



Journal Homepage: [-www.journalijar.com](http://www.journalijar.com)

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/11792
DOI URL: <http://dx.doi.org/10.21474/IJAR01/11792>



RESEARCH ARTICLE

INTEROCCLUSAL RECORDING MATERIALS: A LITERATURE REVIEW

Khera A.¹, Shankar D.², Bhalla V.³, Haque Wasim S.⁴, Bhattacharya S.⁵ and Shetty P⁶

1. Consultant Endodontist, Apollo Hospitals, Mumbai, Maharashtra.
2. Senior Lecturer, Department of Prosthodontics, Hazaribag College of Dental Sciences, Hazaribag, Jharkhand.
3. Senior Lecturer, Department of Conservative Dentistry and Endodontics, ITS, Centre for Dental Studies and Research, Ghaziabad, Uttar Pradesh.
4. Consultant Endodontist, AMRI Hospitals, Kolkata, West Bengal.
5. Consultant Endodontist, Smile and Profile, Kolkata, West Bengal.
6. Consultant Endodontist, Mumbai, Maharashtra.

Manuscript Info

Manuscript History

Received: 25 July 2020

Final Accepted: 28 August 2020

Published: September 2020

Key words:-

Interocclusal Recording Material,
Articulator, Bite Registration Material,
Occlusal Registration Material

Abstract

Introduction: An accurate interocclusal record is necessary for the delivery of fixed prosthodontic restorations. There are various materials and techniques used to obtain an interocclusal record in order to facilitate mounting of the dental casts on an articulator. The interocclusal record refers to the vertical and horizontal relationship of the maxillary and mandibular teeth. The clinician should have an understanding of various interocclusal recording materials, their modifications, shortcomings and awareness of its use in different clinical conditions.

Materials and Methods: An electronic search was conducted using the PubMed Database from 1960 to 2020 using the keywords "bite registration materials" OR "occlusal registration materials" OR "interocclusal recording materials." The articles pertaining to these keywords were further analysed.

Results: The search identified 574 articles, out of which 563 articles did not fulfil the inclusion criteria and were excluded from the study. Hence 11 research articles were analysed for the review.

Conclusion: Accurate interocclusal records are necessary to deliver high quality, predictable and precise fixed prosthodontic restorations. Establishing a tripod of opposing tooth contact is a fundamental principle to dictate accurate mounting of casts, and thus delivery of a well-fitting restoration. Furthermore, the review outlines the clinical guidelines and recommendations for accurate use of interocclusal recording materials in different clinical circumstances.

Copy Right, IJAR, 2020,. All rights reserved.

Introduction:-

A successful prosthesis requires harmony between the maxillomandibular relationships. It is a complex relationship which exists in three dimensions. Hence, it is very important to record this relationship with the least possible error to obtain a successful prosthesis.¹ To record this maxillomandibular relationship, numerous materials are in use and what matters are the precision of the recording materials and their stability.^{1,2} This article seeks to present a review

Corresponding Author:- Dr. Archie Khera

Address:- Apollo White dental Clinic, Apollo hospitals ,Sector:23, Plot No:13, Parsik Hills Road,, Off Uran road, CBD Belapur, Navi Mumbai-400616, Navi Mumbai, Maharashtra 400616.

of major bite registration materials and their modification as well as their advantages and disadvantages along with clinical guidelines and recommendations for accurate use of interocclusal recording materials in different clinical circumstances. No literature review has been reported on analysing all the different articles on properties of interocclusal materials and its shortcomings.

Materials And Methodology:-

A literature search was conducted on PubMed database for articles with the following MeSH words and keywords applied with the Boolean operator: (“bite registration materials”[Mesh] OR “occlusal registration materials” [Mesh] OR “interocclusal recording materials”[Mesh]. The inclusion criteria included all relevant peer reviewed articles from the year 1960 to 2020 and was limited to the English language publications. Full text articles were acquired electronically with MEDLINE and DENTAL JOURNALS and cross references were further screened to identify relevant articles. The search was confined to the articles comparing and evaluating the various properties of interocclusal recording materials. Furthermore, studies in only abstract form, case reports and letters to the editor were excluded from analysis.

