

Palatal Health of Those Wearing Complete Dentures: For How Long Must a Tissue Conditioner and Chlorhexidine Gluconate Mouthrinse be Used?

Tam Protez Hastalarında Palatal Sağlık: Doku Düzenleyiciler ve Klorheksidin Glukonat Ağız Gargaraları Ne Kadar Süre Kullanılmalıdır?

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Abstract

Objective: Palatal inflammation is usually observed in poorly cleaned dentures. The aim of this study was to retrospectively evaluate the time for which a chlorhexidine gluconate mouthrinse (CGM) and tissue conditioner (TC), which are routinely used in daily clinical practice, should be used on palatal erythema patients wearing complete dentures.

Methods: Intraoral pictures taken during the clinical treatment of palatal erythemic patients were evaluated using the Budtz-Jorgensen index. Twenty-four patients wearing complete dentures who had palatal erythema were divided into three groups (n=8): Group 1 patients applied the TC only, group 2 patients, used a 0.2% CGM only, and group 3 patients used the 0.2% CGM and denture relines with the TC. The treatment duration in all groups was 14 days. Intraoral pictures were taken from the palatal area at the baseline and at 1 and 2 weeks after treatment and were evaluated using the Budtz-Jorgensen index. The chi-square test and Wilcoxon signed-Ranks test were used to compare data (p<0.05).

Results: There was no statistically significant difference in inflammation levels among all groups at the baseline. All inflammation levels were severe (p>0.05). The group with the combined use of the TC and 0.2% CGM was found to be effective in reducing palatal inflammation.

Conclusion: The combined use of the TC and 0.2% CGM for 2 weeks is effective in the treatment of palatal inflammation due to complete dentures.

Keywords: Palatal inflammation, complete denture, tissue conditioner, chlorhexidine gluconate mouthrinse

Öz

Amaç: Tam protez kullanımı sonucu damak bölgesinde eritema olan hastaların tedavisinde rutin olarak kullanılan klorheksidin glukonat ağız gargarasının ve doku düzenleyicilerin etkisini retrospektif olarak değerlendirmektir.

Yöntemler: Kliniğimize başvuran tam protez kullanan ve palatal bölgesinde eritema bulunan hastaların klinik tedavisi süresince palatal orta hattından alınan fotoğraflar incelendi ve Butz Jorgensen İndeksine göre değerlendirildi. Hastalar 3 gruba ayrıldı (n=8). Birinci gruba doku düzenleyici, ikinci gruba sadece % 0,2'lik klorheksidin glukonat ağız gargarası verildi üçüncü gruba her iki yöntem birlikte uygulandı. Tüm gruplar için değerlendirme süresi iki hafta olarak belirlendi. Hastaların palatal orta hat bölgesinden başlangıç, tedaviden 1. hafta ve 2. hafta sonrasında ağız içi fotoğraflar çekildi. Niteliksel verilerin karşılaştırılmasında Ki-Kare testi, parametrelerin grup içi karşılaştırmalarında ise Wilcoxon işaret testi kullanıldı. Anlamlılık p<0,05 düzeyinde değerlendirildi.

Bulgular: Başlangıçta tüm grupların enflamasyon seviyeleri arasında istatistiksel olarak anlamlı bir farklılık bulunmadı. Tüm enflamasyon seviyeleri ciddi olarak skorlandı (p>0,05). Doku düzenleyici ve %0,2'lik klorheksidin glukonat ağız gargarasının birlikte kullanımının palatal enflamasyonun azalmasında etkili olduğu görüldü.

Sonuç: Tam protez kullanımı sonucu meydana gelen palatal enflamasyon tedavisinde 2 haftalık doku düzenleyici ve %0,2'lik klorheksidin glukonat ağız gargarasının kullanımı etkilidir.

Anahtar kelimeler: Palatal enflamasyon, tam protez, doku düzenleyici, klorheksidin glukonat ağız gargarası

INTRODUCTION

Denture stomatitis is a term used to describe certain pathologic changes found in the oral mucosa, and two-thirds of the elderly population wearing complete dentures have problems with their palatal and gingival mucosae (1-10). It usually affects the hard palate and occasionally causes angular cheilitis (2, 6, 11). Bright erythematous areas, frequently seen on the maxilla, have been found on the oral mucosa under complete or partial dentures in both jaws; they are frequently seen on the maxillae. The frequency of denture stomatitis has been reported to vary from 10% to 67%. It is seen mostly in women, and its prevalence increases with age (2, 6, 10-14).

