

## Comparative Evaluation of Dimensional Stability and Accuracy of Three Different Types of Interocclusal Recording Material at Various Time Intervals

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### ABSTRACT

**Background:** The purpose of this study was to choose a material that will exhibit least dimensional changes and replicate the correct maxillomandibular relationship on the cast and on the articulator. To evaluate the dimensional stability of three bite registration materials namely aluwax, polyvinyl siloxane and zinc oxide eugenol bite registration paste.

**Keywords:** Aluwax, polyvinyl siloxane, zinc oxide eugenol, interocclusal record.

### INTRODUCTION

An accurately recorded maxillomandibular relationship when properly transferred to the articulator plays a vital role in the success of any prosthesis. These relationships are dynamic and change during life. The faithfully recorded maxillomandibular relationships will eventually be essential for restoration of function, facial appearance and maintenance of patient's health. Though there are many studies <sup>3,6,18,22,29</sup> on the comparative accuracy and stability of interocclusal registration materials, there is no common consensus among the authors as regards to the supremacy of a certain material over the other. This comparative analysis is designed to compare the different materials commonly used for interocclusal records and to help the clinician to choose the material that is most dimensionally accurate and stable.

### MATERIALS AND METHODS

Dimensional stability is one of the most important properties of a good interocclusal recording

material. To check the dimensional stability of various interocclusal recording materials, an in vitro study was conducted using three types of interocclusal recording materials.

Materials used for preparation of samples were as follows- (Fig. 1)

| S.No. | Product Name | Generic Name                                  | Manufacturer                            | Batch No. |
|-------|--------------|-----------------------------------------------|-----------------------------------------|-----------|
| 1.    | Aluwax       | Bite registration wax                         | Aluwax Dental Products Corporation, USA | 40-44     |
| 2.    | Futar D      | Polyvinyl siloxane bite registration material | Kettenbach GmbH & Co. KG, Germany       | 919791    |
| 3.    | Superbite    | Zinc oxide eugenol bite registration paste    | Bosworth Company, USA                   | 0906-249  |

Received: Oct. 5, 2020: Accepted: Dec. 3, 2020

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## METHODOLOGY

### A. Fabrication of the Metal Master die

### B . Dimensions of the brass model simulating a Verticulator® -

Vertical arm = 4.5cm

Horizontal arms = 2cm wide, 8cm long and 0.5cm thick

Standard scale on the vertical arm

Individual materials were manipulated according to manufacturer's instructions and then placed between the teeth and the Verticulator® was closed to the desired separation of 2mm, 4mm or 6mm respectively. Upon setting of the material, the sample was removed from the die and all the excess material (Flash) was trimmed by using a Bard parker knife. The samples were tested and measured.

The samples of the three materials were fabricated as follows:

Fabrication of Aluwax samples

Fabrication of polyvinyl siloxane samples

Fabrication of zinc oxide bite registration samples

## RESULTS

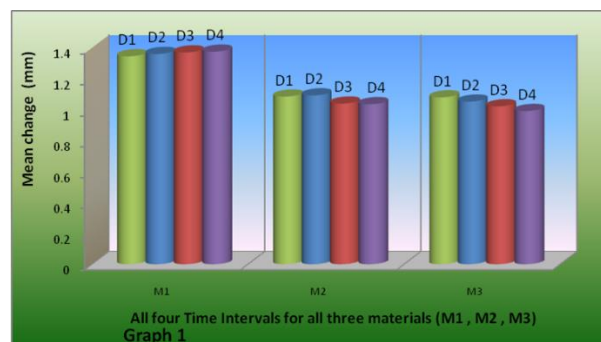
This study was conducted to evaluate the dimensional stability of Aluwax, Polyvinyl siloxane and Zinc oxide eugenol by measuring the mean change in vertical dimension and the percentage distortion of the materials. Statistical analysis was done and the results were tabulated by using the three way analysis of variance (ANOVA).

|      |       |       |       |       |       |
|------|-------|-------|-------|-------|-------|
| M3   | 1.080 | 1.053 | 1.022 | 0.992 | 1.037 |
| Mean | 1.170 | 1.169 | 1.144 | 1.134 | 1.154 |

|      |       |       |       |       |
|------|-------|-------|-------|-------|
| M3   | 0.903 | 1.101 | 1.106 | 1.037 |
| Mean | 0.979 | 1.200 | 1.285 | 1.154 |

|  |             |             |             |             |  |
|--|-------------|-------------|-------------|-------------|--|
|  | 1.155       | 1.110       | 1.080       | 1.060       |  |
|  | <b>T3D1</b> | <b>T3D2</b> | <b>T3D3</b> | <b>T3D4</b> |  |
|  | 1.145       | 1.122       | 1.082       | 1.075       |  |

Graph 1 Mean change in dimension (in mm) of all three materials at various time durations.



(M 1 = Aluwax, M2= Polyvinyl siloxane , M3= Zinc oxide eugenol)

## DISCUSSION

One of the important steps during fabrication of prosthesis by indirect method is recording of various jaw relations. Each and every record has to be made accurately and one should consider the efficient use of time in delivering quality dental care at minimum cost.

In this study only the vertical dimensional change of the interocclusal recording materials over a time was measured. These measurements provide an indication regarding the dimensional stability. However dimensional stability can also be studied in all the three planes using equipment like Condymeter <sup>31</sup>, computerized Axiotron <sup>6</sup> and Buhnergraph<sup>4</sup>.

In the present study a dial gauge was used as the measuring ends could easily engage the points to be measured on the record and it was accurate to 1/20<sup>th</sup> of an mm.(0.05mm) It was also observed that the maximum accuracy was at the least thickness of 2mm , followed by 4mm and 6mm, i.e., the mean dimensional change (in mm) increased with the increase in thickness.

Percentage distortion was found to be significant in vertical direction in this study. Earlier studies<sup>4, 12</sup> also suggest that the distortion values were more in vertical direction than linear.

## SUMMARY AND CONCLUSION

An interocclusal record is important for the eventual success of the prosthetic treatment. It is

the nature of the profession and the treatment modality that the record is not immediately used to articulate the casts. This delay can lead to significant alteration in the jaw relation, which in turn would cause significant increase in chair side time in form of occlusal adjustments of the prosthesis to be delivered. Hence the need to evaluate the existing materials was felt so as to better equip the dentist and improve the quality of dental treatment.

This study was conducted to evaluate and compare the dimensional stability of three commonly used interocclusal recording materials namely aluwax, polyvinylsiloxane, and zinc oxide eugenol at three different thicknesses.

From the results obtained, and within the limitations of the study, following were the **conclusions** drawn –

1. Wax was found to be the dimensionally most unstable material when compared to Polyvinyl siloxane and Zinc oxide eugenol, which were comparable and considerably better.
2. The dimensional change was found to be the least when the record was used in 2mm thickness, followed by 4mm and 6mm.
3. The percentage distortion was found to be the least when the record was used in 6mm thickness, followed by 4mm and 2mm.
4. The time period up to three days did not have any significant effect on the dimensional stability of the materials.

#### CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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