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To study the effect of different core investing material (rigid & resilient) on teeth movement

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Abstract

Aim: The aim of this study was to compare movement of teeth taking place during processing of the denture using various coring material for investing.

Settings And Design: In-vitro comparative study

Method: The present study was conducted to compare the effect of core investing material (rigid and resilient) on teeth movement during complete denture fabrication. Four groups of waxed complete denture (n=60) were invested with four different materials (a) Dental Plaster (b) Gypsum Type III stone (c) Gypsum Type IV stone (d) Zhermack zetaplus condensation silicone. The artificial teeth movement was measured in the mediolateral, vertical and anteroposterior directions between predetermined reference points before and after processing with the aid of Electronic Digital calliper. The findings were

statistically analyzed using parametric Poshoc Bonferroni test and ANOVA F-test.

Results and Conclusions: The results showed a significant tooth displacement in the different investments used in this study. Gypsum Type IV showed the least movement of teeth.

Keywords: Tooth displacement, complete dentures, Coring

Introduction

Processing of resin dentures is technique sensitive and indeed a challenging experience for dentist and technicians due to changes occurring during processing of dentures. There is a definite movement of teeth during and after processing of complete dentures. Teeth movement that occurs during fabrication of denture has been the objective of speculation which can be attributed to nature

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of material and processing techniques¹. Poly methyl methacrylate (PMMA) or acrylic resin is the most commonly used material for fabricating denture bases. PMMA undergoes deformation during polymerization, which is considered to be a major disadvantage of acrylic resin². The change can be verified through the horizontal and vertical linear measurements that are present mainly the maxillary denture³. The combination in of polymerization shrinkage, thermal contraction during flask cooling and strain accompanying stress release during deflasking can result in denture base distortion and displacement of artificial teeth. Teeth displacement can occur in any direction; antero-posterior, transverse or vertical⁴. Therefore, the purpose of the study was to compare movement of teeth taking place during processing of the denture using various coring material for investing.

Material and Methods

A total number of sixty ideal teeth arrangements were done on maxillary cast with even thickness of wax. Flasking was done using four different investing materials as shown in Table 1. Each group comprised of 15 samples. Group 1 or conventional flasking with Dental Plaster was considered as control group.

The samples were tested for the teeth movement using different reference points with the help of Electronic digital caliper.

1. Ideal Maxillary casts were made

Ideal Maxillary casts were made from ideal maxillary mould by pouring with Dental stone type III.

2. Three Reference points were marked on the cast

Midline was marked on the cast bisecting it and three reference points were selected on the cast which are:

- 1st reference point –center of palate on bisecting line
- 2nd reference point –marked just behind maxillary tuberosity on the right side.

Stainless steel pins were embedded at these reference points through the wax into the cast.

3. Following reference points were taken on the acrylic teeth

- Mesial aspect of central groove of the first molar
- Mesially on the center grove of the first premolar(bicuspids)
- Upright on cingulum of both central incisors.

Stainless steel pins were embedded to the acrylic teeth at these reference point.

4. Discrepancy was noted by measurement with Electronic Digital Caliper

Digital caliper capable of registering changes as small as 0.1 mm was used to measure the distance between reference pins

- The anterio-posterior distance was measured from the pin on the Right central incisors to reference point 1 and from reference point 2 to cusp pin on the molar
- The Horizontal distance was measured from center reference point 1 to cusp pins of Right First Premolar and Right First Molar.
- Vertical distance was measured from base of the cast to height of pin embedded on the Left central incisor, Left First premolar and Left First molar
- 1. Dentures were fabricated with different core investing materials and different groups were made

Base flasking of waxed up denture of all groups were done using dental plaster in varsity flask. Standard Water: Powder ratio for dental plaster mix 0 : 5 was used. Once the base flasking was completed and dental plaster set the surface was be smoothened and Vaseline was applied for separation.

The flasks were divided into 4 groups of 15 each.

Counter flasking was done following one of the following methods:

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Group 1 - Conventional flasking with Dental plaster.Group 2 - A layer of coring with Gypsum Type III (Dental stone) + Dental plaster

Group 3 - A layer of coring with Gypsum Type IV (Dental stone) + Dental plaster.

Group 4 – A layer of coring with Silicone + Dental plaster

Flasks were placed under a clamp and plaster was allowed to set.

Dewaxing was done after 1 hour in boiling water for 7 minutes (standardized). The casts and denture mould was allowed to cool till room temperature.