Causes of denture stomatitis are multifactorial. The primary etiological factor is *Candida albicans*. However, other factors may also be associated: denture trauma due to the continuous wearing of dentures, poor oral and dental hygiene, allergic reactions to denture base materials such as residual monomers, dietary factors such as resultant hematological and nutritional deficiencies, infections such as *Candida* infec-

tions, microbial factors, systemic factors such as diabetes mellitus and immunodeficiency, and miscellaneous factors such as thermal stoppage below the denture, age of the denture, smoking, various types of irradiation, dryness of the mouth, medications, and reduced saliva flow (1-8, 10-13, 15-21).

Treatment for denture stomatitis is based on the elimination the etiologic factor. Therefore, improving the denture and oral hygiene of patients, discouraging them from wearing the dentures at night, and resting the tissues of the underlying mucosa of the complete denture comprise the main steps of treatment (5-7). Constructing new dentures after having a healthy palatal mucosa, applying tissue conditioners (TCs) into the existing denture, employing antifungal drugs, using a 0.2% solution of a chlorhexidine gluconate mouthrinse (CGM), or applying a gingival massage with a toothbrush or fingers have been the treatment strategies for denture stomatitis (22). In the literature, a number of agents have been employed for the treatment of denture stomatitis, but there are not enough reports on the time for which a TC and a CGM should be used for palatal erythema patients wearing complete dentures (3, 5-7, 9, 10, 14, 17, 21-25). Therefore, the aim of the present study was to compare and clinically evaluate the in vivo efficacy of a TC and CGM, either alone or combined, on denture stomatitis for 2 weeks.

METHODS

Intraoral pictures taken during the clinical treatment of palatal hyperemic patients were evaluated using the Budtz-Jorgensen index (Table 1). Twenty-four patients wearing complete dentures, 12 men and 12 women, and with palatal inflammation were selected from patients who were referred to the Marmara University, Department of Prosthodontics, Faculty of Dentistry. The age of the patients ranged between 39 and 70 years, with a mean age of 58 years. They had no systemic disease and had been wearing their present denture for approximately 3 years. Palatal erythema was graded on a scale ranging from 0 to 3 according to the Budtz-Jorgensen index (Table 1) (2). The protocol of the study was explained to the patients, and the informed consent form was signed. The patients were randomly divided into three groups (n=8). All groups comprised four females and four males. Group 1 patients applied a TC (Visco-gel, Dentsply DeTrey, Konstanz, Germany), group 2 patients used a 0.2% CGM (Klorhex, Drogan, Ankara, Turkey) and group 3 patients used the 0.2% CGM and relined dentures with the TC (TC+CGM). The study protocol numbered as 29.03.2016, 2016-19 was approved by Clinical Research Ethics Committee, Marmara University, Faculty of Dentistry.

All old dentures of the patients were readjusted. Centric relation and centric, protrusive, and lateral occlusion were checked. All patients were asked to brush their dentures with soap at least twice a day for 2 weeks and the palatal mucosa with a tooth paste.

Group 2 and Group 3 patients were asked to rinse their oral cavity for 60 s and their denture once in the morning before wearing the denture and once at night before bedtime; all patients were asked to not wear their dentures at night.

2 mm thickness of acrylic resin was removed from the inner surfaces of the upper dentures of group 2 and 3 patients. A separator (Separator, Dentsply DeTrey, Konstanz, Germany) was applied to the outer surface

Table 1. The degree of palatal erythema

0	No inflammation
1	Slight inflammation (localized slight hyperemia)
2	Moderate inflammation (diffuse hyperemia)
3	Severe inflammation (diffuse hyperemia and papillary hyperplasia)
(Budtz-Jorgensen, 1970)	

Table 2. The assessment of inflammation levels at the baseline and at the first and second weeks

