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Evaluation of efficiency of complete dentures using bps, lecutonite & acrylic materials: An original research

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***Abstract*---**Introduction: Type of materials used in fabrication of denture base has an effect on dimension during denture base material processing and other factors related to clinical use. The study aims were to assess the efficiency of complete dentures made using bps, lecutonite & acrylic materials. Material and Methods: Ninety patients were selected to construct complete dentures with bps, lecutonite &

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acrylic materials denture base materials. They were randomly divided into three groups: group 1, patients with bps; group 2, patients with heat curing acrylic resin fabricated by injection moulding technique and conventional methods; and group 3, patients with lecutonite. The dimensional changes were assessed using digital caliper. Results: After the twelfth month, injection moulding acrylic resin had significantly the highest dimensional change followed by the lecutonite. There were no significant differences in the dimensions between the three types of denture base materials at normal mouth temperature, while, after hot tea drinking at 45°C, the dimensional change was significantly the highest in cobalt chrome metallic denture base group. Conclusion: BPS denture base has stable dimension compared to denture bases fabricated of lecutonite, acrylic resin but it was more affected by altered mouth temperature.

Keywords---BPS, Lecutonite & Acrylic Materials, Complete Denture.

Introduction

A good complete denture should provide esthetics, restore function, and be biocompatible with supporting and surrounding oral tissues. [1]. During processing, dimensional changes of the acrylic denture base are affected by the type of material used in fabrication of denture base and other factors like polymerization shrinkage or stresses generated by cooling of flask [2]. Although acrylic resin is the most commonly used material in fabrication of denture base, it is dimensionally changed and distorted during acrylic processing and throughout clinical use [3]. These dimensional changes lead to inappropriate adaptation of the denture base to the oral tissue, reduced denture stability, and changes of the positions of the artificial teeth [4]. In addition to factors related to physical properties, processing procedures of denture base material, physiological and the anatomical conditions of patient's oral tissue also could affect the dimensional stability of denture base [5, 6]. Denture bases fabricated of BPS are characterized by dimensional stability regarding inherent properties but they could be affected by thermal changes in the oral environment [7]. Therefore, many researches aimed to compare dimensional stability of new denture base materials and processing techniques [8]. This study aims were to assess the efficiency of complete dentures made using bps, lecutonite & acrylic materials.

Material and Methods

The study was conducted on ninety edentulous male patients. Thirty patients were included in each group, all treated with complete denture. The difference was in the denture base materials. They were randomly divided into three groups: group 1, patients with bps; group 2, patients with heat curing acrylic resin fabricated by injection moulding technique; and group 3, patients with lecutonite. The commonly used method of assessing accuracy of denture dimension included measuring between set points on the denture base using caliper [9, 10].

Measurement of dimensional changes due to altered mouth temperature was taken at normal patient mouth temperature, after drinking hot tea at 45°C and after taking cold drink at 5°C. This measurement was taken only once at separate follow-up session after 1 month of clinical use. Every patient was given one minute to drink cold beverage and 2 minutes to drink hot one. The temperature of the lab was set to 25°C and the measurement of dimensional change was taken directly after patients have finished drinking the beverage. The time span between hot and cold beverage was about one hour to allow for sufficient wash-out period. The thickness of 1.5–2 mm was adopted in all dentures. The data were then analyzed by computerized method SPSS version 20. p values less than 0.05 were considered statistically significant.

Results

Ninety patients were recruited in this study; during the follow-up period 4 patients complained of pain and discomfort which had been released by little adjustment of the dentures. Only one patient was subjected to denture fracture in right molar area which has been repaired in the lab. The fracture line was so far from midline and assumed not to affect the measurement of dimensional accuracy.

Regarding dimensional changes, the group with BPS denture base was considered as control group because metallic bases are known to be dimensionally stable in the constant mouth temperature. Dimensional expansions have occurred in both acrylic resin, lecutonite groups in comparison to BPS control group which remain dimensionally stable throughout one year of clinical use. Denture bases fabricated of heat curing acrylic resin by injection moulding technique were subjected to higher dimensional expansions than those fabricated by conventional technique. In comparison with BPS group, the dimensional changes were always significantly higher in denture bases constructed by injection moulding technique after 4, 8, and 12 months of clinical use, while the dimensional changes which affected denture bases constructed by conventional technique show no statistically significant difference until the 12 months of clinical use (Table 1).

