



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2023; 9(2): 282-291
© 2023 IJADS
www.oraljournal.com
Received: 20-02-2023
Accepted: 28-03-2023

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An appraisal on occlusal concepts and classifications of full mouth rehabilitation: A systematic review

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DOI: <https://doi.org/10.22271/oral.2023.v9.i2d.1741>

Abstract

Aim: The review would aim to provide an appraisal of the current understanding of occlusal concepts and their classification in relation to full mouth rehabilitation.

Settings and Design: Systematic review following PRISMA guidelines.

Materials and Methods: Two researchers looked through the first search results to weed out duplicates and studies that weren't pertinent to the research issue. When choosing the publications, the titles and abstracts were examined to find the pertinent studies. The full versions of these studies were then retrieved, and the third investigator evaluated them for inclusion and exclusion criteria. Additionally noted were the explanations for studies' exclusion. Finally, the studies that were chosen were those that provided answers to the review's queries.

Age, gender, cause of occlusal wear, T&M classification of the clinical condition, applied occlusal scheme, practical applicability of the philosophy, assessment of vertical dimension of occlusion, treatment outcome, and patient comfort are the variables taken into account for the study.

Statistical Analysis Used: Qualitative analysis.

Results: A total of 1143 studies were found which were screened and assessed for eligibility. Out of these 36 articles were full text articles. Of these 17 studies did not meet the eligibility criteria since they failed to mention the occlusal concept incorporated in full mouth rehabilitation procedure.

Out of 19 included studies, 10 were Studies with Full mouth occlusal rehabilitation using Hobo's twin stage technique, 8 were studies Included Studies with Full mouth occlusal rehabilitation using Pankeymann-Schuyler philosophy and only 1 study was Full mouth occlusal rehabilitation using other techniques. All the included studies were case reports; except one study, which was Case series.

Conclusion: Efforts must be made to create a harmonious occlusal interface by accurately diagnosing the cause of disorders and making intra-oral alterations. The Turner & Misserlian categorization shows most cases to be category 1, treated with the canine-guided occlusal concept using the HOBBO twin-stage philosophy. This method simplifies the procedure without sacrificing accuracy.

Keywords: Incomplete rhizogenesis, MTA, enamel hypoplasia, apical sealing

Introduction

In addition to speech and mastication, prosthodontics deals with the treatment and correction of abnormalities by giving the patient a beautiful appearance ^[1]. One of the most distinctive dental treatments for issues related to dentinal hypersensitivity, aesthetic corrections, loss in vertical dimension, and problems in the temporomandibular joint is full mouth rehabilitation. This is among the various prosthodontic procedures that include replacing missing teeth with removable or fixed prosthesis, maxillofacial reconstruction, and dental implantology ^[2]. Stable occlusion, which is dependent on the established occlusal concept and functional harmony between the components of the hard and soft tissues, is the most important component in the success of full mouth rehabilitation ^[3].

The occlusal surfaces of teeth will gradually lose some of their shine throughout the course of a patient's lifetime. Dental attrition leads to occlusal wear, which is a typical clinical finding ^[4]. The amount of wear that takes place is related to factors such as bruxism, diet, tooth composition, exposure to various chemical agents, loss of posterior support and opposing restorations.

However, excessive tooth material loss can lead to occlusal dysfunction, aesthetic disfigurement, impaired function, and eventually mental distress. In the prosthodontic community, there is growing interest in the control of tooth wear. This calls for complete mouth rehabilitation, which transforms all of the detrimental forces on the teeth—which invariably result in pathologic situations—into beneficial forces that allow normal function and, in turn, result in healthy conditions and improve the quality of life [5].

Turner and Misserlian categorization, introduced by them in 1984, is the one that is used the most frequently [6]. The clinician must decide on the occlusal approach and then select a suitable occlusal concept after assessing and categorizing the patient's current clinical situation but before beginning the reconstructive procedure [3].

The best occlusal concept to use during full mouth rehabilitation has been sought after in order to restore the occlusal surfaces of teeth as well as to ensure optimal muscle and joint function. In order to restore the dentition using fixed prosthodontics, numerous theories and methods have been considered up to this point [3].

The PMS technique is based on the functionally generated path technique and the spherical theory of occlusion [7]. Cusp angle is a key factor in the Hobo Twin-tables Technique for determining occlusion. It was feasible to determine the standard amount of discussion by using the standard cusp angle [8]. To replicate the usual level of discussion, different adjustment values of an articulator were established for each occlusal scheme.

A prosthodontist's responsibility of planning and carrying out the restorative rehabilitation of a destroyed occlusion is arguably one of the most conceptually and technically challenging ones [9]. Occlusal wear is very well measured by classifications in complete mouth rehabilitation. Therefore, a crucial step in the prosthetic rehabilitation of a patient with mutilated dentition is the selection of occlusal concept in accordance with classification.

Occlusal principles such as bilateral balanced occlusion (BBO), group function/unilateral balanced occlusion (GF), and mutually protected occlusion are all used in full mouth rehabilitation. Occlusal concepts are diversified and continuously changing over time, so there is a state of uncertainty as to which occlusal concept can be incorporated which would be clinically efficient, practical, feasible that will ensure patient's comfort and satisfaction thereby resulting in enhance quality of life.

