

The Effect of Saturated Salt Solution on Disinfection of *C.albicans* for the Maxillary Acrylic Complete Denture (An in vivo study)

Nadira A Hatim
BDS, MSc (Prof.)

Department of Prosthetic Dentistry
College of Dentistry, University of Mosul

Rana R AL- Sumaidae
BDS, MSc (Asst. Lec.)

Department of Prosthetic Dentistry
College of Dentistry, University of Mosul

الخلاصة

الاهداف: تهدف الدراسة الى تقييم احد المنتجات الطبيعية(محلول ملح الطعام المشبع) كمطهرات للقضاء على خلايا المبيضات البيضاء للطقم الكريليكي العلوي الكلي مقارنة بأقراص المنظفات التجارية(protifex)، (دراسة داخل الفم). **المواد وطرائق العمل:** بلغ العدد الكلي للمرضى (٦٠) مريضاً أردت ذو طقم علوي كلي، تم استعمال جهاز الميكروسكوب المرتبط بالحاسوب والكاميرا. وقد تم اخذ المسحة من السطح الداخلي للطقم الكلي العلوي عند منطقة (incisive) papilla . اختبرت الدراسة فاعلية محلول الملح المشبع على القضاء على خلايا المبيضات البيضاء مقارنة بالماء المقطر و protifex (الالماني). **النتائج:** اظهرت النتائج وجود فرق معنوي بين محلول الملح المشبع و الماء المقطر، وعدم وجود فرق معنوي بين محلول الملح المشبع و protifex (الالماني)، وقد تم استعمال التحليلات الاحصائية الآتية (التحليل الوصفي وتحليل التباين(ANOVA) و Duncan Multiple Analysis Rang) وذلك عند مستوى معنوية(٠.٠٥). **الاستنتاجات:** نستنتج من هذه الدراسة ان محلول الملح المشبع ناجح جدا في القضاء على خلايا المبيضات البيضاء على سطح مادة قاعدة الطقم الاكريليكية عند التغطيس لمدة ثمان ساعات.

ABSTRACT

Aims: The aim of this study was to evaluate the effect of the natural denture cleanser saturated salt solution on disinfection of *C. albicans* for the maxillary complete denture (An in vivo study). **Materials and Methods:** An in vivo study testing anti fungal efficiency of the natural denture cleanser saturated salt solution on disinfection of *C. albicans* for 60 patient wearing maxillary complete denture by using light microscope with camera and connected to computer. The swab was taken from the fitting surface of the denture of about 2.5 cm following the median line starting from incisive papilla. This study compared the effect of disinfection between before and after immersion in distilled water (Control), saturated salt solution (Iraq), and protifex(Germany). **Results:** The results demonstrated that there were significant differences between salt solution and distilled water, that there were no significant differences between salt solution and protifex at p=0.05. **Conclusions:** saturated salt solution was very efficient for disinfection of *C. albicans* for acrylic denture base material.

Keywords: Denture Cleanser. Antifungal, Incisive papilla.

Hatim NA, AL- Sumaidae RR. The Effect of Saturated Salt Solution on Disinfection of *C.albicans* for the maxillary acrylic Complete Denture (An in vivo study). *Al-Rafidain Dent J.* 2013; 13(1): 1-6.

Received: 20/1/2010 **Sent to Referees:** 11/2/2010 **Accepted for Publication:** 20/4/2010

INTRODUCTION

Acrylic resin is the most employed material in the construction of removable complete denture. This material has been used since 1930.^(1,2) Chemical cleansing approach is recommended for plaque control.⁽³⁻⁷⁾ Every surface in the oral cavity natural or synthetic become covered within 30 minute with 0.5-1.5 μ thickness precipitate of salivary glycoprotein and immunoglobulin that is termed "pellicle".⁽⁸⁾ The pellicle in turn provide a substrate to which oral debris (mucin, food particles and desquamated epithelial cells and mi-

croorganisms "bacteria and fungi" readily adhere.⁽⁹⁾

To prevent bacterial cross-contamination among denture patients all dental prosthesis must be disinfected on entering and again on leaving the laboratory.⁽¹⁰⁾

The worldwide overuse of antibiotics has caused microorganisms to develop resistance to the current antibiotics and to become virulent, therefore, antibiotic resistance is a global problem and dentists must be involved in halting it.⁽¹¹⁾