	Group I (TC) n (%)	Group II (CGM) n (%)	Group III (TC+CGM) n (%)	+p
Initial				
Slight	0 (0%)	0 (0%)	0 (0%)	1.000
Moderate	0 (0%)	0 (0%)	0 (0%)	
Severe	8 (100%)	8 (100%)	8 (100%)	
First week				
None	0 (0%)	0 (0%)	0 (0%)	0.511
Slight	5 (62.5%)	3 (37.5%)	3 (37.5%)	
Moderate	3 (37.5%)	5 (62.5%)	5 (62.5%)	
Second week				
None	0 (0%)	0 (0%)	0 (0%)	0.301
Slight	6 (75.0%)	6 (7.0%)	8 (100%)	
Moderate	2 (25.0%)	2 (25.0%)	0 (0%)	
Initial - 1 st week ++p	0.009**	0.009**	0.009**	
Initial - 2 nd week ++p	0.008**	0.008**	0.005**	
1 st week - 2 nd week ++p	0.655	0.083	0.025*	
+ Chi-square test ++ Wilcoxon signed-rank test * p<0.05 ** p<0.01 TC: tissue conditioner; CGM: chlorhexidine gluconate mouthrinse				

of the dentures. A powder and liquid of the TC were mixed according to the manufacturer's recommendation. The entire fitting surface of the denture was covered with a polymerized TC and placed into the upper jaw. Patients were instructed to close their upper and lower dentures to the centric relation and remain stable for 2 min. Then, patients were instructed to make functional jaw movements such as chewing, talking, and swallowing for at least 2 min. The dentures were removed. The excess material was cut with a scalpel (Tip Kimya San Ltd. Sti, Istanbul, Turkey). This procedure was repeated once a week.

The treatment duration in all groups was 14 days. Palatal inflammation was photographed three times during the treatment protocol before the treatment (baseline) and at 1 and 2 weeks after the treatment (Figure 1. a-c, Figure 2. a-c, Figure 3. a-c), and the degree of palatal erythema was scored 0 to 3 according to the Budtz-Jorgensen index (Table 1). Statistical analysis was performed using Statistical Package for Social Sciences version 15 (SPSS Inc.; Chicago, IL, USA). The chi-square test and Wilcoxon signed-ranks test were used to compare data (p<0.05).

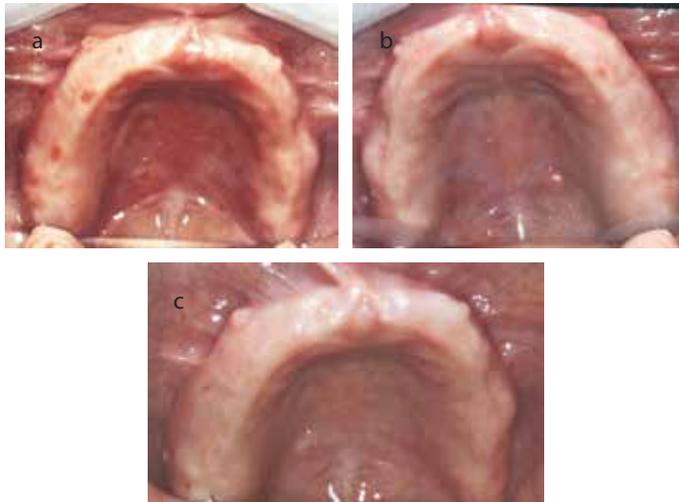


Figure 1. a-c. (a) initial view of the TC (group 1) (b) first-week application of the TC (c) second-week application of the TC

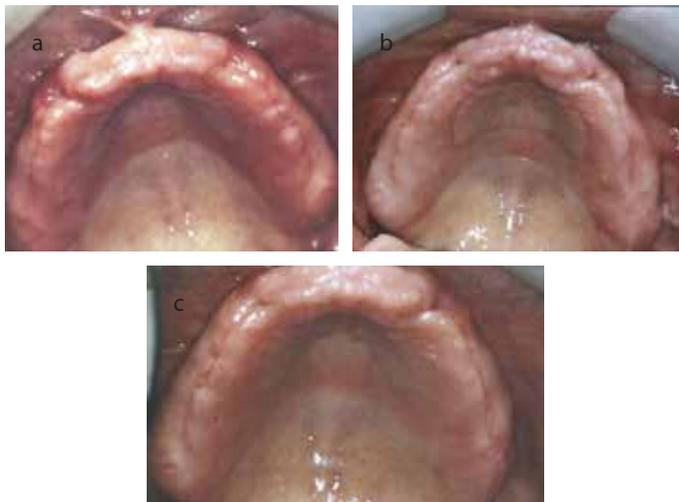


Figure 2. a-c. (a) initial view of the CGM (group 2); (b) first-week application of the CGM; (c) second-week application of the CGM