Numerous studies, primarily literature reviews evaluating occlusal concepts of full mouth rehabilitation, have been conducted. However, a much more structured approach is required because the conventional literature review lacks a formal or repeatable method of estimating the effect of a treatment, including the size and precision of the estimate. With this "systematic review," we hope to present a thorough, objective synthesis of pertinent studies in a single work.

This systematic review's main goal is to evaluate the body of knowledge, including original publications and case studies, on occlusal principles and classifications in full mouth rehabilitation. This will make it easier to choose an acceptable occlusal concept for a particular type of person.

Methodology

1. Protocol and registration

The current systematic review was carried out using the PRISMA declarations' transparent reporting standards for systematic reviews and meta analyses. The protocol is

registered on Prospero.

2. Focus Question

The focus question was established to address precisely the purpose of this systematic review. PICO was formulated for qualitative analysis of systematic review. The question format was exhibited as 'what is the ideal occlusal scheme that can be applied in full mouth rehabilitation?'

P (Population): male and female irrespective of age with worn out dentition through required/developmental anomaly treated by full mouth rehabilitation

I (Intervention): occlusal concepts

C (comparison): canine protected occlusion and group function occlusion

O (outcome): efficacy and comfort of the occlusal scheme in final restoration

Eligibility criteria

Table 1: Criteria for inclusion and exclusion

Inclusion criteria	
■	Time period from 2010 to 2020
■	Fixed prosthesis
■	Occlusal concept and philosophy applied specified
Exclusion criteria	
■	Removable prosthesis
■	Implant supported prosthesis

4. Information sources

A lookup of relevant studies using electronic databases including PubMed, MEDLINE, EMBASE, CINHALL, Web of Science, Research Gate, Ebscohost, and the Cochrane library

5. Literature search

Search terms used were, full mouth rehabilitation; occlusion; philosophies of FMR; PMS; PM instrument; Hobo philosophy; Hobo twin table technique; Hobo twin stage technique; oral rehabilitation; occlusal rehabilitation; implant occlusion; worn out dentition; T&M classification.

6. Study selection

Two clinicians and one methodologist worked separately on this systematic review in a blinded, standardised manner to remove any potential for bias. There were no differences of opinion among the reviewers. The systematic review comprised original research articles, case reports, and case series.

7. Data collection process and data items

Two researchers looked through the first search results to weed out duplicates and studies that weren't pertinent to the research issue. When choosing the publications, the titles and abstracts were examined to find the pertinent studies. The full versions of these studies were then retrieved, and the third investigator evaluated them for inclusion and exclusion criteria. Additionally noted were the explanations for studies' exclusion. Finally, the studies that were chosen were those that provided answers to the review's queries.

Age, gender, cause of occlusal wear, T&M classification of the clinical condition, applied occlusal scheme, practical applicability of the philosophy, assessment of vertical dimension of occlusion, treatment outcome, and patient comfort are the variables taken into account for the study.

8. Assessment of risk of bias

Utilising the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Case Reports (2017), the risk of bias was evaluated independently for studies involving whole mouth occlusal rehabilitation utilising Hobo's twin stage technique and full mouth occlusal rehabilitation using Pankeymann-Schuyler philosophy.

9. Synthesis of result

To assess the outcome and characteristics of included studies, the data taken from the included study were collated and organised into tables.

10. Statistical analysis

Meta-analysis may not be viable with the available data and may perhaps be more detrimental than beneficial. The variety of the current studies renders the meta-analysis useless. Real differences in effect might be hidden. There are a variety of different comparators being compared, and the combination of them may need to be taken into consideration independently. If there is bias in any (or all) of the individual studies, the inaccuracies will only be exacerbated by the meta-analysis, which will result in an incorrect conclusion that may appear more credible.

