Saudi Dental Journal (2017) **xxx**, xxx–xxx

King Saud University

Saudi Dental Journal

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ORIGINAL ARTICLE

Comparative evaluation of dimensional stability of impression materials from developing countries and developed countries after disinfection with different immersion disinfectant systems and ultraviolet chamber

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Received 28 April 2017; revised 13 October 2017; accepted 25 November 2017

KEYWORDS

Dimensional stability;
Immersion systems;
Ultraviolet chamber;
Addition silicone;
Alginate;
Sodium hypochlorite;
Glutaraldehyde

Abstract *Objectives:* It was to analyse and compare the effect of different disinfectant systems on the dimensional stability of commonly used irreversible hydrocolloid and addition silicone impression materials from developing countries as compared to materials from developed countries.

Material and methods: Disinfectant systems used were glutaraldehyde, sodium hypochlorite and ultraviolet chamber. The stability after disinfection of commonly used alginate and addition silicone of native origin (Algin-Gum & Ad-Sil) was compared with similar impression materials from developed countries (Vignette and Aquasil) and results compared. A CAD/CAM manufactured stainless steel die simulating maxilla with four metal studs at canine and molar region was used. Impressions were made and disinfected after rinsing and drying and casts poured. The cross arch distance, interabutment distance and the occluso-gingival length of the studs was measured under traveling microscope and observations were recorded and compared. ANOVA test and Bonferroni test was applied.

Results: An increase in the interabutment and cross arch distance and decrease in occluso-gingival height was seen in the casts obtained. Glutaraldehyde immersion showed variation in the interabutment and cross arch distance for all materials studied. Ultraviolet chamber and sodium

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Peer review under responsibility of King Saud University.

Production and hosting by Elsevier

https://doi.org/10.1016/j.sdentj.2017.11.005

Please cite this article in press as: Samra, R.K., Bhide, S.V. Comparative evaluation of dimensional stability of impression materials from developing countries and developed countries after disinfection with different immersion disinfectant systems and ultraviolet chamber. Saudi Dental Journal (2017), https://doi.org/10.1016/j.sdentj.2017.11.005

hypochlorite produced best results. Dimensional stability of impression materials like Vignette, Algin-Gum & Aquasil was found to within clinically acceptable limits after disinfection while maximum deviation was seen with Algin-Gum.

Conclusion: Evaluated materials can be safely disinfected with sodium hypochlorite and ultraviolet chamber. Addition silicone of native origin is at par with impression materials from developed countries but same cannot be said about alginate.

1. Introduction

The impression material can act as a vehicle for the transfer of bacteria and fungi (Minagi et al., 1986). In a healthy patient, the chances of cross contamination are minimal but in the diseased and debilitated patients, chances of cross infection to the dental personnel and patients are high and can pose a serious threat if proper precautions are not taken. Thus there is a need for an effective system for prevention of cross contamination without causing dimensional changes in the impression.

Studies have focused attention towards the elimination of micro-organisms with various disinfectants as regards to their duration without causing dimensional changes (Minagi et al., 1986). A change in the dimensions can have profound bearing on the success of the prosthesis being finally placed in the patient's mouth. This has been the most important reason for the dental personnel being negligent towards disinfection of impressions so as not to lose the details.

Immersion method with various disinfection solutions and spray disinfection have been tested and proven to be effective for the purpose (Council, 1996). However, the most reliable method is immersion as the disinfectant solution comes in contact with all surfaces of the impression material and tray. In 1996, the American Dental Association Council on Dental Materials recommended spray disinfection for irreversible hydrocolloid, immersion disinfection for polysulphide and addition silicone whereas for polyether, spraying with chlorine compound was recommended for 2–3 min (Council, 1996). Merchant VA concluded that efficacy of disinfection by immersion is preferable as sprayed disinfectant tends to pool and thus all surfaces of the impression are not covered (Merchant, 1989). Irreversible hydrocolloid materials are organic and hydrophilic thus facilitating retention and growth of microorganisms. It was reported in several studies that disinfection of alginate impressions by immersion did not cause clinically significant changes on the dimensional stability of the resultant casts (Minagi et al., 1986; Herrara and Merchant, 1986; Durr and Novak, 1987; Setcos et al., 1984). Later studies support immersion disinfection for polyether, hydrophilic-addition silicone and irreversible hydrocolloid impressions with recommended times and disinfectants (Tullner et al., 1988; Thouati et al., 1996; Kern et al., 1993; Rios et al., 1996).

New methods to disinfect impressions have been introduced like the autoclave chamber, microwave and ultraviolet chamber and the results have been evaluated (Boylon et al., 1987; Ishida et al., 1991). Research is going on for a material which is easy to use and incorporates the disinfectant without affecting the dimensional stability of the impressions.

In market today, most of the dental products are from developed countries. Developing countries are also producing products of native origin and trying to be at par with international standards. Many studies have been conducted on the dimensional stability of the international products from developed countries after disinfection but evaluation of products from developing countries has not been carried out extensively to see their stability. Irreversible hydrocolloid is one of the impression materials frequently used in the making of a fixed prosthesis. Alginate impressions are used extensively in dentistry for making diagnostic casts, check impressions and making impressions for provisional crowns. The other material taken up in this study is addition silicone which is one of the most accurate impression materials. In this study, the effect of commercially available disinfectants like 2% glutaraldehyde, 5.25% sodium hypochlorite and the ultraviolet rays on the dimensional stability of commonly available and extensively used irreversible hydrocolloid and addition silicone from international brands and the same materials from developing countries was studied and the results were recorded and compared.

2. Material and methods

The study was conducted in the Prosthodontics Department. The dimensional stability of the impressions was assessed indirectly by measuring specific dimensions on gypsum casts which were recovered from impressions of a stainless steel metal die designed by CAD/CAM technology (Shivam Technology Lab., Pune) resembling human dental maxillary arch

Fig. 1 CAD/CAM designed stainless steel die.

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