Separating medium was applied while the dew axed moulds was warm to get a thin layer of separating medium. Later the flasks were allowed to cool for 1hour. Packing was done with Heat Cure Acrylic Resin and packed in the mould in dough stage.

Trial closure was done to ensure complete closure of the flasks. The flasks were bench cured for 2 hours before placing in the Acrylizer, a short curing cycle of acrylic resin was followed for processing.

The dentures were de-invested following the sectional method to avoid distortion of the acrylic resin.

6. Marking of processed dentures to visualize smooth movement

To visualize the movement in the teeth position in the processed dentures measurements were taken at the same points specified and marked at the waxed up denture stage. These readings were calculated. The reading of the processed dentures was compared with the reading of the waxed up denture to note the movement occurring during processing. The mean value was calculated and the four groups were compared in anterio- posterior, horizontal and vertical aspects.

Result and Discussions

This study compared Movement of teeth is expected to take place during the processing of a denture. These movements should be minimum to be able to maintain occlusion planned for the patient and verified at the try in stage. There should be no change in occlusion of the processed dentures. However movement of teeth does take place during the fabrication of the complete denture. When dentures were flasked in only dental plaster maximum movement of the teeth was observed in the study especially in the medio lateral direction. Flasking done in silicone material gave smooth surface of the processed dentures, it was easy to deflask but showed maximum movement of teeth in the anteroposterior and vertical direction. This could be attributed to the resiliency of the silicone material.

Dental stone when used as the coring material over the teeth and polished surface of denture along with dental Stone IV showed the least movement of teeth during processing both in the vertical and anteroposterior direction. This is so because dental stone due to it's rigidity binds the teeth together and prevents them from moving. Results of this study showed that the movements during flasking with the different material i.e. Plaster, Dental stone III, Dental stone IV and Silicone was highly significant with the silicone material within all the directions. Because of its resilient property the surface of the processed denture was very smooth. It was also observed that, the increased movement and surface smoothness which is in accordance with the previous studies as done by Turakhia H et al.

The mechanical properties investigated and compared in the present study were only a limited view of the materials. So, further studies may be carried out with the different material. Moreover, only one mechanical property i.e. movement was taken into consideration in this in vitro study. Further studies considering other mechanical, esthetic and biological properties can be carried out.

Summary and Conclusion

This in vitro study was carried out to evaluate the effect of different core investing material on the teeth movement during complete denture fabrication.

A total number of sixty ideal teeth arrangements were done on maxillary cast with even thickness of wax. Flasking was done using four different investing materials. i.e Dental Plaster, Dental Stone III, Dental stone IV, Silicone. Base flasking of waxed up denture of all groups were done using dental plaster in varsity flask. Standard Water: Powder ratio for dental plaster mix 0:5 were used. Once the base flasking was completed and dental plaster set the surface was be smoothened and Vaseline was applied for separation.

The flasks were divided into 4 groups of 15 each:-

Group 1 - Conventional flasking with Dental plaster.

Group 2 - A layer of coring with Gypsum Type III (Dental stone) + Dental plaster

Group 3 - A layer of coring with Gypsum Type IV (Dental stone) + Dental plaster

Group 4 – A layer of coring with Silicone + Dental plaster Dew axing was done after 1 hour in boiling water for 7 minutes (standardized).

After this Packing was done with Heat Cure Acrylic Resin and packed in the mould in dough stage. Trial closure was done to ensure complete closure of the flasks. The flasks were bench cured for 2 hours before placing in the Acrylizer, a short curing cycle of acrylic resin was followed for processing.

The dentures were de-invested following the sectional method to avoid distortion of the acrylic resin. To visualize the movement in the teeth position in the processed dentures measurements were taken at the same points specified and marked at the waxed up denture stage. These readings were calculated. The reading of the processed dentures was compared with the reading of the waxed up denture to note the movement occurring during processing. The mean value was calculated and the four groups were compared in anterio- posterior, horizontal and vertical aspects.

The data thus obtained was subjected to statistical analysis. According to the results and limitations of this in vitro study, it could be concluded that coring with Dental Stone IV shows least movement. Silicone gave smooth surface of the processed dentures with maximum tooth movement.

However, only one mechanical property i.e., movement was taken into consideration in this in vitro study. Further studies considering other mechanical, esthetic and biological properties can be carried out.

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