Results:-

The search yielded 574 articles in the initial phase. However, 563 articles were excluded because they were unrelated to the subject or were in only abstract form. A total of 11 articles were included in the analysis and reviewed.

Discussion:-

Tripod for Interocclusal Stability:

A simple way of understanding the purpose of an interocclusal record is a tripod of three widely spaced contacts which is the minimum number that should be present between two casts during mounting.¹ One or two locations of tooth contact or vertical support are inadequate when one is mounting casts without an interocclusal record. Horizontal stability is dependent on good intercuspation of teeth, which will prevent lateral rotation of the casts. The role of an interocclusal record is to provide the stability that the remaining dentition lack.^{1,3} This concept needs to be understood before deciding the interocclusal material for a given clinical situation.

Freilich et al stated that when there is good intercuspation (tripod of vertical support and horizontal stability is present), there is no need for a record, whereas when there is poor intercuspation (tripod of vertical support without horizontal stability), the use of elastomeric materials is indicated for full arch or segmental record. Furthermore rigid materials i.e. Wax, Plaster, Resin, Paste should be used in cases of prepared tooth/teeth for segmental record.³ This concept is important to understand for successful interocclusal record taking, which will facilitate knowledge to the clinicians on the indications of various materials in different clinical scenarios.

Properties of interocclusal recording materials:

An interocclusal record is made with an assumption that exact position has been captured. The importance of accurate and reliable recording materials cannot be overemphasized because the function of indirectly made restorations is influenced by this critical step.

Berman⁴ et al tested the accuracy of interocclusal records made with dental waxes and found that all lead to some resistance to closure, and that this resistance was inappropriate which was in agreement with Lassila et al.⁵ The author also advocated the use of zinc oxide eugenol impression paste to make jaw relation records for fabrication of complete denture prostheses.

Lassila et al⁵ compared several interocclusal recording materials including silicone putty, polyether elastomer, zinc oxide eugenol (ZOE) paste, eugenol-free zinc oxide paste, acrylic resin, and baseplate wax. The author concluded that silicone putty had very high resistance to closure and therefore cannot be considered suitable for interocclusal registrations for gingiva-supported prostheses. However, the elastomeric recording materials, remained stable for a long time if they were stored in tightly sealed plastic bags. Fattore et al⁶ studied the accuracy of materials used in recording relationships against hand articulation of casts and concluded that waxes were inferior to the other materials. Zinc oxide materials, despite their accuracy, were difficult to use because of cracking and their sticking to teeth. The polyether material was accurate and had the advantage that the record could be used several times i.e. multiple pours.

Muller et al⁷ tested the accuracy of materials after various storage periods. They reported that plaster and polyether materials were the most accurate recording materials and wax records when used with a corrective paste, were accurate too if used soon after collection. This was in agreement with Tejo et al⁸ where polyether was found to be more dimensionally stable interocclusal recording material followed by Silicone and Zinc oxide eugenol (ZOE). Furthermore, author also mentioned that Polyether interocclusal records must be articulated within 48 hours, Polyvinylsiloxane interocclusal records within 24 hours and ZOE within 1 hour to get a correct restoration with minimum distortion and maximum satisfaction without failure of prosthesis.

Mullick et al⁹ investigated casts assembled by use of seven interocclusal record materials and concluded that Aluwax was the most variable and least reliable, ZnO Eugenol lead to open cast relationships and the elastomers resulted in least amount of errors.

