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RESEARCH ARTICLE

INTEROCCLUSAL RECORDS: A REVIEW.

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Abstract

In the field of dentistry, various materials have been used for interocclusal records. Studies conducted earlier, correlated the several techniques that have been employed with these materials. However there is a scarcity in literatures that explain or compares the material aspect. This article systematically reviews various interocclusal material used in the field of Prosthodontics.

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Introduction:-

Dentists have realized the importance of correct interocclusal records in the longevity and stability of a prosthesis. It is necessary to record the precise maxillomandibular relationship and meticulously transfer it to the articulator for providing a prosthesis with accurate occlusion.¹ An accurate interocclusal record with proper mounting of the casts in an articulator allow the laboratory technician to create proper contours, alignment and clearance of the substructure as well as proper occlusion and intercuspation of the final restoration.^{2,3}

An interocclusal registration material records the occlusal relationship between the natural and / or artificial teeth for planning occlusal rehabilitation and for construction of removable and fixed partial dentures⁴.

The most common indications for interocclusal records is full mouth rehabilitation⁵, Reconstructing long span edentulous areas, and also used for diagnostic as well as for the treatment plan⁶, for the single unit or a multi unit implant placement, for confirming the centric record in the complete denture.⁷

The accuracy of the interocclusal material is the crucial factor in the success of any type of prosthesis. The basic requisites of an ideal interocclusal material are:

1. Limited resistance before setting for mandibular closure.
2. Rigid or resilient after setting⁸.
3. Minimal dimension changes after setting.
4. Accurate record of the incisal and occlusal surface of teeth.
5. Easy to manipulate.
6. No adverse effects on the tissues involved in recording procedure.

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7. The interocclusal record is verifiable.⁹

Earlier, many studies were conducted to check and correlate various techniques employed in recording the interocclusal records. However, there is a scarcity of literature which explains and compares the material aspect. This article systematically reviews various interocclusal material used in the field of Prosthodontics.

Materials used for interocclusal records

A) Impression plaster

Historically, impression plaster was used as a bite registration material. Its chief constituent is calcinated calcium sulfate hemi-hydrate. On mixing with water, this reacted to form a rigid mass of calcium sulphate dihydrate (Combe, 1975)¹⁰. Berman (1960) found plaster flows readily¹¹ but it fractured easily because a thin mix was used for the registration, and lacked adherence.

Skurnik (1969) noted that working with plaster was complicated and not conducive to a neat and clean field of operation. Further, if undercuts were present, plaster would fracture upon removal from the mouth. Craig (1975) noted the popularity of dental impression plaster had waned with the introduction of the elastic materials^{12, 13}.

B) Waxes

Millstein and Kronman (1971) studied the accuracy of two types of baseplate wax. They studied closing pressures, storage environments, time intervals, and seating pressures. They found: (1) Complete closure under pressure comparable to a clinical setting, 172 p.s.i., was not achieved when wax was present. (2) Storage of the wax registration resulted in distortion. Storage of the record in cold water showed the greatest dimensional change; air cooling produced the least. Also, cooling from mouth temperature to room temperature caused distortion of the record. (3) There was considerable vertical and slight horizontal change when the model was gently placed into a previously formed wax registration. (4) Exact reproduction of the original wax recording was never achieved¹⁵.

The bite registrations are frequently made from 28 gauge casting wax or from base paste wax, specially formulated from bee wax or hydrocarbon waxes such as paraffin or ceresin.

Paraffin wax, colourless or white consisting of a mixture of solid straight-chain hydrocarbons ranging in melting point from about 48° to 66° C (120° to 150° F) is commonly used. Advantage: A major factor in popularity is clinical flexibility of waxes and accounts for the broad range around which records can be modified changed, corrected and verified with comparative ease.

Disadvantage: Studies have demonstrated that wax interocclusal records are inaccurate, unstable and inconsistent².

