

Original Research

Effectiveness of microwave disinfection of complete dentures on the treatment of candida related denture stomatitis

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ABSTRACT:

Background: To study the effectiveness of microwave disinfection of complete dentures on the treatment of candida related denture stomatitis. **Materials & methods:** A total of 40 subjects were enrolled. The age of patients was 40 to 90 years. The subjects were divided into 4 groups. Group 1 was control group. In Group 2 patients who had their upper denture micro waved (650 W/6 min). In group 3, patients who received the treatment of group 1 in conjunction with topical application of miconazole three times per day for 30 days. In group 4 patients who received the antifungal therapy of group 3. Dental and medical history of the patients was recorded. Data was collected and results were analysed using SPSS software. **Results:** A total of 40 patients were enrolled. The patients were divided into groups each containing 10 subjects. Group 1 is the control group showed no improvement. It also shows that mycelial forms of Candida were not seen in any of the smears of the patients from groups 2 and 3 at day 30 of treatment (improvement of 100%). **Conclusion:** Microwave disinfection of complete upper dentures was effective for the treatment of Candida-related denture stomatitis.

Keywords: denture stomatitis, candida, microwave disinfection.

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INTRODUCTION

Denture stomatitis (DS) is a common recurring problem of the denture wearers. The aetiology of the disease includes infection, trauma and probably a defect in the host defense mechanism.¹ Fungal species of *Candida* have high affinity for adhering to and colonizing acrylic surfaces which is considered the first step in the pathogenesis of DS.² Therefore, the presence of *Candida* species on dentures is considered a major factor in the development of this infection.³

Any appliance such as dentures and dental impressions placed in the oral cavity can be a source of infection or cross-contamination⁴ with microorganisms such as *Candida albicans*, α -hemolytic streptococci, *Escherichia coli*, *Staphylococcus aureus*, β -hemolytic streptococci, *Klebsiella*, *Pseudomonas*, and *Mycoplasma*.^{5,6}

The presence of a denture on the oral mucosa by itself, without other factors may serve as a catalyst to

the initiation of denture stomatitis.⁷ Dentures may alter the local environmental conditions because of the lower pH values and decreased saliva flow that occurs on tissue surfaces and the lack of mechanical cleaning by the tongue.⁸ Moreover, the tissue surface of the acrylic resin denture acts as reservoirs that harbour microorganisms thus enhancing their infective potential and aggravating a previously existing condition. The adherence of *Candida* species to host cells and fitting surface of dentures is recognized as a crucial first step in the initiation and propagation of denture stomatitis. When *Candida* species are accumulated in its pathogenic form (pseudohyphae and hyphae), an intense immunological and inflammatory response is observed.^{9,10}

The influence of microwave irradiation on physical properties of denture materials was investigated by research.^{11,12} Some studies found that microwave had deleterious effect on the base adaptation while others found it safe. Some researchers evaluated occlusion

vertical dimension of complete dentures after microwave disinfection when the maxillary complete dentures submitted to microwave disinfection (650 W/3 min), three times a week, for 4 weeks.¹³ Hence, this study was conducted to study the effectiveness of microwave disinfection of complete dentures on the treatment of candida related denture stomatitis.

MATERIALS & METHODS

A total of 40 subjects were enrolled. The age of patients was 40 to 90 years. The patients found to have mycelial forms of *Candida* spp. on either the palate or the upper denture at base line were selected. The presence of mycelial form in smears is considered to be indicative of fungal infection. Cytological smears were taken with a No. 31 metal spatula* from the palatal surface of each maxillary denture and the corresponding erythematous tissue (palatal mucosa of the hard palate and maxillary alveolar ridge area). The material from the denture and palate was spread onto glass slides fixed in ether/alcohol 1:1 for 30 min and stained with periodic acid-Schiff for disclosure of *Candida* spp. cells. The subjects were divided into 4

Table: effectiveness in the groups

Groups	Period	Mycelial forms			
		Palate Denture			
		Absence	Presence	Absence	Presence
Group 1 (control group)	Day 0	6(60%)	4 (40%)	0 (0%)	10 (100%)
	Day 30	6 (60%)	4 (40%)	0 (0%)	10 (100%)
Group 2	Day 0	4 (40%)	6 (60%)	0 (0%)	10 (100%)
	Day 30	10 (100%)	0 (0%)	10 (100%)	0 (0%)
Group 3	Day 0	4 (40%)	6 (60%)	0 (0%)	10 (100%)
	Day 30	10 (100%)	0 (0%)	10 (100%)	0 (0%)
Group 4	Day 0	6 (60%)	4 (40%)	0 (0%)	10 (100%)
	Day 30	7(70%)	3 (30%)	2 (20%)	8 (80%)

