁻¹⁸

CONCLUSION

Occlusal rehabilitation is a radical procedure and should be carried out in accordance with the dentist's choice of treatment based on his knowledge of various philosophies followed and clinical skills. Further scientific research and systematic reviews are needed to validate occlusal treatment theories. Ultimately, the clinician must evaluate and assess the literature along with individual clinical experiences.

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