Lassila et al⁵ stated that the dimensional stability of rigid materials, acrylic resin, and zinc oxide pastes was good. Elastomers were reliable for a relatively long time when stored in a tightly sealed plastic bag. This is in agreement with Murray et al¹⁰ that zinc oxide eugenol pastes and elastomeric materials should be preferred due to their accuracy, surface hardness and rheological properties. Furthermore, most commonly used uncorrected wax, which is non brittle in nature, dimensionally unstable, soft and has poor flow characteristics prior to a slow set, if used with a corrective paste can improve the accuracy and stability of that record and can also help in rechecking it, especially if occlusal changes are planned. The viscosities of zinc oxide eugenol paste and polyvinyl siloxane are significantly lower than the other materials. This may be clinically advantageous in accurately recording patterns of closure and avoiding mandibular deviations caused by more viscous materials.

Sweeney et al¹¹ studied various types of interocclusal recording materials for accuracy in articulation of digital models and concluded that Polyvinyl siloxane is a more accurate interocclusal recording material when articulating digital models as compared to thermoplastic or wax materials.¹¹ The authors also recommended that bite registration to articulate digital models should be considered as the first step in the articulation process, with a likely residual need to manipulate the models manually. This was in agreement with Dixon et al where polyvinyl siloxane recording materials were examined for their dimensional stability and associated weight change. All brands were found to be accurate and dimensionally stable over a 48-hour period. The negligible weight change did not affect the dimensional stability of the materials. Furthermore, Chai et al¹² studied the surface hardness and dimensional stability of several intermaxillary registration materials and concluded that the dimensional stability of a polyether registration material was significantly lower than that of the vinyl (poly)siloxane materials tested.^{12,13}

Clinical Recommendations:

1. Lower viscosity of zinc oxide eugenol paste and polyvinyl siloxanes is beneficial in accurately recording patterns of closure and avoiding mandibular deviations which can be caused by more viscous materials.¹⁰
2. In cases of poor intercuspation, non rigid materials such as elastomers for full arch or segmental record. Furthermore rigid materials i.e. Wax, Plaster, Resin, Paste should be used in cases of prepared tooth/teeth for segmental record. The adhesive property of acrylic resin and zinc oxide paste may prove to be advantageous with removable prosthesis and a problem with interocclusal registration for fixed restorations.^{13,21,25}
3. Polyvinyl siloxane is a more accurate interocclusal recording material when articulating digital models as compared to thermoplastic or wax materials.^{11,16}
4. Polyether and zinc oxide-eugenol pastes with carriers are most accurate recording mediums, but they require a disciplined technique. Elastomers maintained their reliability for a relatively long time when stored in a tightly sealed plastic bag.^{5,23}
5. Polyether materials are highly accurate and have the advantage that the record could be used for multiple pours.^{6,19,24}
6. Corrective washes when used over the hardened wax improves its value in rechecking the record particularly if occlusal changes are planned.⁷
7. Polyether interocclusal records must be articulated within 48 hours, PVS interocclusal records within 24 hours and ZOE should be articulated within 1 hour to get a correct restoration with minimum distortion and maximum satisfaction without failure of prosthesis.⁸

Conclusion:-

There is no interocclusal record that is fast, accurate, and easy to make that is indicated for all clinical situations. For each clinical situation, the practitioner must balance the time used to make the interocclusal record that best supports

and stabilizes the casts against the time spent making additional intraoral occlusal adjustments that may follow the use of the most practical interocclusal record.

Authors Contributions:

Conceptualization : Khera A ,Data curation : Khera A, Bhalla V , Shankar D, Formal analysis : Haque Wasim S, Funding acquisition : Bhattacharya S, Shetty P, Investigation : Khera A , Methodology: : Khera A, Shankar D Project administration :Khera A Resources Bhattacharya S, Shetty P ,Software: Khera A, Supervision :Khera A . Validation: Haque Wasim S,Shankar D, Visualization: Bhalla V , Jose S Writing - original draft: Khera A , Writing - review & editing: Khera A, Shankar D

Conflicts of interest:

Nil.