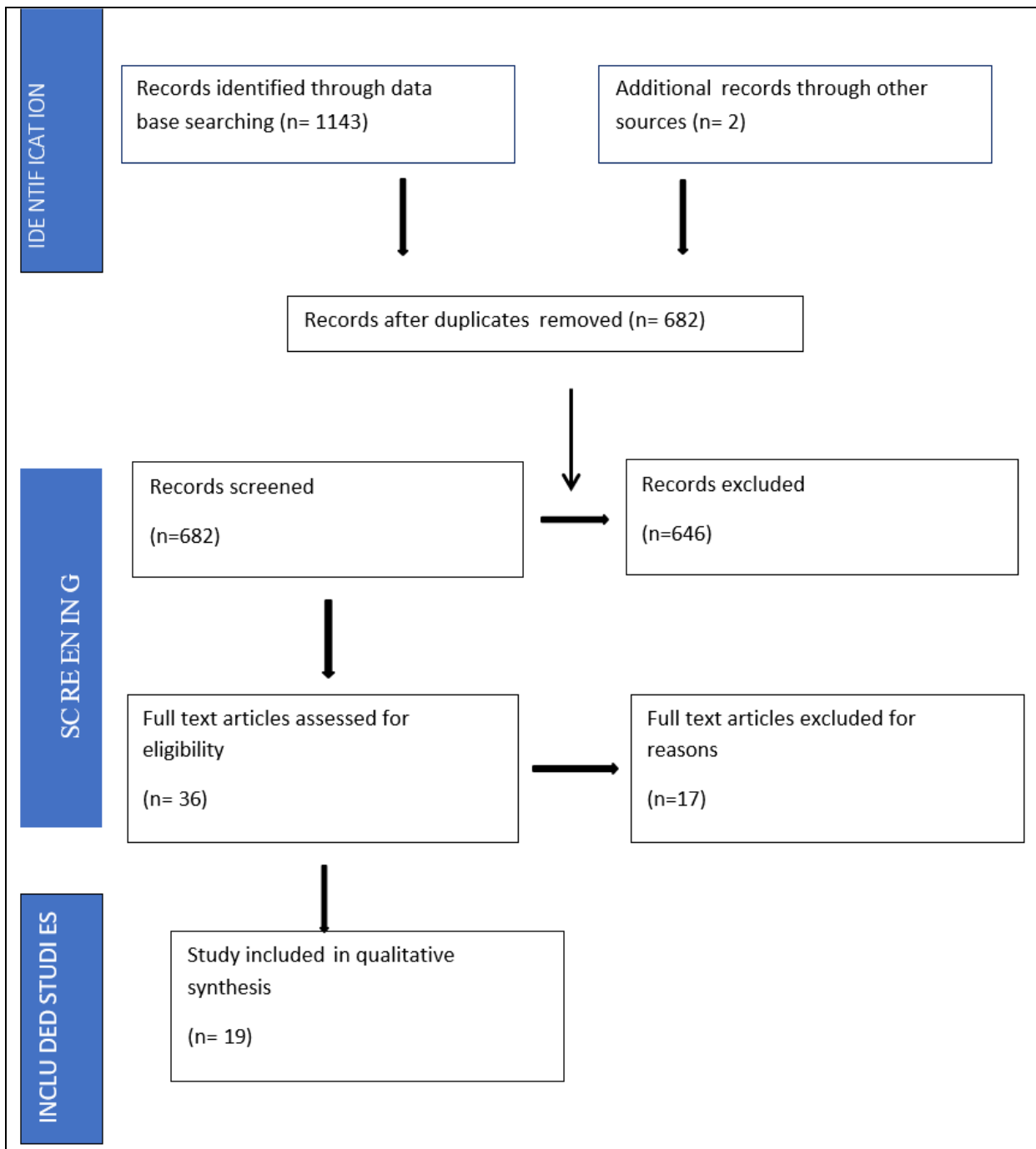


Fig 1: PRISMA flow diagram for new systematic reviews which included searches of databases

Table 2: Included Studies with Full mouth occlusal rehabilitation using Hobo's twin stage technique

Sr. No	Author	Year	Sample size	Age and gender	Clinical condition	Appliance / treatment used	Occlusal scheme	Other factors studied	Conclusion
1.	Kar AK <i>et al.</i> [10]	2010	1	25/M	Mild-to- moderate generalized attrition of dentition with moderate loss of vertical dimension.	Hobo and Takayama twin stage procedure	Canine guided occlusion	Condylar path and guidance	The final prosthesis with this twin-stage technique ensured a restoration with a predictable posterior discussion and anterior guidance in harmony with the condylar path.
2.	Shetty <i>et al.</i> [11]	2012	1	55/M	Excessive wear	Hobo's twin stage technique	Canine guided occlusion	Condylar path and guidance	The cusp angle and the anterior guidance are more important determinants to achieve discussion and use of an average angulation of the horizontal condylar guidance can be successfully used to achieve a mutually protected occlusion.
3.	Anulekha Avinash CK <i>et al.</i> [12]	2014	1	55/M	Severely worn out dentition	Hobo's Twin-stage procedure was adopted to produce a definite amount of disocclusion during eccentric movements.	Group function	none	Choice of selecting the method for rehabilitation of the occlusion is case specific, with respect to operator convenience and clinical skills.
4.	Verma K <i>et al.</i> [13]	2015	1	58/M	Severe attrition and Abrasion	Twin stage procedure	Canine guided	none	Reorganization of occlusion should be done only when it is necessary.
5.	Baneerji <i>et al.</i> [14]	2016	1	30/F	Generalized attrition	Hobo & Takayama's Twin Stage technique	Group function	none	Restoring the optimal oral health of this patient utilizing twin stage technique resulted into a very satisfied and happy patient.
6.	Chouksey V <i>et al.</i> [15]	2017	1	52/M	Severely worn out dentition	Hobo twin- stage occlusal philosophy using HANAU wide-Vue semiadjustable articulator	Canine guided occlusion	Vertical dimension	The technique is relatively simpler and does not need any sophisticated armamentarium. This technique can be easily adopted by clinicians to achieve more predictable outcomes
7.	Kalra A <i>et al.</i> [16]	2019	1	45/M	Severe attrition	Hobo's twin-stage approach with porcelain-fused-to-metal crowns on all maxillary and mandibular teeth.	Canine guided occlusion	None	For doing the full-mouth rehabilitation treatment, all the imperfections in bite position should be removed, and the mandible should be seated in centric relation.
8.	Maharjan A <i>et al.</i> [17]	2019	1	56/M	Severely worn dentition	Hobo's techniques and Pankey Mann Schuyler's philosophy	Canine guided occlusion	Vertical dimension	The twin stage technique formulated by Hobo and Takayama reproduces disocclusion and anterior guidance more precisely and scientifically.
9.	Ezzy H <i>et al.</i> [18]	2019	2	72/M, 54/F	Severe or excessive wear	Phase-by- phase treatment using Hobo Twin-stage procedure.	Canine guided occlusion	Vertical dimension	The maintenance of severe wear cases can be ensured by the development of proper cuspal angulation and anterior guidance that allows for posterior disocclusion within the patient's envelope of function.
10.	Deva Meena S <i>et al.</i>	2020	1	45/M	Attrited dentition	Hobo's technique using Hanau- Wide-Vue- II articulator	Canine guided occlusion	Vertical dimension	Full mouth rehab with increased VD is challenging. Simplified clinical procedures yielded better results

