

Efficiency of an Organic Disinfectant on Alginate Impressions-A Pilot Study

* Priti Jha¹, Ashmitha K. Shetty² and Latha Anandakrishna³

*Corresponding Author E-mail: pritijs77@gmail.com

Contributors:

¹Ex Post Graduate Student,
²Associate Professor, ³Professor and Head, Department of Pedodontics and Preventive Dentistry, Faculty of Dental Sciences, M.S. Ramaiah University of Applied Sciences, Bengaluru - 560054

Abstract

Background-Dental impressions are routinely taken in our pediatric dental practice. The risk of cross infection control is an imperative issue in dental operative even when dealing with non-invasive procedures. The use of effective disinfection procedures after taking alginate impression becomes important in operator to prevent cross-contamination. **Aim-**The present study focused on evaluating the anti-microbial efficiency of an organic disinfectant Ecosan[®] on commonly used impression material alginate after oral contact. **Material and Methods-**Alginate impressions were made of 10 healthy children and the selected impression area to be studied was dissected in the first permanent molar & second deciduous molar area into two halves. One half was disinfected with Ecosan[®] for 10 mins and the other was only rinsed with water which served as the control group. The microbial colony was counted and compared in both groups after inoculation and incubation in nutrient media. **Results and Conclusion-** Statistical analysis was done using. Statistically significant difference ($p < 0.05$) was obtained by using Wilcoxon signed rank test between the colony forming units of both the groups.

Keywords: Alginate Impression, Disinfection

1. INTRODUCTION

Infectious microorganism and their potential to transmit disease in dental operatory are considered to be a prevailing issue in dentistry¹. Presences of pathogenic organisms on dental tools including dental impressions are frequently the cause of cross infection to dental personnel²⁻⁵. Since the impression and other prosthetic materials are the main sources that can potentially transfer the microorganisms from the patient's mouth to dental laboratory, they should be rinsed thoroughly and disinfected before delivering to the laboratory^{1,2,6,7,8,9}. The impression can be disinfected through immersion or spraying with a disinfectant. Although immersion technique is more efficient in eliminating the microorganisms, spraying method decreases the alteration of the impression^{6, 8, 10, 11}. Cleaning with water alone is not only inadequate in eliminating the oral pathogens but also may add to spreading a significant number of remaining bacteria over the surface of the dental impression^{6, 12}.

Disinfectants have the ability to disinfect the product by almost eliminating all forms of pathogenic microorganisms on objects. As compared to sterilization it could be less fatal

process, as it would not be successful in taking away endospore forms of bacteria¹³. Dental clinic and laboratory setting are at high risk for contact infections and thus American Dental Association (ADA) has suggested disinfection of dental impression made in the dental clinic. This could reduce the cross contamination and efficiently reduce microbial infection during dental procedures^{14, 15}.

Generally in dental practice, dental impression is washed under tap water despite the fact that studies have shown to 40% bacteria is removed and on the other hand studies have shown upto 90% elimination of microorganism¹⁶. As impressions and occlusal registration indices do not withstand heat treatment, chemical disinfection has until now been the method of choice^{17,18,19,20}.

Disinfectants chemicals are available as solution or spray for dental impressions. The disinfectants used are chemical containing aldehydes, alcohols, phenols, chloride and iodine combinations, ammonium and biguanides²¹. Disinfectants available are mainly made of synthetic chemicals which could cause



deleterious effect to human health. Options of organic and natural product with efficient disinfectant property would be non-toxic approach to prevent cross infection.

Ecosan® an herbal disinfectant with primary active ingredient as natural polymer of glucosamine, which has similar characteristic and structure of honey. The presence of quaternary ammonium compound is used as an emulsifying agent. The natural anthraquinones in the form of aloin from Aloe Vera also boosts its antimicrobial property. This natural polymer of glucosamine in combination with Aloe Vera has bioactive properties, wound healing, haemostatic, and tissue regeneration. Its disinfective property has not been assessed although it has promising antimicrobial property. Thus, study was designed to assess the effect of Ecosan® as disinfectant when compared to washing of alginate impression with plain water.