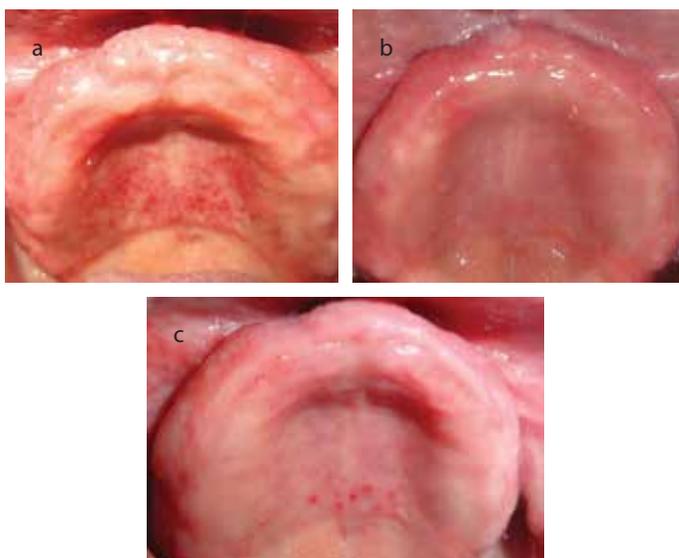


Figure 3. a-c. (a) initial view of TC +CGM+ (group 3); (b) first-week application of TC +CGM; (c) second-week application of TC +CGM

RESULTS

Palatal erythema scores during the treatment period in all groups are shown in Table 2. No statistically significant difference in inflammation levels among the groups was found at the baseline. All inflammation levels were severe ($p>0.05$). The statistical results of group 1 and 2 patients were similar. The decrease in the inflammation level in the first and second weeks was statistically significant compared to the initial levels ($p<0.01$) in all groups, but no statistically significant difference was seen in the second week compared to the level in the first week ($p>0.05$). The decrease in inflammation level in the first and second weeks in the CGM+TC group was statistically significant ($p<0.01$), and a statistically significant difference was also seen in the second week compared to the level in the first week ($p<0.05$).

DISCUSSION

Denture stomatitis is characterized by inflammatory conditions of the palatal mucosa seen in those wearing complete dentures (1-3, 15). There are different clinical treatment alternatives. Different solutions, mouthrinses, antifungal drugs, and relining dentures with a TC have been used to minimize the degree of palatal inflammation (5-7, 10, 21, 23, 24, 26). In the present study, a TC and CGM were used for the clinical treatment of palatal inflammation of patients wearing complete dentures. Even though the use of the TC gave better results than the use of the CGM in the first week, the results in the second week were the same. The results showed that there were statistically significant differences in reducing palatal inflammation level when the TC and CGM were combined ($p=0.005$). The results of the present study are similar to those of the study by Uludamar et al. (7) Their study evaluated the effect of 0.8% chlorine dioxide and 0.2% chlorhexidine gluconate mouthrinses and TCs (Visco-gel) on clinical and microbiological flora of 60 patients with denture stomatitis. They showed that although the relining dentures with the TC decreased palatal inflammation, mouthrinses had greater improvement in case of palatal inflammation.

In their in vitro study, Kanathila et al. (27) combined magnesium oxide with two TCs (Visco-gel and GC Soft) to inhibit the growth of *C. albicans* and reported that the combination was effective against *C. albicans*. Further, when the concentration of magnesium oxide increased, the zone of inhibition of *C. albicans* increased. In the presented in vivo study, even if any product was added to the TC, the same results were obtained. The results of the present study are consistent with those of the study by Kanathila et al. (27)

Thomas and Nutt (28) reported that Visco-gel alone was completely inert and could therefore not be used without nystatin in the treatment of denture stomatitis where a yeast infection was present. In the present study, a yeast infection was not investigated, and the degree of palatal erythema was scored 0 to 3 according to the Budtz-Jorgensen index. The visual assessment results of this study was controversial with the results of Thomas and Nutt's study (28). In the present study, a statistically significant difference was found after the 2-week clinical application of the TC ($p<0.008$). The use of the TC was also effective for the diminution of the palatal inflammation level. The results of this study were consistent with those of the meta-analysis by Emami et al. (29). They reported their conflicting results when antifungals were compared to placebos, such as a TC, denture adhesive, or placebo medication. The TC and denture adhe-

sive were found to be effective in the reduction of palatal erythema. The clinical efficacy of the oral adhesive and TC could be explained by their cushioning effect on the palatal mucosa. Using these dental materials, denture trauma reduced; therefore, the inflammation level also reduced.

