

Original Article

## Comparison of Changes of Gingival Condition in Self-Cured and Heat-Cured Acrylic Resin Provisional Crown in Fixed Prosthodontics Treatment

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### Abstract

**Background:** Gingival Condition is an important issue in provisional crown in fixed prosthodontics treatment. **Objective:** The purpose of the present study was to find out any change of gingival condition after insertion of self-cured and heat-cured acrylic resin provisional crown. **Methodology:** This prospective comparative study was carried out in the Department of Prosthodontics, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University, Dhaka from July 2014 to June 2015 for a period of one year. Patients who were treated with full veneer crown in the department of Prosthodontics, Faculty of Dentistry, BSMMU, and also their provisional crown were prepared with self-cured and heat-cured acrylic resin. Patients were divided into two groups named as group A and group B. Group A patients were treated with self-cured acrylic resin provisional crown. Group B patients were treated with heat-cured acrylic resin provisional crown. Patient was examined and clinical finding such as gingival condition, color change and burning sensation of gingival tissue were recorded on the data collection sheet. Data were collected on the day of insertion and on recall visit 3<sup>rd</sup> day and 7<sup>th</sup> day. **Result:** A total number of 48 patients were recruited of which 24 patients were in group A and the rest 24 patients were in group B. At the day of insertion the gingival condition of all the patients in group A and B were in grade 0. In day 3, the changes of gingival condition of grade 0 is significant ( $p=0.009$ ). At the 7th day, grade 0 and I were not significantly change. **Conclusion:** Both heat-cured acrylic resin provisional crowns and self-cured acrylic resin provisional crowns maintain healthy gingiva in the oral cavity. [*Journal of Science Foundation, 2015;13(2):31-35*]

**Keywords:** prosthodontics; heat-cured acrylic resin; self-cured; provisional crown; gingival tissue

### Introduction

Provisional restorations are fabricated to protect the prepared tooth structure during the period between tooth preparation and the final restoration. Fabrication of provisional restorations is an important procedure for fixed prosthodontics. It is designed to enhance aesthetics, stabilization and/or function for a limited period of time after which it has to be replaced by a definitive prosthesis. This type of restoration has also been known for many years as Provisional crown or Interim restoration (Rayhan 2008).

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Since poly methyl methacrylate shrinks approximately 8% when it polymerizes (Phillips 1991), Polymerization outside the mouth without a supporting form results in distortion and a less than optimal fit. So it is beneficial to fabricate provisional restorations indirectly on casts made from impression of prepared teeth. The indirect technique has been associated with superior fit and pulpal protection. In a study of the marginal adaptation of provisional restoration, Crispin et al (1980) showed that the marginal fit of poly methyl methacrylate provisional restorations could be improved nearly 70% by fabricating them indirectly. But indirect technique is very time consuming, need extra laboratory support, and thus not suitable for chair side fabrication of provisional restorations.

Acrylic resins are the most frequently used materials in the fabrication of provisional crown. The majority of are made from self cure acrylic resins which are believed to result in the release of certain toxic chemicals such as formaldehyde, methyl methacrylate, methacrylate acid and benzoic acid, causing serious reactions in the surrounding tissues. The major element causing these reactions is the methyl methacrylate monomer present in the provisional crown which can be released into the saliva (Schuster et al., 1995; Tsuchiya Hoshino et al, 1994) The amount of released monomer depends on factors such as the type of resin, polymerization reaction, the length of polymerization cycle and the thickness of the resin (Vallittu et al, 1998; Yunus et al., 1994). The degree of harmfulness of these acrylic resins is associated with their route of insertion and their availability in the environment (Craig et al., 2006). On the other hand, frequent use of antigenic materials in dentistry can cause hypersensitivity reactions in the oral mucosa (American Dental Association Document Journal of Dentistry 2012). Denture base resins have exhibited variable degrees of cellular toxicity in vitro and tissue reactions in vivo which may be attributed to the level of residual monomers after completion of polymerization reaction (Jorge et al., 2003).

Variation in the components, structure and the purity level of the available resins in the market, the monomer conversion rate and manipulative variables may affect the physical and biochemical properties or the toxicity of the resins (Bahnen et al, 1996; Huang 2000; Vallittu et al., 1996). Valletta et al (1998) evaluated the effect of polymerization time and temperature on the residual monomers in their results indicated that compared to the heat-cured type, self-cured acrylic resins release free methyl methacrylate. The burning sensation, gingival color change and change the gingival condition occurred mainly due to residual monomer and exothermic heat production. This study aimed to determine the gingival tissue response of self- cured acrylic resin in comparison with heat- cured acrylic resin. The purpose of the present study was to find out any change of gingival condition after insertion of self-cured and heat-cured acrylic resin provisional crown.