2. MATERIALS and METHODS

An in-vitro comparative study requiring swabs taken from alginate dental impression of patients was conducted after obtaining ethical approval from the Institutional Review Board of Ramaiah University of Applied Sciences. 10 children in the age range of 6-10 years visiting the outpatient Department of Pedodontics and Preventive Dentistry were part of the study. Children in the age range of 6-10 years having caries free lower permanent first molar and primary second molar were included in the study. Children with any systemic disease or salivary gland pathology were excluded from the study.

Procedure:

A sectional impression in the mandibular first permanent molar and primary second molar area was made. The impression was dissected into 2 equal halves (Fig. 1). One half was disinfected by immersing in Ecosan® (Test group) for 10 minutes (Fig. 2). To remove the traces of disinfectants on the impression material it was rinsed for 15 minutes with distal water. The other half was rinsed under running tap water (Control group). A sterile swab was swiped with sterile cotton for both the halves of the alginate impression. The swabs inoculated into 5 ml Luria-Bertani (LB) medium. The medium were

incubated at 37°C (Figure 3). The cultures were serially diluted and plating was done using 10 µl of the sample and incubated overnight. The colony forming units were then counted for both groups.

Statistical Analysis: To assess the statistical significant difference between the two groups Wilcoxon signed rank test was performed.



Figure 1: Impression was dissected into 2 equal halves



Figure 2: Disinfected by immersing in Ecosan® for 10 minutes

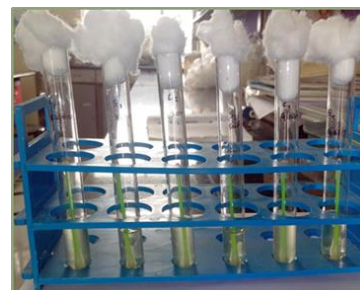


Figure 3: Inoculation of Cotton swabs

3. RESULTS

Results showed that mean bacterial count for the tap water group was 210 x 10⁶ CFU/ml whereas for the Ecosan® group it was 1.3 x 10⁶ CFU/ml (Figure 4 and 5). The 2 groups showed statistical difference ($p \leq 0.05$) (Table 1).

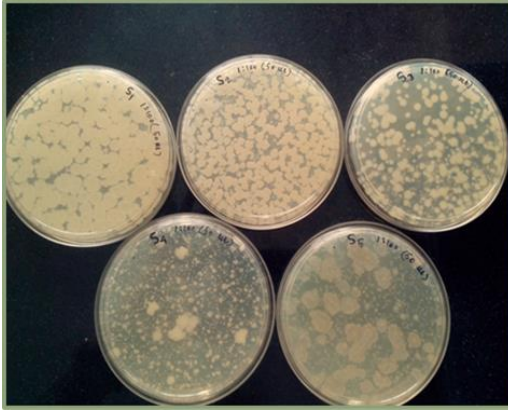


Figure 4: Ecosan Group (Test group)

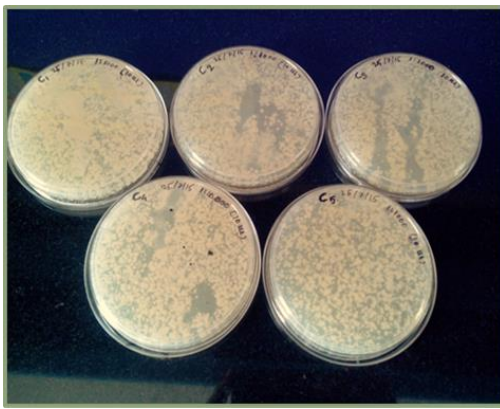


Figure 5: Water-Wash Group (Control Group)

4. DISCUSSION

Alginate impressions act as a vehicle for transmission of microorganisms and disinfection with the commercially available natural disinfectant Ecosan[®] reduced the microbial load when compared to simply washing with tap water (1.3×10^6 CFU/ml vs. 210×10^6 CFU/ml).

