

Short Communication**Comparison of *Candida Albicans* Adherence to Conventional Acrylic Denture Base Materials and Injection Molding Acrylic Materials**Masoomeh Aslanimehr ¹, Shirin Rezvani ², Ali Mahmoudi ³, Najmeh Moosavi ⁴¹ Dept. of Microbiology, Cellular and Molecular Research Center, Qazvin University of Medical Sciences, Qazvin, Iran.² Dental Caries Prevention Research Center, Qazvin University of Medical Sciences, Qazvin, Iran.³ Dentist, Private Practice, Shiraz, Iran⁴ Dept. of Prosthodontics, School of Dentistry, Qazvin University of Medical Sciences, Qazvin, Iran.**KEY WORDS**

Candida albicans;

Acrylic Resins;

Denture;

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Accepted July 2016;**ABSTRACT****Statement of the Problem:** Candida species are believed to play an important role in initiation and progression of denture stomatitis. The type of the denture material also influences the adhesion of candida and development of stomatitis.**Purpose:** The aim of this study was comparing the adherence of *candida albicans* to the conventional and injection molding acrylic denture base materials.**Materials and Method:** Twenty injection molding and 20 conventional pressure pack acrylic discs (10×10×2 mm) were prepared according to their manufacturer's instructions. Immediately before the study, samples were placed in sterile water for 3 days to remove residual monomers. The samples were then sterilized using an ultraviolet light unit for 10 minutes. 1×10⁸ Cfu/ml suspension of *candida albicans* ATCC-10231 was prepared from 48 h cultured organism on sabouraud dextrose agar plates incubated at 37°C. 100 µL of this suspension was placed on the surface of each disk. After being incubated at 37°C for 1 hour, the samples were washed with normal saline to remove non-adherent cells. Attached cells were counted using the colony count method after shaking at 3000 rpm for 20 seconds. Finally, each group was tested for 108 times and the data were statistically analyzed by t-test.**Results:** Quantitative analysis revealed that differences in colony count average of *candida albicans* adherence to conventional acrylic materials (8.3×10³) comparing to injection molding acrylic resins (6×10³) were statistically significant (*p*<0.001).**Conclusion:** Significant reduction of *candida albicans* adherence to the injection acrylic resin materials makes them valuable for patients with high risk of denture stomatitis.**Corresponding Author:** Rezvani Sh., Dental Caries Prevention Research Center, Qazvin University of Medical Sciences, Bahonar Blvd., Qazvin, Iran. Tel: +98-912-6457156 Fax: +98-28-33353066 Email: shirin_rezvani@yahoo.comCite this article as: Aslanimehr M., Rezvani Sh., Mahmoudi A., Moosavi N. Comparison of *Candida Albicans* Adherence to Conventional Acrylic Denture Base Materials and Injection Molding Acrylic Materials. J Dent Shiraz Univ Med Sci., 2017 March; 18(1): 61-64.**Introduction**

Denture-induced stomatitis is a common infection in complete or partial denture wearers. Depending on the extent and severity of the infection, it is classified in three types. Type I is a localized simple inflammation or pinpoint hyperemia. While in type II, the erythematous area involves a portion of or the entire surface of the denture covered mucosa. Type III is a combination

of type I and II in addition to a granular inflammatory hyperplasia which usually involves the midline of the hard palate and alveolar ridges. [1]

Among many etiological and predisposing factors, candida species are believed to play an important role in initiation and progression of this infection. [2] The impression surface of a maxillary denture in particular may be a common reservoir for microorgan-

isms. *Candida albicans* is the most important and predominant oral fungal pathogen. It has the ability to adhere and proliferate on both soft and hard tissues, forming complex biofilm structures. [3] This depends on initial attachment to the denture impression surface, which in turn depends on physical properties of the material surface such as porosity, surface free energy, hydrophobicity, [4] and roughness. [5] These variables are all influenced by type of the materials used in preparing dentures, their polymerization method, and any surface modifications in corporation of fibers or surface coating. [6]

Injection molding acrylics are among most popular denture base materials these days. It is less laborious and less prone to errors in comparison with conventional compression molding. Good dimensional stability and suitable tissue adaption are other advantages of this technique. [7] According to the factory assertion, these material show less plaque adhesion; therefore, less denture induced stomatitis is probable in patients wearing dentures made of injection molding resins. This study was designed to evaluate *Candida albicans* adherence of injection molding resins in comparison with conventional pressure pack ones.