Table 3: Included Studies with Full mouth occlusal rehabilitation using Pankeymann- Schuyler philosophy

Sr. No	Author	Year	Sample size	Age and gender	Clinical condition	Appliance / treatment used	Occlusal scheme	Other factors studied	Conclusion
1.	Chauhan C <i>et al.</i> ^[19]	2012	1	48/ M	Wear facets because of severe worn-out teeth	Pankey Mann- Schuyler philosophy	Group function	Vertical dimension	Full mouth rehabilitation by Pankey Mann- Schuyler philosophy is successful approach. Patient was satisfied with esthetic and masticatory efficiency.
2.	Mete J <i>et al.</i> ^[20]	2012	1	27/F	severe attritional wear with very short clinical crown heights	Pankey– Mann– Schuyler philosophy of complete occlusal rehabilitation.	Canine guided	None	Treatment not only restored function and esthetic, but also showed a positive psychological impact and thereby improved perceived quality of life
3.	Vaibhav D <i>et al.</i> ^[21]	2014	1	32/ M	severely worn out dentition due to amelogenesis imperfecta	Pankey Mann Schuyler philosophy of full mouth rehabilitation	Group function	None	Use of prosthodontic principles and strategic planning in addition to a multidisciplinary approach in managing a patient of AI.
4.	Vyshnavi Ch <i>et al.</i>	2016	1	55/ M	severely attrited	Pankey Mann Schuyler technique and functional ly generated pathway	Group function	Vertical dimension	Choice of philosophy followed is depended on the case selected, operator knowledge and skills.
5.	Qahhar A <i>et al.</i> ^[22]	2016	1	53/M	generalize d attrition	Full mouth porcelain fused to metal crowns and custom post and core for maxillary anterior PMS	Canine guided	Vertical dimension	A positive psycho-social changes were conveyed by patient's family and colleagues.
6.	Kaushik K <i>et al.</i> ^[23]	2018	1	48/F	Attrition of teeth	Pankey mann schuyler Technique Ue & Broadrick flag method	Canine guided	Vertical dimension	Several techniques of full mouth rehabilitations are available and a clinician should ascribe to one after a comprehensive diagnosis of the patient's clinical condition
7.	Zinzala B <i>et al.</i> ^[24]	2017	1	48/ M	sensitivity of anterior teeth and teeth wear	Pankey- Mann- Schuyler philosophy	Canine guided occlusion	Vertical dimension	Pankey Mann Schuyler's technique is most effective technique for full mouth rehabilitation
8.	Thimmaiah M ^[25]	2018	1	21/ M	Enamel hypoplasia	Pankey Mann Schuyler's technique of full mouth rehabilitation.	Canine guided	none	Pankey Mann Schuyler's technique is employed as it is the most reliable technique with the ease of fabrication.

Results

A total of 1143 studies were found which were screened and assessed for eligibility. Out of these 36 articles were full text articles. Of these 17 studies did not meet the eligibility criteria since they failed to mention the occlusal concept incorporated in full mouth rehabilitation procedure. Out of 19 included studies, 10 were Studies with Full mouth occlusal rehabilitation using Hobo’s twin stage technique, 8 were studies Included Studies with Full mouth occlusal rehabilitation using Pankeymann-Schuyler philosophy and only 1 study was Full mouth occlusal rehabilitation using other techniques. All the included studies were case reports; except one study, which was Case series. Table 2 and 3 summarizes the included studies with the applied occlusal concept.

performed. Out of 19 included studies, 10 were Studies with Full mouth occlusal rehabilitation using Hobo’s twin stage technique, 8 were studies with Full mouth occlusal rehabilitation using Pankeymann- Schuyler philosophy and only 1 study was Full mouth occlusal rehabilitation using other techniques. All the included studies were case reports; except one study, which was Case series.

Risk of Bias assessment was done using Joanna Briggs Institute (JBI) Critical appraisal checklist for Case reports (2017); separately for studies with Full mouth occlusal rehabilitation using Hobo’s twin stage technique and Full mouth occlusal rehabilitation using Pankeymann- Schuyler philosophy. The checklist included different items; which were presented as Figures showing low, unclear or high risk of bias and not just in the form of checklist table.