Table 1: Quantification of microorganisms showing Mean Bacterial Count with respect to Ecosan[®] and Tap water

Mean Bacterial Count (Cfu/MI)	Ecosan [®] Group	Tap Water Group	P Value
	1.3×10^6	210×10^6	$p \leq 0.05$

Simple rinsing with water would not apparently remove all blood and saliva due to the presence

of salivary adhesive proteins and salivary mucins on the impression surface²². Hazardous microorganisms like Staphylococcus aureus, Methicillin resistant Staphylococcus, Candida albicans and Pseudomonas aeruginosa with rate of 55.6%, 25.9%, 25.9%, and 5.6%, respectively²³. There is always a high risk for transfer of opportunistic pathogens from oral cavity to alginate impression²². Use of commonly available chemical disinfectant like sodium hypochlorite showed 99.9% decrease in the microbial count when compared to rinsing with water which is 48.5%²⁴. Ecosan[®] the natural polymer of glucosamine in combination with Aloe Vera has bioactive properties used for wound healing. It has been used for disinfection of surgical instruments, endoscopes, equipments, labs & other infection prone areas. In this study, for the first time the antimicrobial effect of Ecosan[®] on impression materials was investigated. Disinfecting dental impressions 75.9% of the respondents reported washing the impression under running water as a routine practice whereas only 24.1% of the respondents reported use of chemical disinfectants even though the literature clearly states that simple washing with tap water can leave a substantial load of microorganisms on impression surfaces²⁴. The present study was restricted to aerobic bacteria but the actual microbial load in alginate samples after mouth contact would be much higher. The effect of the Ecosan[®] on dimensional changes also has to be assessed. Replacing harmful chemical disinfectants by milder and efficient organic disinfectants is crucial to avoid any threat to the health of the dental operators.

5. CONCLUSION

In comparison to using water for cleaning alginate impression Ecosan[®] proves to be a promising natural disinfectant for dental impressions but requires further studies & comparison with other chemical disinfectants.

REFERENCES

- [1] Bergman B. Disinfection of Prosthodontic Impression Materials: A Literature Review. *Int. J Prosthodont.* 1989; 2:537–42.
- [2] Cottone JA, Molinari JA. Selection for Dental Practice of Chemical Disinfectants and Sterilants