Materials and Method

Twenty injection molding materials (Bre.Crystal; Bredent, Germany) and 20 Conventional Pressure Pack (Meliodent® Heat Cure; HeraeusKulzer, Germany) acrylic resins were prepared in accordance with their manufacturer's instructions. Forty Acrylic resin samples (18 sample discs for each group, 2 negative, 2 positive) were adjusted to remove excess material and trimmed into 10-mm² sections (10×10×2mm) (Figure 1).

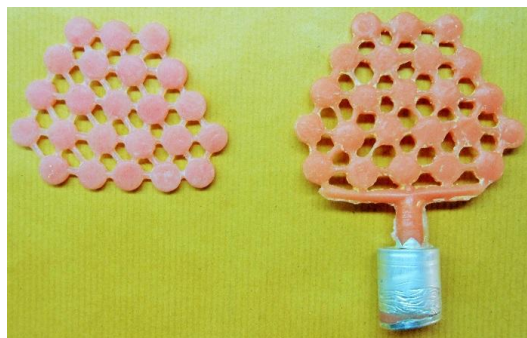


Figure 1: Prepared sample discs with conventional pressure pack acrylic resins (on the left) and injection molding acrylic resins (on the right)

Acrylic disks were polished with a particular sequence of bures and stones, by one technician with controlled hand pressure in order to reach nearly the same polished surface in all acrylic disks (Figure 2).

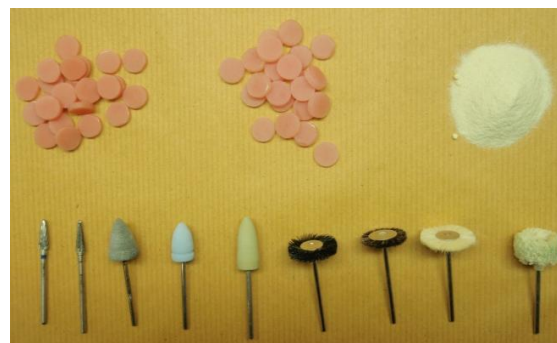


Figure 2: Sequence of acrylic disks polishing

Samples were then placed in sterile water for 3 days to remove any residual monomers. Immediately prior to perform the microbiological study, samples were sterilized using an ultraviolet light unit for 10 minutes. Cultivated *candida albicans* ATCC-10231 on sabouraud dextrose agar (SDA) was used as a test organism. Fungal suspension was prepared from 48-hour cultures on SDA plates that were incubated at 37°C and standardized to 1×10^8 Cfu/ml in a sterile normal saline to achieve the equivalent turbidity of 0.5 McFarland standards. A 100 µL of this suspension was placed on the surface of each acrylic resin discs. Each sample was incubated at 37°C for 1 hour and then washed with normal saline for 5 seconds to remove non-adherent cells. Attached cells were removed from the acrylic discs by shaking at 3000 rpm for 20 seconds. The *candida albicans* was quantified by using the colony count method. Finally, each group was tested for 108 times. The data were statistically analyzed by t-test.

Results

Quantitative analysis of *candida albicans* attachment to either conventional pressure pack, or injection molding acrylic resins revealed that there was statistical difference between two groups of resin examined. The average of adherent cells counted (Figure 3) for injection molding acrylic disks was 6×10^3 Cfu/ml and for conventional acrylic denture base disks was $8/3 \times 10^3$ Cfu/ml which showed less *candida albicans* adherent for injection molding acrylic resins and this difference was sta-

Table 1: *Candida albicans* colony count of each group after 24 hours of incubation (cfu/ml)

Groups	Conventional pressure pack acrylic resin disks	All CPP positive groups	All CPP negative groups	Injection Molded acrylic resin disks	All IM positive groups	All IM negative groups
Average	8.3×10^3	8.5×10^4	0	6×10^3	6.1×10^4	0

tistically significant ($p < 0.001$). The comparative results of both groups are shown in Table 1.