In the clinical trials of Uludamar et al. (23), the in vivo efficacy of three different alkaline peroxide tablets and two mouthrinses containing 0.2% chlorhexidine gluconate were compared to eliminate *C. albicans* on dentures; they reported that the use of mouthrinses significantly decreased the number of microorganisms on dentures. The results of this study were in accordance with those of Uludamar et al. (23)'s study. In the present study, greater reduction in palatal inflammation was observed after 2 weeks of using the CGM ($p < 0.008$). The CGM was effective against denture stomatitis. It prevented bacterial colonization around the teeth and soft tissues; thus, the development of gingivitis was also prevented (5, 7, 25). Emami et al. (29) reported that disinfection and antiseptic methods could be as effective as antifungal therapy in the treatment of denture-related erythematous stomatitis.

Antifungal treatment for denture stomatitis needs microbiological analyses. The long-term use of antifungal agents could have side effects such as gastrointestinal disturbances, hypersensitivity and also may cause changes in the levels of liver enzymes, and may interact with other medicines (6, 26). The extensive use of antifungal medications can lead to the development of microbial resistance (26).

Walker et al. (30) reported that the mechanical cleansing of dentures is as effective as topical treatment with antifungal drugs in treating *Candida*-associated denture stomatitis. The results of this study are consistent with those of the study by Walker et al. The use of a TC and CGM for 2 weeks within the treatment and the mechanical cleansing of dentures and patients' palatal mucosae will be the conservative approach for those who have palatal inflammation in clinical settings when microbiological analyses cannot be performed. The lack of a microbial evaluation is the limitation of the present study.

CONCLUSION

The results of the present study revealed that in case of palatal inflammation that occurs due to wearing complete dentures, the combined use of 0.2% CGM and a TC for 2 weeks is an alternative for improving palatal inflammation to maintain the oral hygiene of patients. Patients must be aware about the mechanical cleansing of their dentures and also of their palatal mucosa.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Marmara University Faculty of Dentistry, Clinical Research Ethical Committee (29.03.2016, Decision No: 2016-19).

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REFERENCES

- Naik AV, Pai RC. A study of factors contributing to denture stomatitis in a North Indian Community. *Int J Dent* 2011; 2011: 589064.
- Budtz-Jørgensen E. The significance of *Candida albicans* in denture stomatitis. *Scand J Dent Res*, 1974, 82: 151-90. [CrossRef]
- Arendorf TM, Walker DM. Denture stomatitis: a review. *J Oral Rehabil* 1987; 14: 217-27. [CrossRef]
- Kulak-Ozkan Y, Kazazoglu E, Arıkan A. Oral hygiene habits, denture cleanliness, presence of yeasts and stomatitis in elderly people. *J Oral Rehabil* 2002; 29: 300-4. [CrossRef]
- Kulak Y, Arıkan A, Delibalta N. Comparison of three different treatment methods for generalized denture stomatitis. *J Prosthet Dent* 1994; 72: 283-8. [CrossRef]
- Koray M, Ak G, Kurklu E, Issever H, Tanyeri H, Kulekci G, et al. Fluconazole and/or hexedidine for management of oral candidiasis associated with denture-induced stomatitis. *Oral Dis* 2005; 11: 309-13. [CrossRef]
- Uludamar A, Özyeşil AG, Ozkan YK. Clinical and microbiological efficacy of three different treatment methods in the management of denture stomatitis. *Gerodontology* 2011; 28: 104-10. [CrossRef]
- Davenport JC. The oral distribution of candida in denture stomatitis. *Br Dent J* 1970; 129: 151-6. [CrossRef]
- Andrucioli MC, de Macedo LD, Panzeri H, Lara EH, Paranhos Hde F. Comparison of two cleansing pastes for the removal of biofilm from dentures and palatal lesions in patients with atrophic chronic candidiasis. *Braz Dent J* 2004; 15: 220-4. [CrossRef]
- Pinto TM, Neves AC, Leão MV, Jorge AO. Vinegar as an antimicrobial agent for control of *Candida* spp. in complete denture wearers. *J Appl Oral Sci* 2008; 16: 385-90. [CrossRef]
- Pires FR, Santos EB, Bonan PR, Almeida OP, Lopes MA. Denture stomatitis and salivary *Candida* in Brazilian edentulous patients. *J Oral Rehabil* 2002; 29: 1115-9. [CrossRef]
- Pouloupoulos A, Belazi M, Epivatianos A, Velegraki A, Antoniadis D. The role of candida in inflammatory papillary hyperplasia of the palate. *J Oral Rehabil* 2007; 34: 685-92. [CrossRef]
- Salerno C, Pascale M, Contaldo M, Esposito V, Busciolano M, Millillo L et al. *Candida*-associated denture stomatitis. *Med Oral Patol Oral Cir Bucal* 2011; 16: e139-43. [CrossRef]
- Lal K, Santarpia RP 3rd, Pollock JJ, Renner RP. Assessment of antimicrobial treatment of denture stomatitis using an in vivo replica model system: therapeutic efficacy of an oral rinse. *J Prosthet Dent* 1992; 67: 72-7. [CrossRef]
- Kulak Y, Arıkan A. Aetiology of denture stomatitis. *J Marmara Univ Dent Fac* 1993; 1: 307-14.
- Figueiral MH, Azul A, Pinto E, Fonseca PA, Branco FM, Scully C. Denture-related stomatitis: identification of aetiological and predisposing factors - a large cohort. *J Oral Rehabil* 2007; 34: 448-55. [CrossRef]
- Salles AE, Macedo LD, Fernandes RA, Silva-Lovato CH, Paranhos Hde F. Comparative analysis of biofilm levels in complete upper and lower dentures after brushing associated with specific denture paste and neutral soap. *Gerodontology* 2007; 24: 217-23. [CrossRef]
- Schou L, Wight C, Cumming C. Oral hygiene habits, denture plaque, presence of yeasts and stomatitis in institutionalised elderly in Lothian, Scotland. *Community Dent Oral Epidemiol* 1987; 15: 85-9. [CrossRef]
- Stafford GD, Arendorf T, Huggett R. The effect of overnight drying and water immersion on candidal colonization and properties of complete dentures. *J Dent* 1986; 14: 52-6. [CrossRef]