MATERIALS AND METHODS

An in vivo study testing anti fungal efficiency of the natural denture cleanser saturated salt solution on disinfection of C. albicans for 60 patient attending clinic of Prosthodontic Department- College of Dentistry/University of Mosul having maxillary complete denture for more than 2 years, who are of age ranging from 35 to 65 year and are systemically controlled patients but excluding diabetic patients, and at least after two weeks of receiving antibiotics. The swab was taken from the fitting surface of the denture immediately after removal of the denture from the patient mouth in the afternoon were the patients instructed to wear the denture for whole day time, swab was wiped

over an area of about 2.5 cm following the median line starting from incisive papilla⁽¹⁸⁾, then the swab placed in a screw capped bottle containing (1ml) of nutrient broth as a transparent medium that is incubated for (24hrs at 37⁰C), then 0.01 ml of it is taken and plated on SDA. And incubated for (24hrs at 37⁰C), and counted as (CFU/ml) for the viable C. albicans present. While the denture itself immersed in a salt solution for 8hours, (40gm salt/100ml of tab water), then 0.01 ml of its solution taken and plated on SDA, and incubated for (24hrs at 37⁰C), then counted as (C FU/ml) for the remaining viable C. albicans colonies by using light microscope with camera and connected to computer (Figure 1).



Figure (1): *C. albicans* on SDA

The culture media were sterilized by using an autoclave at 15 pound / inch² at 121⁰C for 15min., while glass Petri-dishes, screw cap bottles and tweezers were sterilized by hot air oven at (160-180)⁰C for 1 hour.⁽¹²⁾

Identification of C.albicans were done by the following diagnostic laboratory tests: (Culture characteristics): On Sabouraud's Dextrose Agar medium with-

in (24-48) hrs. at 37 °C, Candida species produce soft creamy-coloured colonies with a yeast odor^(13,14) (Figure 1). Microscopic Examination: The smears that had been obtained from the culture of patient's specimens were examined by light microscopic using a gram's stain technique for pseudohyphae and budding cells^(14,15) (Figure 2).



Figure (2): *C.albicans*, microscopically

Germs Tube Test: In this test, a loop-full was taken from each culture, incubat-

ed in test tubes containing human serum (0.5-1) ml for about 90 min intervals at

37°C.^(14,15) Microscopic observation made for a smear obtained from each test tube. The yeast cells of *C. albicans* will begin to form germs tubes or true hyphae after 30 min.⁽¹⁶⁾ After incubation of the bacterial suspension 0.01ml. was taken and plated on Sabouroid agar for counting of *C. albicans* colonies after incubated for (24hrs at 37°C) to check the count of viable species only.

RESULTS

The number of samples, mean differences, standard deviation, standard error mean for disinfection of maxillary complete acrylic denture from *C. albicans* at 8hours of immersion were shown in (Table 1and 2).

Table (1): Descriptive statistics for disinfection of maxillary complete acrylic denture (in vivo, D.W as a control)

	GROUPS	N	Mean(CFU/ml)	S. D	S. E Mean
DATA	Salt	20	28245.0000	26990.57292	6035.27558
	DW	20	1279.0000	3199.50309	715.43064

S.D: standard deviation , S.E: standard error , N: number of samples

Table (2): Descriptive statistics for disinfection of maxillary complete acrylic denture (in vivo, Protefix as a control)

	GROUPS	N	Mean(CFU/ml)	S. D	S. E Mean
DATA	Salt	20	28245.0000	26990.57292	6035.27558
	Prot	20	14915.0000	19093.73761	4269.48952

N: number of samples , S.D: standard deviation , S.E: standard error

T- Test and mean difference for disinfection of maxillary complete acrylic denture from *C. albicans* at 8hours of immersion, when D.W was the control (Ta-

ble 3, and Figure 3) showed that there were significant differences between salt and D.W.

Table (3): T- Test for disinfection of maxillary complete acrylic denture (in vivo, D.W as a control)

t-test for Equality of Means			
	t	df	Sig.(2-tailed)
DATA	4.437	38	.000

df :degree of freedom

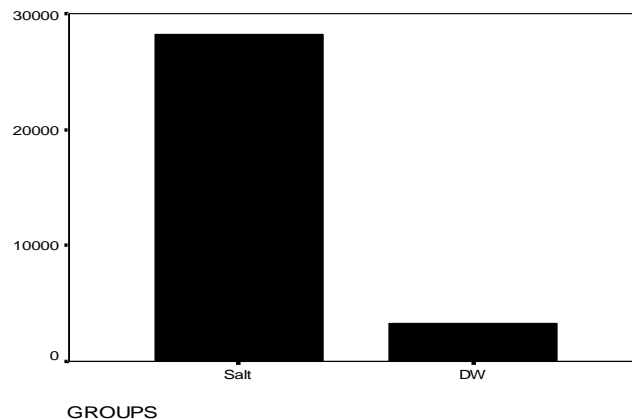


Figure (3): The mean differences for the disinfection of maxillary complete acrylic denture (in vivo, D.W as a control)

T- Test and mean difference for disinfection of maxillary complete acrylic denture from *C. albicans* at 8hours of immersion, when Protefix was the control

(Table 4 and Figure 4) showed that there were no significant differences between salt and protefix, and (Figure 5) show the result of in vivo disinfection.