## **Methodology**

This study was a prospective comparative study. This study was carried out in the Department of Prosthodontics, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University, Dhaka from July 2014 to June 2015 for a period of one (1) year. Patients who were treated with full veneer crown in the department of Prosthodontics, Faculty of Dentistry, BSMMU, and also their provisional crown were prepared with self-cured and heat-cured acrylic resin. Patients who were treated with full veneer crown following endodontically treated tooth in both anterior & posterior teeth with healthy periodontium and gingiva with the age group of 20 to 50 years and maintain good oral hygiene were included in this study. Periodontally compromised teeth, the teeth with resorptive defect & grossly decayed teeth, patient with debilitating condition and specially uncontrolled diabetes, immunocompromised patients, patients with metabolic disorder and patients with known hypersensitivity to acrylic resin were excluded from this study. Samples were divided into two groups named as group A and group B. Group A patients were treated with self-cured acrylic resin provisional crown. Group B patients were treated with heat-cured acrylic resin provisional crown. Gingival condition was measured as grade 0= normal gingiva; grade 1= mild inflammation – slight change in color and slight edema but no bleeding on probing; grade 2= moderate inflammation – redness, edema and glazing, bleeding on probing; grade 3= severe inflammation – marked redness and edema, ulceration with tendency to spontaneous bleeding. The Gingival Index (Löe and Silness, 1963) was created for the assessment of the gingival condition and records qualitative changes in the gingiva. It scores the marginal and interproximal tissues separately on the basis of 0 to 3. The bleeding was assessed by probing gently along the wall of soft tissue of the gingival sulcus. This changes had been cross checked by the another dentist. Each patient of this study was selected by a thorough medical and dental history as well as clinical and radiographic examination as per history sheet enclosed herewith. After

insertion patients were instructed for maintenance and advised to come on recall visits for collecting the data. The tooth preparation was done in conventional procedure. Impression was made with alginate impression material. Provisional crown was made by self-cured acrylic resin or heat-cured acrylic resin. Provisional crown was cemented with non-eugenol cement. Particulars of the patient were collected. Patient was examined and clinical finding such as gingival condition, color change and burning sensation of gingival tissue were recorded on the data collection sheet. Data were collected on the day of insertion and on recall visit 3<sup>rd</sup> day and 7<sup>th</sup> day. After 7 days patient was provided with full veneer crown. The tooth preparation was done in conventional procedure. In both anterior and posterior teeth subgingival finish lines were given. Impression was made with alginate impression material after preparing the tooth. Model was made; separating media was applied on the model. Self-cured acrylic resin was manipulated and put on the model when the resin was in doughy stage. Provisional crown was made. Finishing and polishing was done. Impression was made with alginate for heat-cured acrylic resin, model was made and wax pattern was done on the model. Dewaxing was done, packing the restoration with heat-cure acrylic resin. After curing finishing and polishing was done. Both group A and group B provisional crown were cemented on the prepared tooth with non eugenol ZnO cement. All data were compiled, checked up and put into the computer and analyzed with the help of software program SPSS-20 (statistical package for social science). Chi-square test was done to compare categorical data.

## Results

A total number of 48 patients were recruited of which 24 patients were in group A and the rest 24 patients were in group B. At the day of insertion the gingival condition of all the patients in group A and B were in grade 0. In day 3, the changes of gingival condition of grade 0 is significant ( $p=0.009$ ). At the 7<sup>th</sup> day, grade 0 and I were not significantly change (Table 1).

