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Original Article

Effect of infection control aids on polymerization inhibition of polyvinyl siloxane impression materials – An invitro study

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ABSTRACT

Objectives: To evaluate the effect of infection control aids (latex gloves in contact with surfactants) upon polymerization during manipulation of different types of polyvinyl siloxane impression materials.

Materials: Three types of polyvinyl siloxane impression materials, (Examix, Affinis and Aquasil Ultra) were tested under four surface treatment conditions (alcohol, water, soap/water and unexposed glass surface as control) with two types of latex gloves (powdered and powder free). This resulted in a $3 \times 4 \times 2$ experimental design of 24 cells with 20 specimens each.

Methods: PVS impression material was expressed onto the glass surface conditioned with surfactant resulting in specimens ($n = 20$). The specimens were lifted from the testing surface at the applicable time, and the contact areas were examined independently by 2 of the authors to subjectively determine whether polymerization inhibition had occurred. Polymerization inhibition frequency was calculated for each group, and chi-square analysis and fissures exact test were used to determine whether there was a statistically significant relationship between polymerization inhibition in any of the study conditions ($P < 0.05$).

Results: The results of this data showed significant increase in the polymerization inhibition of Examix and Affinis along with glove/alcohol combination. Comparison of the powdered/powder free glove groups found that there is no significant difference between these groups.

Conclusion/clinical significance: Use of latex gloves along with alcohol should be avoided (simulation can happen during clinical practice) while manipulating polyvinyl impression materials.

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1. Introduction

Accuracy and dimensional stability of impression materials have been the traditional goals of researchers and clinicians. Due to a host of contingencies, many dentists do not pour their own impressions immediately. Thus impressions must be stable enough to produce accurate casts over extended periods of time. This need for a more stable, accurate, and elastic impression material sponsored the introduction of elastomers into dentistry.¹ Polyvinyl siloxane (PVS) impression materials, also known as addition reaction silicones are among the most popular non-aqueous elastomeric impression materials used in dentistry. These materials provide excellent accuracy and records fine detail and have demonstrated excellent elastic recovery.^{2,3} A thorough understanding of the composition, physical properties, and manipulative variables of these materials is essential to achieve predictable success. Infection control guidelines require the use of protective gloves.

Various disinfectants like isopropyl alcohol are used to clean the surfaces. Problems with the retarded polymerization of PVS impression materials have been associated with sustained exposure to certain latex gloves, when the impression material is in contact with a rubber dam, and even by indirect intraoral contact of teeth and soft tissue structures with latex gloves before impression making.

Reitz et al studied the inhibition of polymerization of numerous brands of regular body PVS materials and addition and condensation silicone putty impression materials. They found that certain glove/brand/condition combinations had no effect, whereas others inhibited the polymerization of the impression material.³⁻⁵

Aim of this study was to evaluate the effect of latex gloves in contact with various surfactants upon polymerization of different types of PVS impression materials and to find out the difference between the effect of powdered and powder free latex gloves upon PVS impression materials.

2. Materials and method

A glass slab served as the test surface to be impressed. A combination of three independent variables were used.

1. Two types of latex gloves Trikasafe, Trikaya Marketing, India (a powdered glove and a powder free glove).
2. Three types of polyvinyl siloxane impression materials (Aquasil Ultra/DENTSPLY, Affinis/COLTENE and Examix/GC).
3. Four surface treatment conditions (Glass surface rubbed with wet glove washed with soap and water, with glove wetted with tap water, simultaneously with alcohol gauze and glove, unexposed which served as a control).

This resulted in a $2 \times 3 \times 4$ experimental design of 24 cells with 20 specimens each.

A clean glass slab surface was exposed to the various combinations of variables to simulate clinical contamination resulting from contact by gloved hands. The slab was first

cleaned by washing with soap water, followed by rinsing with tap water for 60 s and drying. The slab was left unexposed (control) and the remaining three were subjected to applicable independent variables.

Thus, 3 of the test areas were exposed to rubbing contact for 30 s by use of 1 of the gloves/surfactant conditions.

In the water/soap/rinse treatment, the gloves were washed with soap water for 30 s and then rinsed with water, after which the glass surface was rubbed for 30 s. In the gloves wetted with water group, the test surface was rubbed for 30 s with a glove after it had been briefly wetted with tap water. The glove and alcohol treatment consisted of holding an alcohol saturated 2 inch \times 2 inch gauze pad with the glove and rubbing the glass surface for 30 s, ensuring that both glove and gauze pad simultaneously contacted the glass surface. The fourth glass slab was not exposed and served as control.

Immediately after the described timed exposures, the glass surface was air dried with an air syringe until no residual moisture was evident. With the manufacturer's cartridge dispenser and corresponding mixing tubes, PVS impression material was expressed onto the glass surface resulting in specimens ($n = 20$), of 15 mm in diameter. 15 min is allowed for polymerization (Fig. 1).

The individual who dispensed the impression materials lifted the specimens from the testing surface after 15 min, and the contact areas were examined independently by 2 of the authors to subjectively determine whether polymerization inhibition had occurred (Fig. 2). When the PVS residue remained on the glass surface/oily surface/rippled appearance on the impression surface of the specimen was rated as inhibited. The absence of residue resulted in a rating of "no inhibition".

Polymerization inhibition frequency was calculated for each group, and chi-square analysis and Fisher's exact test were used to determine whether there was a statistically significant relationship between polymerization inhibition and any of the study conditions ($P < 0.05$).

Rodney H. Jones et al, used following criteria's to score polymerization inhibition of impression surface. Inhibited

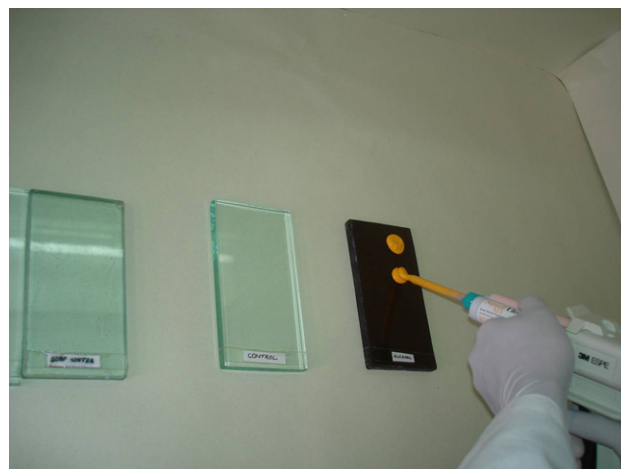


Fig. 1 – Impression material impressed with the dispensing gun upon the glass surface.

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