Table (4): T- Test for disinfection of maxillary complete acrylic denture (in vivo, Protefix as a control)

t-test for equality of Means			
	T	df	Sig.(2-tailed)
DATA	1.803	34.208	.080

df :degree of freedom

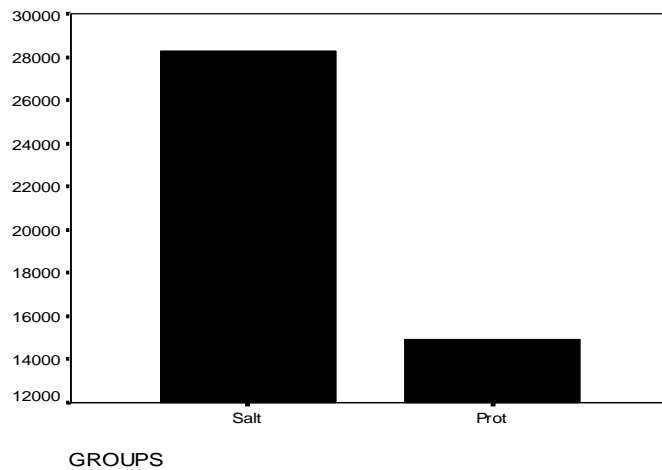


Figure (4): The mean differences for the disinfection of maxillary complete acrylic denture (in vivo, Protefix as a control)

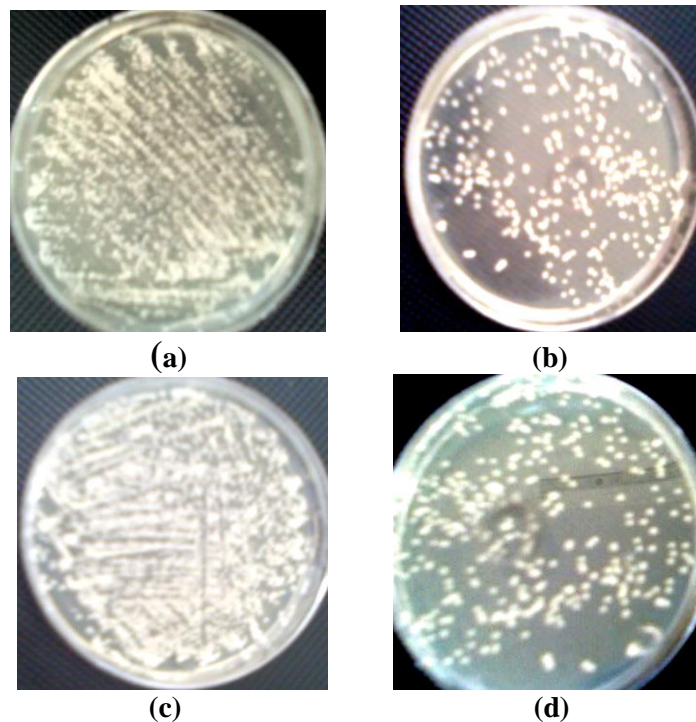


Figure (5): Disinfection of maxillary complete acrylic denture from *c. albicans* (in vivo): (a) before and (b) after immersion in saturated salt solution, and (c) before and (d) after immersion in protefix.

DISCUSSION

According to the results of the in vitro study the best prepared natural solution as a denture cleanser (for acrylic denture base material) was saturated salt solution for 8 hours immersion, swap was wiped over an area of about 2.5 cm following the median line starting from incisive papilla. Some authors⁽¹⁷⁻¹⁹⁾ were stated that *C. albicans* was isolated more frequently from the denture fitting surface than from the corresponding mucosa. Also, other explanation⁽²⁰⁾ compared between the concentration of microorganisms on the polished surface or glazed surface and the non polished or tissue surface of the denture, they stated that there is a significant difference between the concentration of microorganisms on the polished surface and the non polished or tissue surface of the denture. Table (3-4) showed that there were significant differences between saturated salt solution and distilled water (control). So, its considered effective in disinfection of acrylic denture from *C. albicans*.⁽²¹⁾ There were no significant differences between saturated salt solution and protifix that indicate that this simple, cheap, available natural product has same action as the commercial disinfectant. The effects of a cleanser in vivo are constantly challenged by the daily ingestion of food, which may explain at least part of the variability between in vivo and in vitro study.⁽²²⁻²³⁾

CONCLUSION

According to the results of this study, saturated salt solution was very efficient for disinfection of *C.albicans* for the acrylic denture base material.