References:-

1. Freilich MA, Altieri JV, Wahle JJ. Principles for selecting interocclusal records for articulation of dentate and partially dentate casts. *J Prosthet Dent.* 1992;68(2):361-367.
2. Müller J, Götz G, Hörz W, Kraft E. Study of the accuracy of different recording materials. *J Prosthet Dent.* 1990;63(1):41-46
3. Schnader YE. The stone core intaglio in restorative dentistry. *Dent Clin North Am.* 1981 Jul;25(3):493-510.
4. Berman MH. Accurate interocclusal records. *J Prosthet Dent* 1960;10: 620-30.
5. Lassila V. Comparison of five interocclusal recording materials. *J Prosthet Dent.* 1986;55(2):215-218.
6. Fattore L, Malone WF, Sandrik JL, Mazur B, Hart T. Clinical evaluation of the accuracy of interocclusal recording materials. *J Prosthet Dent.* 1984;51(2):152-157.
7. Müller J, Götz G, Hörz W, Kraft E. Study of the accuracy of different recording materials. *J Prosthet Dent.* 1990;63(1):41-46.
8. Tejo SK, Kumar AG, Kattimani VS, Desai PD, Nalla S, Chaitanya K K. A comparative evaluation of dimensional stability of three types of interocclusal recording materials-an in-vitro multi-centre study. *Head Face Med.* 2012;8:27.
9. Mullick SC, Stackhouse JA Jr, Vincent GR. A study of interocclusal record materials. *J Prosthet Dent.* 1981;46(3):304-307.
10. Murray MC, Smith PW, Watts DC, Wilson NF. Occlusal registration: science or art?. *Int Dent J.* 1999;49(1):41-46.
11. Sweeney S, Smith DK, Messersmith M. Comparison of 5 types of interocclusal recording materials on the accuracy of articulation of digital models. *Am J Orthod Dentofacial Orthop.* 2015;148(2):245-252
12. Chai J, Tan E, Pang IC. A study of the surface hardness and dimensional stability of several intermaxillary registration materials. *Int J Prosthodont* 1994;7:538-42.
13. Dixon DL. Overview of articulation materials and methods for the prosthodontic patient. *J Prosthet Dent.* 2000;83(2):235-247
14. Muller J, Gotz G, Bruckner G, Kraft E. An experimental study of vertical deviations induced by different interocclusal recording materials. *J Prosthet Dent* 1991 ;65:43-50.
15. Skurnik H. Accurate interocclusal records. *J Prosthet Dent.* 1969;21(2):154-165
16. Wieckiewicz M, Grychowska N, Zietek M, Wieckiewicz W. Evaluation of the Elastic Properties of Thirteen Silicone Interocclusal Recording Materials. *Biomed Res Int.* 2016;2016:7456046.
17. Chai J, Leong D K, Pang I-C. An investigation of the rheological properties of several interocclusal registration materials. *J Prosthodont* 1994 3: 134-137.
18. Freilich MA, Altieri JV, Wahle JJ. Principles for selecting interocclusal records for articulation of dentate and partially dentate casts. *J Prosthet Dent* 1992;68:361-7.
19. Breeding LC, Dixon DL, Kinderknecht KE. Accuracy of three interocclusal recording materials used to mount a working cast. *J Prosthet Dent* 1994;71:265-70.
20. Warren K, Capp N. A review of principles and techniques for making interocclusal records for mounting working casts. *Int J Prosthodont* 1990;3:341-8.
21. Breeding LC, Dixon DL. Compression resistance of four interocclusal recording materials. *J Prosthet Dent* 1992;68:876-8.
22. Hatzi P, Tzakis M, Eliades G. Setting characteristics of vinyl-polysiloxane interocclusal recording materials. *Dent Mater.* 2012;28(7):783-791

23. Bell JW, Davies EH, von Fraunhofer JA. The dimensional changes of elastomeric impression materials under various conditions of humidity. *J Dent* 1976;4:73-82.
24. Ghazal M, Ludwig K, Habil RN, Kern M. Evaluation of vertical accuracy of interocclusal recording materials. *Quintessence Int.* 2008;39(9):727-732.
25. Millstein PL, Clark RE, Myerson RL. Differential accuracy of silicone-body interocclusal records and associated weight loss due to volatiles. *J Prosthet Dent.* 1975;33(6):649-654.