**Table 1: Distribution of patients according to gingival condition in response to self-cured and heat-cured acrylic resin provisional crown (n=48)**

Follow up visit	Gingival condition	Group A (n=24)	Group B (n=24)	P value
Day of insertion	Grade-0	24(100%)	24(100.%)	Baseline
	Grade-I	0(0.0%)	0(0.0%)	Baseline
	Grade-II	0(0.0%)	0(0.0%)	Baseline
	Grade-III	0(0.0%)	0(0.0%)	Baseline
3rd day	Grade-0	0(0.0%)	6(25.0%)	0.009*
	Grade-I	18(75.0%)	16(66.7%)	0.525 <sup>ns</sup>
	Grade-II	6(25.0%)	2(8.3%)	0.125 <sup>ns</sup>
	Grade-III	0(0.0%)	0(0.0%)	-
7th day	Grade-0	10(41.7%)	14(58.3%)	0.248 <sup>ns</sup>
	Grade-I	14(58.3%)	10(41.7%)	0.248 <sup>ns</sup>
	Grade-II	0(0.0%)	0(0.0%)	-
	Grade-III	0(0.0%)	0(0.0%)	-

Statistical analysis was done by Chi-square test; \* = Significant; ns = Not significant; n = Number of samples; Group A = Self-cured acrylic resin provisional crown; Group B = Heat-cured acrylic resin provisional crown; Grade- 0= Normal gingival; Grade-1= Mild inflammation – slight change in color and slight edema but no bleeding on probing; Grade- 2= Moderate inflammation – redness, edema and glazing, bleeding on probing; Grade- 3= Severe inflammation – marked redness and edema, ulceration with tendency to spontaneous bleeding

## Discussion

The most commonly used provisional restorative materials are acrylic resins (poly methyl methacrylate resin). Poly methyl methacrylate is strong, has a high wear resistance, is easy to add to, and has good aesthetics, which is maintained over longer periods (Crispin and Caputo, 1979). However, it has some disadvantages, like polymerization shrinkage, residual monomer irritation, and danger of pulpal damage because of exothermic heat production (Wassell et al., 2002). However these problems of methyl methacrylate reins are associated primarily with direct method of fabrication, because the exposure to free monomer and exothermic heat is more in this technique. On the other hand, to avoid locking into undercuts,

a directly fabricated resin provisional restoration must be removed from the tooth before it has completely polymerized.

Resin-based dental materials can cause adverse reactions on oral mucosa. MMA has the potential to elicit irritation, inflammation and allergic response of the oral mucosa. Further, residual monomer is capable of producing both stomatitis and an angular cheilitis. The allergic reaction occurs within a few to several hours after the mucosa is exposed to the resin. When allergic reactions were noted, they were described as white, necrotic lesions on the mucosa; either as small, multiple lesions or as large ulcers mimicking aphthous stomatitis.

Regarding gingival condition in response to provisional crown materials, in this study, at the day of insertion, all the patients of both groups A and B had normal healthy gingiva without any inflammation. On 3<sup>rd</sup> day, the percentage of healthy gingiva of group B was higher than that of group A. The difference was statistically significant ( $p=0.02$ ). At the day 7, there was no statistically significant clinical finding present in this visit ( $p=0.37$ ). On the 3<sup>rd</sup> day the gingival response of group-A was higher due to more residual monomer. This has been supported by the study of Willershausen et al (2001) and Waerhaug (1996) who showed the most significant mechanism through which dental materials can affect marginal gingival health. Hugget et al (1984) and Honorez et al (1989) also showed that heat-cured acrylic resin materials produced minimal levels of residual monomer if compared with self-cured resin materials. Nideli (2013) demonstrated that self-cured release more residual monomer than heat-cured acrylic resin.

This monomer associated with irritation, inflammation, allergic reaction, burning sensation and burning mucosa. Michael et al (1978) detected on a histologic evaluation of tissue response to three currently used temporary acrylic resin (self-cured, heat-cured and light-cured) crown that no change in the gingiva associated with interim restoration over 3 weeks. Baker et al (2008) have evaluated the concentration of residual monomer leached from auto-polymerized resins in saliva was detected for up to 1 week after wearing the appliance. The biological effect of residual monomer is irritation, pain, ulceration, oedema, burning mouth syndrome and stomatitis. Mallikarjuna (2014) showed biodegradation of acrylic resins in the oral cavity, which leads to leaching of residual monomer which can cause cytotoxicity. The cytotoxic effect of Methyl-methacrylate has the tendency to cause hypersensitivity. Ivkovic et al (2013) proved the properties and functional efficiency of acrylic resins depend on the methods of polymerization. Residual monomer is often associated with inflammatory reactions and causes mucosal redness. No more related study was found to compare with present study.

## Conclusions

Both heat-cured acrylic resin provisional crowns and self cured acrylic resin provisional crowns maintain healthy gingiva for a period of 7 days in the oral cavity. Further research is necessary to elicit the best acrylic resin provisional crown because this result was depending on visual inspection, visual inspection with mirror and visual inspection with periodontal probe.

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