REFERENCES

1. Anusavice KJ. Philips science of dental material. 10th ed., W.B.Saunders Co. 1996; Pp: 211-271.
2. Gunningham JL : Shear bond strength of resin teeth to heat cured and light cured denture base resin. *J Oral Rehabil.* 2000; 27: 312-316.
3. Pipko JD, El-Sadeek M : An in vitro investigation of abrasion and staining of dental resin. *J Dent Res.* 1972; 15: 689-693.
4. Dills SS, Olsen AM, Goldner S: Comparison of antimicrobial capability of an abrasive paste and chemical soak denture cleansers. *J Prosthet Dent.* 1988; 60:467.
5. McCabe JF, Davidmurry J, Kelly PJ: The efficacy of denture cleansers. *Eur J Prosthodont Res Dent.* 1995; 3(4): 203-207.
6. Nikawa H, Yamamoto T, Hamada T, Sodomori S: Cleansing efficacy of commercial denture cleansers: ability to reduce *Candida albicans* biofilm activity. *Int J Prosthet.* 1995; 8 :527-534.
7. Haselden CA, Hoblirk JA, Pearson GJ, Davis EH: A comparison between the wear resistance of three types of denture resin to three different dentifrices. *J Oral Rehabil.* 1998; 25:335-339.
8. Skjorland KK, Rykke M, Sonju T: Rate of pellicle formation in vivo. *Acta Odontol Scand.* 1995 ; J.53:358.
9. Carlen A ,Borjesson AC, Nickdel K: Composition of pellicles formed in vivo on the tooth surfaces in different parts of the dentition and in vitro on hydroxyapatite. *Caries Res.* 1998; 32: 447.
10. American Dental Association : Guide to dental material and devices .7th ed. Chicago, 1975; Pp:205-208, 130-136.
11. Al-Haroni M: Bacterial resistance and the dental professionals role to halt the problem. *J Dent Norway.* 2008; 36: 95-103.
12. Baker FJ, Silverton RE: Introduction to medical laboratory technology.5th ed. Butter worth's Publication, London. 1985; Pp. 350-354,465-475.
13. Koneman EW, Allen SD, Janda WM, Schreckenberger PC,Winn WC: Color Atlas and textbook of diagnostic microbiology. 5th ed. 1997; Pp 539-615.
14. Jawetz E, Melnick JK, Adelbrg EA: Medical microbiology. Lange medical book. 21st ed. Appleton and Lange, Norwalk, Connecticut/San Mateo, California.USA. 1998,Pp.603-605, 611-14.
15. Forbes BA, Sahm DF, Weissfeld AS: Bailey and Scotts: Diagnostic Microbiology.(2) 10th ed. Mosby, Inc. USA. 1998 b;65: 941-960.
16. Barlow AJ, Aldersly t, Challaway FW: Factors present in serum and plasma which promote germ tube formation and

- mycelial growth of *Candida albicans*. *J Gen microbial*. 1974 ; 82: 261-272.
17. MBahn AN, Quillman PD, Kendrick FJ.: Intra-oral localization of microorganisms. *J Dent Res*. 1962 ; 41:715.
 18. Koopmans ASF , Kippuw N , Graaff JD: Bacterial involvement in denture-induced stomatitis.(ACTA) Academic center for dentistry, Department of Prosthet Dent and Oral Microbiology. *J Dent Res*. 1988; 67(9): 1246-1250.
 19. Santarpia III RP, Renner RP, Pollock JJ, Gwinnet AJ, Brandt EC: Model system for the in vitro testing of a synthetic histidine peptide against candida species grown directly on the denture surface of patient with denture stomatitis. *J prosthet Dent*. 1988; 60:62-70.
 20. Sesma N, Lagana DC, Morimoto S, Gil C: Effect of denture surface glazing on denture plaque formation. *Br Dent J*. 2005 ; 16(2):129-134.
 21. Baltch AL, Smith R P, Franke M A, Ritz W J, Michelsen P, Bopp LH, Singh J K: Microbicidal activity of MDI-P against *Candida albicans*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Legionella pneumophila*. *Am J Infec*. 2007; 28: (3): 251-257
 22. Webb BC, Thomas CJ , Willcox MDP, Harty DWS ,Knox KW: *Candida* associated denture stomatitis: Etiology and management. A review part 2. Oral diseases caused by candida species. *Aust Dent J*. 1998b; 43(3):160-166.
 23. Gornisky M , Paradis I , Landaverde G, Malo AN, Velly AM: A clinical and microbiological evaluation of denture cleansers for geriatric patients in long-term care Institutions. *J Can Dent Assoc*. 2002; 68 (1): 39-45.