Concerning dimensional changes that followed altered mouth temperature, denture bases fabricated of heat curing acrylic resin by conventional technique show dimensional stability during thermal changes applied in follow-up sessions, while BPS denture bases showed significantly higher dimensional changes when compared to both types of heat curing acrylic resin. As a lecutonite, it shrinks on cold temperature and expands with hot temperature. Denture bases made of acrylic resin by injection moulding technique showed insignificant slight shrinkage with cold drink (Table 2).

TABLE 1: The dimensional changes (mean and standard deviation) of the three denture base materials over time

Time	After 4 months		After 8 months		After 12 months	
Base material	Mean	SD	Mean	SD	Mean	SD

Lecutonite	1.52	0.014	1.56	0.018	1.59*	0.02
Acrylic resin fabricated by injection moulding technique	1.58*	0.019	1.6*	0.022	1.63*	0.027
Acrylic resin fabricated by conventional technique	1.52	0.014	1.56	0.018	1.59*	0.02
BPS	1.5	0.01	1.5	0.01	1.5	0.01
*Statistically significant.						

TABLE 2: The dimensional changes of the three denture base materials by temperature changes (after one month of denture insertion)

Temperature	Normal mouth temperature		Hot tea at 45°C		Cold drink at 5°C	
Base material	Mean	SD	Mean	SD	Mean	SD
Lecutonite	1.5	0.01	1.5	0.01	1.5	0.01
Acrylic resin fabricated by injection moulding technique	1.5	0.01	1.5	0.01	1.48	0.009
Acrylic resin fabricated by conventional technique	1.52	0.014	1.56	0.018	1.59*	0.02
BPS	1.5	0.01	1.6*	0.019	1.43*	0.004
*Statistically significant.						

Discussion

The dimensional changes of the three denture base materials were varied, since heat curing acrylic resin fabricated by injection moulding technique was with low dimensional stability, while the BPS base was dimensionally stable over one year of clinical service (4, 8, and 12 months). Furthermore, the study reported that the changes of mouth temperature have an effect on the denture base dimensions on BPS denture base. The BPS denture bases were more subjected to dimensional changes due to altered mouth temperature than acrylic resin denture bases. This study was a clinical trial aimed at assessing the dimensional stability of denture bases in intraoral environment over one year of clinical service, unlike the majority of previous studies that compared dimensional stability of denture base materials in laboratory setting. Effects of saliva and forces of mastication on dimensions of denture bases rather than the effect of polymerization shrinkage were mainly assessed over time in this study. M.-J. Kim and C.-W. Kim conducted a study to compare the effect of processing and immersion in artificial saliva on different denture base materials. They found that conventional resin group showed significantly largest dimensional changes after processing and immersion in artificial saliva for several weeks, while metallic base group showed significantly the smallest dimensional changes [11]. The dimensional expansion affecting acrylic resins during intraoral use could be attributed to known property of water sorption found in acrylic resin [12, 13]. In laboratory setting, Young found the conventional technique more dimensionally accurate than injecting

moulding technique using cobalt chrome as gold standard for comparisons. These findings were in agreement with the findings found by the current clinical study [14]. In another hand, a study conducted by Keenan et al. showed different findings, although it aimed to identify the dimensional changes related to heat curing techniques. [12,15]. A clinical evaluation study conducted by Polychronakis et al. found initial shrinkage during insertion of dentures followed by compensation of this shrinkage during the first 3 months of clinical use. After that, expansion started to happen in the denture base of acrylic resin increasing with duration of clinical service. These findings were in agreement with the current study that found gradual expansion affecting acrylic resin base materials starting from 4-month follow-up period till one year of follow-up [16]. The major limitation of this study is time of follow- up, since one year is considered as short follow-up period for complete denture wearers who are usually wearing dentures for several years [17]. The dimensional changes in mesiolingual and vertical directions were not assessed in this study which was able to generate more comprehensive understanding for dimensional stability of studied denture base materials.

Conclusion

Dimensional expansions have occurred in acrylic resin, lecutonite denture bases especially denture bases fabricated by injection moulding technique, while cobalt chrome control group remains dimensionally stable. The change of mouth temperature was more tolerated by dentures produced from acrylic resin denture bases especially those fabricated by conventional technique.

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