Assessment of risk of bias

Risk of bias assessment of all the included studies was

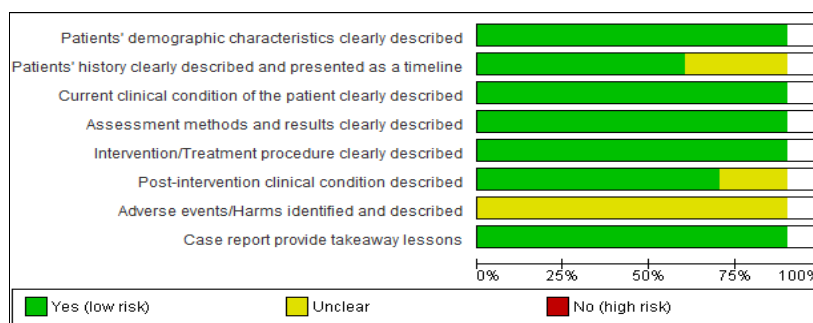


Fig 1: Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies with Hobo’s twin stage technique

	Patients' demographic characteristics clearly described	Patients' history clearly described and presented as a timeline	Current clinical condition of the patient clearly described	Assessment methods and results clearly described	Intervention/Treatment procedure clearly described	Post-intervention clinical condition described	Adverse events/Harms identified and described	Case report provide takeaway lessons
Avinash CK et al	+	+	+	+	+	+	?	+
Choukse V et al	+	+	+	+	+	+	?	+
Devameena S et al	+	+	+	+	+	+	?	+
Ezzy H et al	+	+	+	+	+	+	?	+
Kalra A et al	+	?	+	+	+	+	?	+
Kar A et al	+	?	+	+	+	?	?	+
Mahrajan A et al	+	+	+	+	+	+	?	+
Mohindra R et al	+	+	+	+	+	+	?	+
Shetty et al	+	+	+	+	+	+	?	+
Verma K et al	+	?	+	+	+	?	?	+

Fig 2: Risk of bias summary: review authors' judgements about each risk of bias item for each included in-vivo study with Hobo’s twin stage technique

For with Full mouth occlusal rehabilitation using Hobo’s twin stage technique

Risk of Bias assessment: Joanna Briggs Institute (JBI) Critical appraisal checklist for Case reports (2017).

The above graph is the risk of bias graph for all included studies with Hobo’s twin stage technique. The quality assessment shows overall low risk of bias for majority of the domains; whereas only one domain; adverse events/harms

showed unclear bias, as many of the studies did not mention the same. The risk of bias summary shows that the majority of the studies show low risk of bias in all the domains assessed. About 3 studies showed unclear risk of bias for adverse events/harms reported. Thus, it can be interpreted that almost all the studies included showed overall low risk of bias.

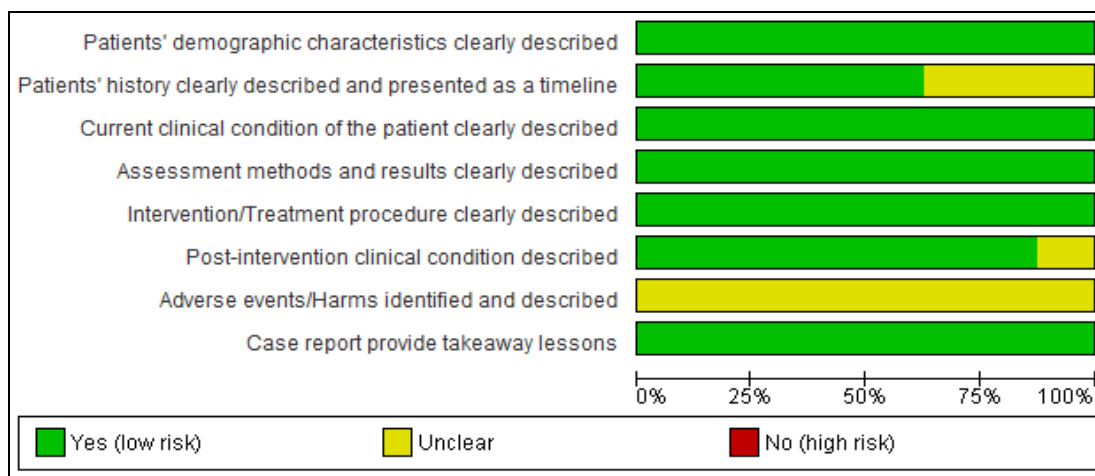


Fig 3: Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies with Pankey Mann- Schuyler philosophy

	Patients' demographic characteristics clearly described	Patients' history clearly described and presented as a timeline	Current clinical condition of the patient clearly described	Assessment methods and results clearly described	Intervention/Treatment procedure clearly described	Post-intervention clinical condition described	Adverse events/Harms identified and described	Case report provide takeaway lessons
Chauhan C et al	+	+	+	+	+	+	?	+
Kaushik K et al	+	+	+	+	+	+	?	+
Mete J et al	+	+	+	+	+	?	?	+
Qahhar A et al	+	+	+	+	+	+	?	+
Rajesh P et al	+	?	+	+	+	+	?	+
Thimmaiah M et al	+	?	+	+	+	+	?	+
Vyshnavi Ch et al	+	?	+	+	+	+	?	+
Zinzala B et al	+	+	+	+	+	+	?	+