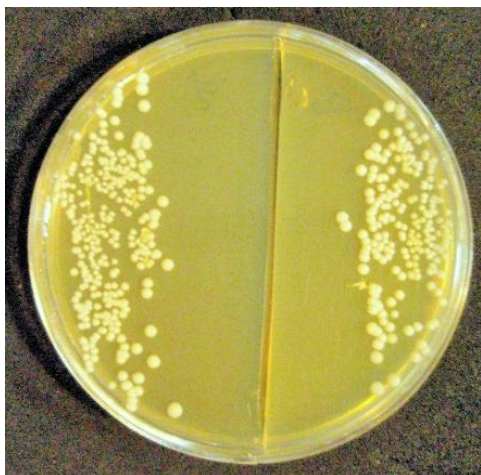


Figure 3: Growth of adherent *Candida albicans* cells on SDA-sabouraud dextrose agar

Discussion

As mentioned before, denture stomatitis is a common condition where inflammation and redness of the oral mucous membrane occurs beneath a denture, mostly beneath the maxillary denture. There are many risk factors related to this condition but in about 90% of cases, candida species are involved. Many studies have shown that the adherence of this microorganism to the denture base materials is the first step towards the initiation of denture-induced stomatitis. [8]

He XY *et al.* studied the adherence of all groups of candida species such as *C.krusei*, *C.glabrata*, *C.albicans* and *C.dubliniensis* to different denture base acrylic materials. The result showed that the adherence of all candida species to the acrylic denture base materials were positive. [9]

However, recent data showed that the materials used as denture base may have a great impact on *Candida albicans* adherence and initiation of denture stomatitis. [6, 8, 10-11] Studies show that the amount of *Candida albicans* collected from the mucosal part of a denture was much more than those collected from the mucous membrane tissue beneath the denture. [12] This means the adherence of candida albicans could be controlled or prevented by using a better material with

better quality related to the adherence of candida species. The studies of Falahati *et al.*, [8] Al-Bakri *et al.*, [11] and Akalin-Evren *et al.* [12] on the adherence of *Candida albicans* to acrylic denture base materials with different characteristics also proved the importance of the materials and their characteristics in the amount of the *Candida albicans* adhesion. Their data showed that modifying denture base acrylic materials may significantly increase or decrease the amount of the candida adhesion. [8, 11-12]

In this study, conventional pressure pack and injection molded acrylic denture base materials were selected due to their vast usage in dentistry and sporadic studies about their comparison from the point of view of *Candida albicans* adherence. *Candida albicans* was also selected for the microorganism choice of contamination because of its bold roll of initiation of denture stomatitis.

Based on the data collected in this study, *Candida albicans* adherence to injection molded acrylic materials was less than the amount adhered to the conventional pressure pack acrylic resins and the results were statistically significant ($p < 0.001$). This result could be due to the difference in preparing techniques of both materials. Injection molding resins are available in premixed cartridges while in conventional technique powder and liquid are mixed by hand which could lead to entrapment of air bubbles and increased surface porosity. The difference in other physical properties like surface free energy, hydrophobicity, and roughness could be possible reasons for this difference.

Zeina M.A. *et al.* [13] revealed that the *Candida albicans* adherence to the injection molded acrylic materials was less than the amount adhered to the conventional pressure pack acrylic resins; this is in line with the results of the recent study. On the other hand, Young *et al.* study [10] stated that the *Candida albicans* adherence to injection molded acrylic materials did not show any significant differences in comparison with conventional pressure pack and self-cured acrylic resins. The reason for the difference between the results of Young's study and this study might be the

usage of sonication for separation of adhered *candida albicans* from the samples rather than shaking; which could have destructive effects on cell walls of *candida albicans*.

In this study, the *Candida albicans* adherence to conventional and injection molding acrylic denture base materials has been evaluated. It is recommended to use various microbial species with different denture base materials in future studies. Due to lack of enough clinical case, this study was designed in an *in vitro* environment. To achieve more clinically reliable results, performing an *in vivo* study would be appreciated. On the other hand, due to the importance of surface roughness on microbial adherence, it is highly recommended to check this parameter by using electronic microscope.

Conclusion

Within the limitations of this study, *candida albicans* adherence to injection molded acrylic materials was less than the amount adhered to the conventional pressure pack acrylic resins. This quality makes injection molding materials a better choice for denture wearers with higher risk of candidiasis.

Acknowledgments

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Conflict of Interest

None to declare.

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