- for Hepatitis and AIDS. *Australian Dental Journal*. 1987; 32:368–74.
- [3] Egusa H, Watamoto T, Matsumoto T, Abe K, Kobayashi M, Akashi Y, Clinical Evaluation of the Efficacy of Removing Microorganisms to Disinfect Patient-Derived Dental Impressions. *International J Prosthodont*. 2008; 21:531–8.
- [4] Nassar U, Chow A K., Surface Detail Reproduction and Effect of Disinfectant and Long-Term Storage on the Dimensional Stability of a Novel Vinyl Polyether Silicone Impression Material. *Journal of Prosthodont*. 2015; 24: 494–8.
- [5] Nejatidanesh F, Khosravi Z, Goroohi H, Badrian H, Savabi O. Risk of Contamination of Different Areas of Dentist's Face During Dental Practices. *International Journal of Prev Med*. 2013; 4: 611–5.
- [6] Al-Jabrah O, Al-Shumailan Y, Al-Rashdan M. Antimicrobial Effect of 4 Disinfectants on Alginate, Polyether, and Polyvinyl Siloxane Impression Materials. *International Journal of Prosthodont*. 2007; 20: 299–307.
- [7] Blair FM, Wassell RW. A Survey of the Methods of Disinfection of Dental Impressions Used in Dental Hospitals in the United Kingdom. *Br Dental J*. 1996; 180:369–75.
- [8] Nejatidanesh F, Bagheri KP, Shahtousi M, Talaei M, Savabi O. Disinfection of Polyether Impression Materials with Hydrogen Peroxide Solution Containing Silver Ion. *J Isfahan Dent Sch*. 2010; 5:181–8.
- [9] Izadi A, Farnaz F, Soufiabadi S, Vafae F, Kasraei S. Antibacterial Effect of Sanosil 2% and 6% and Sodium Hypochlorite 0.5% on Impressions of Irreversible Hydrocolloid (Alginate) and Condensational Silicone (Speedex) *Avicenna J Dent Res*. 2014;5:e21107.
- [10] Dorner AR, Ferraz da Silva JM, Uemura ES, Borges AL, Fernandes Junior VB, Yamamoto EC. Effect of Disinfection of Irreversible Hydrocolloid Impression Materials with 1% Sodium Hypochlorite on Surface Roughness and Dimensional Accuracy of Dental Stone Casts. *European J Gen Dent*. 2014; 3:113.
- [11] Muzaffar D, Braden M, Parker S, Patel MP. The Effect of Disinfecting Solutions on the Dimensional Stability of Dental Alginate Impression Materials. *Journal of Dental Materials*. 2012; 28:749–55.
- [12] McNeill MR, Coulter WA, Hussey DL. Disinfection of Irreversible Hydrocolloid Impressions: A Comparative Study. *International Journal of Prosthodont*. 1992; 5:563–7.
- [13] Naylor WP. Infection Control in Fixed Prosthodontics. *Dental Clinics of North America*. 1992 Jul; 36(3):809-31.
- [14] Council on Dental Materials, Instruments and Equipment. Disinfection of Impressions. *J Am Dent Assoc*. 1991; 122:110.
- [15] Best M, Sattar SA, Springthorpe VS, Kennedy ME. Efficacies of Selected Disinfectants against Mycobacterium Tuberculosis. *Journal of Clinical Microbiology*. 1990 Oct 1; 28(10):2234-9.
- [16] Al-Jabrah O, Al-Shumailan Y, Al-Rashdan M. Antimicrobial Effect of 4 Disinfectants on Alginate, Polyether, and Polyvinyl Siloxane Impression Materials. *International Journal of Prosthodontics*. 2007 May 1; 20(3).
- [17] Beyerle MP, Hensley DM, Bradley DV, Schwartz RS, Hilton TJ (1994) Immersion Disinfection of Irreversible Hydrocolloid Impressions with Sodium Hypochlorite. Part 1: Microbiology. *International Journal of Prosthodont* 7:234–238.
- [18] Jennings KJ, Samaranayake LP (1991) The Persistence of Microorganisms on Impression Materials Following Disinfection. *International Journal of Prosthodont* 4:382–387.
- [19] Look JO, Clay DJ, Gong K, Messer HH (1990) Preliminary Results from Disinfection of Irreversible Hydrocolloid Impressions. *J Prosthet Dent* 63:701–707.
- [20] Wilson SJ, Wilson HS (1987), The Effect of Chlorinated Disinfecting Solutions on Alginate Impressions. *Rest Dent* 3:86–89.
- [21] Ahmad S, Tredwin CJ, Nesbit M, Moles DR. Effect of Immersion Disinfection with Perform-ID on Alginate, an Alginate Alternative, an Addition-Cured Silicone and Resultant Type III Gypsum Casts. *British Dental Journal*. 2007 Jan; 202 (1):E1.
- [22] Egusa H, Watamoto T, Matsumoto T, Abe K, Kobayashi M, Akashi Y, Yatani H. Clinical Evaluation of the Efficacy of Removing Microorganisms to Disinfect Patient-Derived Dental Impressions. *International Journal of Prosthodontics*. 2008 Nov 1; 21(6).
- [23] Correia-Sousa J, Tabaio AM, Silva A, Pereira T, Sampaio-Maia B, Vasconcelos M. The Effect of Water and Sodium Hypochlorite Disinfection on Alginate Impressions. *Revista Portuguesa de Estomatologia, Medicina Dentaria E Cirurgia Maxilofacial*. 2013 Jan 1; 54(1):8-12.
- [24] Marya CM, Shukla P, Dahiya V, Jnaneswar A. Current Status of Disinfection of Dental Impressions in Indian Dental Colleges: A Cause of Concern. *The Journal of Infection in Developing Countries*. 2011 Nov 9; 5(11):776-80.