Fig 4: Risk of bias summary: review authors' judgements about each risk of bias item for each included study with Pankey Mann- Schuyler philosophy

For Full mouth occlusal rehabilitation using Pankeymann- Schuyler philosophy

Risk of Bias assessment: Joanna Briggs Institute (JBI) Critical appraisal checklist for Case reports (2017)

The above graph is the risk of bias graph for all included included studies with Pankey Mann- Schuyler philosophy. The quality assessment shows overall low risk of bias for majority of the domains; whereas only one domain; adverse events/harms showed unclear bias, as many of the studies did not mention the same. The risk of bias summary shows that majority of the studies depict low risk of bias in almost all the domains. Only unclear bias is noted with respect to adverse events/harms. Thus, it can be interpreted that the included in vivo studies show overall low to moderate risk of bias.

Discussion

A prosthodontist's competence and abilities have been tested by the difficulty of reconstructing a severely attrited dentition.^[26] In order to recognise the necessity for the restoration and create a thorough treatment plan, the diagnostic information, which includes the occlusal vertical dimension, is evaluated. In order to assess the severity of the current disease and to develop a comprehensive treatment plan, the purpose necessitates a classification. In order to discuss a case with the expert and employ a specific occlusal concept for rehabilitation, it is helpful to categorise worn-out teeth^[5]. Understanding their historical development and proper application are necessary for a critical evaluation of the material that is now accessible on occlusal philosophies of full mouth rehabilitation. Therefore, this systematic review was carried out to assist the clinician in selecting an appropriate occlusal concept to handle a specific T&M classification.

A systematic review is an examination of a well-defined subject that use standardised and repeatable techniques to locate, pick, and evaluate all pertinent research as well as to gather and analyse data from the studies that are included in the review. The superior characteristics of the methodology employed to conduct the review have elevated systematic review to a high position in the hierarchy of evidence. The superior characteristics of the methodology employed to conduct reviews have elevated systematic review to a high position in the hierarchy of evidence.

A total of 36 published studies were gathered for this systematic review. only 19 of which were picked after the first hit. The remaining 17 articles were left out because they employed broad occlusal repair principles rather than any explicit occlusal plan. Finally, 18 case reports and 1 case series were among the 19 selected papers. Higher levels of evidence, like randomised control trials, aren't available for this subject, though.

Statistical assessment of case reports revealed that 14 out of 19 cases established canine guided occlusal concept for lateral excursion and 5 cases presented with group function occlusion.

Out of 19 included studies, 8 cases were treated with Pankey Mann Schuyler technique. But 5 out of 8 cases applied canine guided occlusal scheme for lateral excursive movements. Though the philosophy advocates group function occlusion, most of the clinicians prefer canine guided occlusal scheme as it is more superior and reduces lateral stresses. Most of the cases that followed this philosophy had loss of vertical dimension of occlusion which was raised through occlusal splint. Vertical dimension was assessed through esthetics, phonetic and inter occlusal records. There has never been a

method for measuring a patient's vertical dimension that is accurate, practical, and based on science. Traditional methods, such as phonetics, interocclusal distance, cephalometrics, electromyography, and patient's neuromuscular perception, have been employed to estimate the vertical dimension of occlusion. PM instruments weren't applied in any of the situations. Many operators preferred Broad rick flag analyzer over PM instrument because it is a more streamlined version of the latter. Out of total 8 cases treated with Pankey Mann Schuyler technique, 6 cases fall into category 1 of Turner and Misserlian classification. The majority of case reports include male patients in the wide age range of 18 to 75 years. This age difference may result from pathologic wear in the older age group and changed morphology in the younger age group.

Similar to Schuyler, Hobo and Takayama found that anterior guidance and condylar guidance were dependent, rather than independent, factors.²⁷ Instead of adhering to the PMS concept, which states that group function is achieved on the working side, they believed in posterior disclusion in eccentric motions. Freedom was not a part of centric. Condylar route was not required to be recorded throughout the twin-stage process because cusp angle served as the primary indicator of occlusion. As a result, sophisticated tools like the pantograph and completely adjustable articulators are not necessary. Although much less complicated than the typical gnathological procedure, this procedure still adheres to gnathological principles.

Out of total 19 included studies, only 1 study by Agrawal *et al.* used HOBOS twin table technique. In this case, canine guided occlusal scheme was established. Ten studies out of 19 included studies were treated with HOBOS twin stage technique. 8 out of 10 case reports treated by HOBOS twin stage applied mutually protected occlusion with canine guidance as their occlusal scheme. The 10 case reports which included 11 patients had 9 patients in category 1 of Turner and Misserlian classification. One under category 2 and one fell under category 3, both were given canine guided occlusal scheme.

In all out of 19 included studies, 14 studies used canine guidance on lateral excursion and mutually protected occlusion irrespective of the philosophy adapted. Because it is simpler to establish, acceptable, and lessens lateral interferences and stress on posterior teeth, canine guided occlusion is regarded as superior. Canines have lengthy roots, solid, compact bones, and the least amount of muscular activity when they're working. 10 out of 19 studies used HOBOS twin stage philosophy. Out of total 20 patients included in 19 studies, 15 of them are classified into category 1 of Turner and Misserlian classification. In these 15 patients only 4 were given group function occlusal scheme, 11 of them had canine guided occlusal scheme.