20. Emami E, Séguin J, Rompré PH, de Koninck L, de Grandmont P, Barbeau J. The relationship of myceliated colonies on *Candida albicans* with denture stomatitis: an in vivo/in vitro study. *Int J Prosthodont* 2007; 20: 514-20.
21. Gornitsky M, Paradisi I, Landaverde G, Malo AM, Velly AM. A clinical and microbiological evaluation of denture cleansers for geriatric patients in long-term care institutions. *J Can Dent Assoc* 2002; 68: 39-45.
22. Hickey JC, Zarb GA. *Boucher's Prosthodontic treatment for edentulous patients*. 2nd ed., The C.V. Mosby Company, St. Louis, Missouri, 1980, Chap 1, p:33-35.
23. Uludamar A, Ozkan YK, Kadir T, Ceyhan I. In vivo efficacy of alkaline peroxide tablets and mouthwashes on *Candida albicans* in patients with denture stomatitis. *J Appl Oral Sci* 2010; 18: 291-6. [\[CrossRef\]](#)
24. Nikawa H, Yamamoto T, Hamada T, Rahardjo MB, Murata H, Nakanoda S. Anti-fungal effect zeolite-incorporated tissue conditioner against *Candida albicans* growth and/or acid production. *J Oral Rehabil* 1997; 24: 350-7. [\[CrossRef\]](#)
25. Quirynen M, Avontroodt P, Peeters W, Pauwels M, Coucke W, van Steenberghe D. Effect of different chlorhexidine formulations in mouthrinses on de novo plaque formation. *J Clin Periodontol* 2001; 28: 1127-36. [\[CrossRef\]](#)
26. Pinelli LA, Montandon AA, Corbi SC, Moraes TA. *Ricinus communis* treatment of denture stomatitis in institutionalized elderly. *J Oral Rehabil* 2013; 40: 375-80. [\[CrossRef\]](#)
27. Kanathila H, Bhat AM, Krishna PD. The effectiveness of magnesium oxide combined with tissue conditioners in inhibiting the growth of *Candida albicans*: an in vitro study. *Indian J Dent Res* 2011; 22: 613. [\[CrossRef\]](#)
28. Thomas CJ, Nutt GM. The in vitro fungicidal properties of Visco-gel alone and combined with nystatin and amphotericin B. *J Oral Rehabil* 1978; 5: 167-72 [\[CrossRef\]](#)
29. Emami E, Kabawat M, Rompre PH, Feine JS. Linking evidence to treatment for denture stomatitis: a meta-analysis of randomized controlled trials. *J Dent* 2014; 42: 99-106. [\[CrossRef\]](#)
30. Walker DM, Stafford GD, Huggett R, Newcombe RG. The treatment of denture-induced stomatitis. Evaluation of two agents. *Br Dent J* 1981; 151: 416-9. [\[CrossRef\]](#)