C. Zinc oxide Eugenol Paste

Zinc oxide-eugenol was considered to be dimensionally stable. Craig (1975) found slight shrinkage of 0.1% or less at the end of thirty minutes after mixing. No significant change occurred at the end of twenty-four hours.¹⁶

Zinc oxide and eugenol paste has a relatively long working time, which can be shortened by an accelerator such as ethyl alcohol. Zinc oxide materials can be stored in stable conditions, but they are susceptible to changes in relative humidity. Zinc oxide – eugenol paste is an effective and reliable interocclusal registration material.¹⁷ It is simple to use, sufficiently rigid and easy to store. However it dehydrates, is significantly brittle, sticks to the teeth and important portions of the record may be lost due to breakage. Besides, once used it rarely can be used again. It is advisable to use a minimum amount of Zinc Oxide eugenol to avoid excess flash as flash around the teeth can interfere with the accurate seating of the casts. Certain studies do not recommend the use of zinc oxide eugenol paste as it is extremely variable and consistently resulted in an open cast relationship¹⁴.

D. Silicone Elastomers

Silicones are synthetic polymers. The chain is composed of silicon and oxygen linked as follows to form a siloxane chain. Two types of silicone elastomers are available as interocclusal registration materials: condensation silicone and addition silicone. They are highly accurate and were found to be dimensionally stable over a 48 hr time period with negligible weight change. They do not require a carrier. However the disadvantages are their minimum working time and predetermination of the record space is required. One major disadvantage of silicone is resistance to compression of the set material, which contributes to difficulty in the seating of plaster casts⁷.

E. Polyether elastomers

Polyether interocclusal registration material consists of the basic impression material augmented by plasticizers and fillers. The advantages of this material as an interocclusal registration material are accuracy, stability after polymerization and during storage, fluidity and minimal resistance to closure, can be used without a carrier. Disadvantages are that resiliency and accuracy may exceed the accuracy of the plaster casts. Both of these factors can interfere with the placement of the plaster cast into the recording medium during mounting procedures. The records are trimmed to remove excess material and preserve only the teeth indentations, avoiding distortions¹⁸.

F. Acrylic resins

The most frequent application of acrylic resins for interocclusal records is in the fabrication of single – stop centric occlusion records. Acrylic resin is both accurate and rigid after setting. Disadvantages of acrylic resin as an interocclusal registration material includes dimensional instability due to continued polymerization resulting in shrinkage, rigidity of the material can damage plaster cast and dies during mounting on the articulator¹⁹.

Discussion:-

An in vitro study was conducted Veijo Lassila, compared the five interocclusal materials under four properties

a) Resistance of closure

Highest degree of resistance after 1 minute after mixing was found to be silicone (13.8N) followed by Polyether, zinc oxide pastes, and acrylic resin within the range of 0.5 N to 0.6 N. Minimal resistance to closure produces the best results in interocclusal registration. So acrylic resin was found to be best under the property of resistance of closure.

b) Volumetric changes

The volumetric changes of elastomers, zinc oxide eugenol during registration within 0 to 30 minutes found to be 0.5%. The volumetric contraction / shrinkage seen in acrylic resin, and wax was found to 3.8% and 3.6 % respectively. Elastomers and zinc oxide eugenol was found to be least under the property of volumetric changes.

c) Thermal expansion

Wax found to be the highest coefficient, about 330 ppm/°C, followed by elastomers and zinc oxide pastes were slightly below 200 ppm/°C. Acrylic resin was least sensitive to changing of temperature (about 91 ppm/°C). Acrylic resin was found to be least in thermal expansion because its coefficient of thermal expansion is less compared to the other materials.

d) Dimensional stability

The dimensional changes of rigid materials, acrylic resin, and zinc oxide pastes during a storage period of 30 minutes to 72 hours remained below 0.3% under room conditions followed by wax and silicone. The expansion of polyether was found to be 1.4 %. For an ideal interocclusal record material requires higher dimensional stability for a long time. Silicone found to be 0.3% expansion after 72 hours²⁰.

Conclusion:-

An interocclusal record is a precise recording of maxillomandibular position. It should be capable of maintaining extreme accuracy even under such varying condition as storage and handling even though a record may appear to be fixed and accurate it may still undergo dimensional changes which can only be evaluated microscopically the clinical change in interocclusal record can be only evaluated by dentist or by the patient in reference to high points. The cause of occlusal discrepancies attributable to the interocclusal record can be divided into three categories one cause is related to biologic characteristics of stomatognathic system, a second cause is attributed to iatrogenic errors and third cause is associated with the properties of interocclusal recording material. To avoid diagnostic treatment errors conducted with meticulous attention to manipulation of these materials with specific instruction for each material. Selection of an ideal material for making interocclusal records would allow the placement of indirectly fabricated prosthesis in patients mouth with no occlusal errors.

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