Because each occlusal concept is based on distinct principles, it is impossible to comment on the treatment outcome or success rate of any one of them. Although several papers could be included in the systematic review, absence of randomized control trials on the subject appears to be the main reason there are still limitation of existing evidence. Further research on clinical trials and randomized control trial on occlusal concepts needs to be carried out. While new technology and computerization can make procedures more consistent, labor-intensive, and efficient, they cannot take the place of education, real-world experience, clinical judgement, or technical expertise.

Limitations

The study presented a comprehensive review of occlusal concepts and classifications involved in full mouth rehabilitation. The study presented the review of published articles in recent period. Some clinicians may have been implementing certain occlusal concepts successfully but might not be publishing their reports. The information in non-English literature may also have been missed. This review summarizes the occlusal concepts and classification for fixed restoration, we further intend to perform a quality review of all the cases that have been rehabilitated including removable and implant supported as well.

Conclusion

All functional factors are interrelated, universal treatment principles apply, and every effort should be made to create an occlusal interface that allows the periodontium of teeth, muscles of mastication, and TMJs to work harmoniously together. This calls for an accurate diagnosis of the cause of the disorder, intra-oral alterations, and other detrimental impacts on jaw relations.

Turner & Misserlian categorization is the one used in literature the most frequently, and category number one was where the greatest number of cases were identified. Furthermore, the vast majority of cases demonstrated the superiority of the canine guided occlusal concept, which lessens lateral interferences and stresses on posterior teeth. Most category 1 patients were handled using the HOB0 twin stage philosophy, which is based on the canine guided occlusal approach.

Condylar path measurement is not required, making complex devices like the pantograph and fully adjustable articulator superfluous. Because of this, the Twin-Stage method is significantly easier to do than the traditional gnathological procedure while still adhering to gnathological principles. This treatment is simple to combine with widely utilised clinical techniques including cusp-fossa waxing, facebow transfer, and numerous centric recording techniques. In conclusion, the Twin- Stage Procedure is regarded as being very trustworthy and accurately and scientifically reproducing anterior and posterior disocclusion.

Conflict of Interest

Not available

Financial Support

Not available

References

1. Functionally Generated Pathway to Harmonise Occlusion in Full Mouth Rehabilitation Vyshnavi Ch1, Taruna M2, Sudhir N3, Chittaranjan B4.
2. Alshadidi AAF, Alshahrani AA, Aldosari LIN, Chaturvedi S, Saini RS, Hassan SAB, *et al.* Investigation on the Application of Artificial Intelligence in Prosthodontics. *Appl. Sci.* 2023;13(8):5004. <https://doi.org/10.3390/app13085004>
3. Tiwari B, Ladha K, Lalit A, Dwarakananda Naik B. Occlusal concepts in full mouth rehabilitation: an overview. *J Indian Prosthodont Soc.* 2014 Dec;14(4):344-51. Doi:10.1007/s13191-014-0374-y. Epub 2014 Jun 25. PMID: 25489156; PMCID: PMC4257939.
4. Thirumurthy VR, Bindhoo YA, Jacob SJ, Kurien A, Limson KS, Vidhiyasagar P. Diagnosis and management of occlusal wear: a case report. *J Indian Prosthodont Soc.* 2013 Sep;13(3):366-72. Doi: 10.1007/s13191-012-0173-2. Epub 2012 Oct 4. PMID: 24431762; PMCID: PMC3732697.
5. Thimmappa M, Katarya V, Parekh I. Philosophies of full mouth rehabilitation: A systematic review of clinical studies. *J Indian Prosthodont Soc.* 2021 Jan-Mar;21(1):19-27. Doi: 10.4103/jips.jips_397_19. PMID: 33835065; PMCID: PMC8061435.
6. Assessment of FMR patients based on turner and missirlian classification: A retrospective study 1Amit Kumar Singh, 2Revathi Duraisamy 1Graduate, Saveetha Dental College, Saveetha Institute of Medical and Tech
7. Dawson PE, editor. Evaluation, diagnosis, and treatment of occlusal problems. 2. St. Louis: Mosby; 1989. p. 265. [Google Scholar]
8. Hobo S, Takayama H. Twin-stage procedure. Part 1: A new method to reproduce precise eccentric occlusal relations. *Int J Periodontic Restor Dent.* 1997;17:113-123. [PubMed] [Google Scholar]
9. Praveen M, Chandrasekar A, Gautam A, Rathinam VJ, Saxena A. All in one: a case report. *J Indian Prosthodont Soc.* 2013 Dec;13(4):600-6. doi: 10.1007/s13191-012-0211-0. Epub 2013 Jan 1. PMID: 24431798; PMCID: PMC3792330.
10. Kar AK, Parkash H, Jain V. Full-mouth rehabilitation of a case of generalized enamel hypoplasia using a twin-stage procedure. *Contemp Clin Dent.* 2010 Apr;1(2):98-102. doi: 10.4103/0976-237X.68601. PMID: 22114392; PMCID: PMC3220095.
11. Shetty M, Joshi N, Prasad DK, Sood S. Complete rehabilitation of a patient with occlusal wear: a case report. *J Indian Prosthodont Soc.* 2012 Sep;12(3):191-7. doi: 10.1007/s13191-012-0131-z. Epub 2012 Jul 18. PMID: 23997471; PMCID: PMC3416936.
12. Avinash Ck A, B C, Charry N S, Reddy R, Jagini AS. Restoring the Lost Functional Harmony in a Mutilated Dentition using Hobo's Twin Stage Concept of Full Mouth Rehabilitation. *J Clin Diagn Res.* 2014 Sep;8(9):ZD21-3. doi: 10.7860/JCDR/2014/7982.4830. Epub 2014 Sep 20. PMID: 25386539; PMCID: PMC4225991.
13. Rani G, Gambhir A. Twin-stage technique for occlusal rehabilitation of a mutilated dentition – A case report. *J Oral Health Craniofac Sci.* 2020;5:006-010.
14. Banerjee S, Chakraborty N, Singh R, Gupta T. Full-mouth rehabilitation of a patient with severe attrition using the Hobo twin-stage procedure. *Contemp Clin Dent.* 2012 Jan;3(1):103-107. Doi: 10.4103/0976-237X.94558. Retraction in: *Contemp Clin Dent.* 2013 Jul;4(3):396. PMID: 22557909; PMCID: PMC3341744.
15. Full Mouth Rehabilitation using Hobo Twin-stage Technique International Journal of Preventive and Clinical Dental Research, October-December 2017;4(4):319-323-319. *IJPCDR Full Mouth Rehabilitation using Hobo Twin-stage Technique* 1 Vivek Choukse, 2 Ankita Parmar,3 Neeraj Sharma,4 Rajeev Srivastava
16. Kalra A, Sandhu HS, Sahoo NK, Nandi AK, Kalra S. Full-mouth rehabilitation using twin-stage technique. *Int J Oral Health Sci.* [serial online] 2019 [cited 2023 May 3];9:40-4. Available from: <https://www.ijohsjournal.org/text.asp?2019/9/1/40/258580>
17. Maharjan A, Joshi S, Verma A, Rimal U. Rehabilitation of Severely Attrited Teeth with Hobo Twin Stage