DISCUSSION

Denture disinfection is a very important step to treat denture stomatitis, prevent cross-contamination between patients, and to remove bad odor and stains of acrylic resin dentures. This procedure should not cause harmful changes to denture base materials. For disinfection, logarithmic transformation of each CFU count was performed to normalize the data due to the high range of fungi numbers. 4 log₁₋₀ or greater reduction in CFU is considered as a standard for adequate disinfection.¹⁴ Several cases of systemic involvement with different fungal species have been reported, including candidal meningitis,¹⁵ respiratory infections, septicemia with *C. albicans*, aspergillosis and mycosis.¹⁶ In our study, a total of 40 patients were enrolled. The patients were divided into groups each containing 10 subjects. Group 1 is the control group showed no improvement. It also shows that mycelial forms of *Candida* were not seen in any of the smears of the patients from groups 2 and 3 at day 30 of treatment (improvement of 100%).

A study by Neppelenbroek KH et al, studied effectiveness of microwave disinfection of maxillary complete dentures on the treatment of *Candida*-related

groups. Group 1 was control group. In Group 2 patients who had their upper denture microwaved (650 W/6 min). In group 3, patients who received the treatment of group 1 in conjunction with topical application of miconazole three times per day for 30 days. In group 4 patients who received the antifungal therapy of group 3. Slides were visualized on a bright field microscopy. Dental and medical history of the patients was recorded. Data was collected and results were analysed using SPSS software.

RESULTS

A total of 40 patients were enrolled. The patients were divided into groups each containing 10 subjects. Group 1 is the control group showed no improvement. It also shows that mycelial forms of *Candida* were not seen in any of the smears of the patients from groups 2 and 3 at day 30 of treatment (improvement of 100%). In group 4, the mycelial forms were present at the denture but slightly reduced at end of the treatment. Also in group 4, the mycelial forms were present on the palate about 30% at the end of treatment.

denture stomatitis. Patients (n = 60) were randomly assigned to one of four treatment groups of 15 subjects each; Control group: patients performed the routine denture care; Mw group: patients had their upper denture microwaved (650 W per 6 min) three times per week for 30 days; group MwMz: patients received the treatment of Mw group in conjunction with topical application of miconazole three times per day for 30 days; group Mz: patients received the antifungal therapy of group MwMz. Smears and cultures of palates and dentures of the groups Mw and MwMz exhibited absence of *Candida* at day 15 and 30 of treatment. On day 60 and 90, few mycelial forms were observed on 11 denture smears (36.6%) from groups Mw and MwMz, but not on the palatal smears. Miconazole (group Mz) neither caused significant reduction of palatal inflammation nor eradicated *Candida* from the dentures and palates. Microwaving dentures was effective for the treatment of denture stomatitis. The recurrence of *Candida* on microwaved dentures at follow-up was dramatically reduced.¹⁷ In our study, in group 4, the mycelial forms were present at the denture but slightly reduced at end of the treatment. Also in group 4, the mycelial forms were

present on the palate about 30% at the end of treatment.

Webb et al. showed that microwaves were more effective than sodium hypochlorite in disinfecting dentures.¹⁸ Moreover, in a study by Banting and Hill, microwave irradiation proved more effective than chlorhexidine in delaying recontamination of denture surfaces with *C. albicans* and infection of soft tissues.¹⁹ Furthermore, Mima et al. found that microwaves inactivate *C. albicans*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *S. aureus* in 3 min.²⁰ Furthermore, Buerger et al. reported that disinfection using microwaves had the maximum effect when combined with immersion in water and followed by the use of 1% sodium hypochlorite for 10 min.²¹

Ribeiro et al. reported that microwave irradiation at 650 W for 3 min resulted in complete disinfection of dentures and the complete elimination of *C. albicans*, *Staphylococci*, and *Streptococci* from denture surfaces.²²

CONCLUSION

Microwave disinfection of complete upper dentures was effective for the treatment of *Candida*-related denture stomatitis.

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