- Technique: A Case Report. JNMA J Nepal Med Assoc. 2019 Nov-Dec;57(220):453-456. doi: 10.31729/jnma.4745. PMID: 32335661; PMCID: PMC7580423.
18. Full-mouth Rehabilitation of Worn Dentition by Hobo Twin-stage Philosophy: A Case Series Huzaifa Ezzy, Amit Gaikwad², Sabita Ram³, Naisargi Shah⁴, Jyoti Nadgere⁵, Janani Iyer⁶
 19. Chauhan C, Shah V, Shah D, Doshi P. Full mouth rehabilitation in a case of severely attrited dentition-A case report. J Dent Med Sci. 2012;1:610-15. [Google Scholar]
 20. Mete JJ, Dange SP, Khalikar AN, Vaidya SP. Functional and esthetic rehabilitation of mutilated dentition associated with amelogenesis imperfecta. J Indian Prosthodont Soc. 2012;12(2):94-100. [PMC free article] [PubMed] [Google Scholar]
 21. Kamble VD, Parkhedkar RD. Multidisciplinary approach for restoring function and esthetics in a patient with amelogenesis imperfecta: A clinical report. J Clin Diagn Res. 2013 Dec;7(12):3083-5. doi:10.7860/JCDR/2013/6665.3860. Epub 2013 Dec 15. PMID: 24551735; PMCID: PMC3919324.
 22. A One Year Follow-Up of a Full Mouth Rehabilitation for Severly Attrited Dentition Mohammed Abdul Wahab Qahhar, Faisal M Alkhayrat, Bassam M Hakami.
 23. Kaushik K, Dhawan P, Madhukar P, Tandan P, Tomar SS, Mehta D. Full mouth rehabilitation of worn dentition using Pankey Mann Schuyler technique & Broadrick flag method A case report. Int J Adv Res. 2018;6(3):935-44. [Google Scholar]
 24. Zinzala B, Javiya P, Sethuraman R, Tiwari A, Rutvik P, Jain J. Functional and esthetic full mouth rehabilitation of a patient with severely worn dentition: A clinical report. Int J Oral Health Med Res. 2017;4:42-45. [Google Scholar]
 25. Thimmaiah M. Full mouth rehabilitation of a patient with enamel hypoplasia – A case report. Oral Health Case Rep. 2018;4:149. [Google Scholar]
 26. Song MY, Park JM, Park EJ. Full mouth rehabilitation of the patient with severely worn dentition: a case report. J Adv Prosthodont. 2010 Sep;2(3):106-10. doi: 10.4047/jap.2010.2.3.106. Epub 2010 Sep 30. PMID: 21165279; PMCID: PMC2994694.
 27. Concepts in full mouth rehabilitation: An overview 1H.Firdus Fareen, 2Annot Rhea

How to Cite This Article

A Mahajan, A Barabde, B Thombre, S Ambadkar, R Bele. An appraisal on occlusal concepts and classifications of full mouth rehabilitation: A systematic review. International Journal of Applied Dental Sciences. 2023;9(2):282-291.

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