Comparison of Denture Stomatitis Prevalence in 2 Population Groups

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Purpose: The aim of this cross-sectional study was to profile complete denture wearers in 2 different unmatched and nonrandomized population groups and compare any possible relationships between the prevalence of denture stomatitis and other factors involved in wearing complete dentures. ***Materials and Methods:*** Denture wearers who attended the clinics of the Dental School and Hospital, University of Bristol, United Kingdom (group A), and the Dental School, University of Athens, Greece (group B), were examined. The examination included a record of gender, age, years wearing a complete denture, number of dentures used, duration of current denture's usage, daily time period of denture wearing, and clinical examination of the maxillary denture-bearing mucosa. Data were analyzed using the chi-square test. ***Results****:* Denture wearers of group A were older, more experienced in wearing complete dentures, and had used more sets of dentures. The majority of patients used dentures exhibiting decreased vertical dimension of occlusion and wore their dentures only in the daytime. Denture stomatitis prevalence was statistically significantly different between groups A and B (27% and 39.7%, respectively). In both groups, the denture stomatitis prevalence was greater in women. There was no statistically significant difference between the groups regarding the age of denture wearers, the number of dentures used, or the vertical dimension of occlusion. In group B, the denture stomatitis prevalence was significantly related to the years of denture-wearing experience and the current denture's usage. In both groups, continuous denture wearing was highly related to denture stomatitis prevalence. ***Conclusions:*** This cross-sectional study showed that 2 different population groups of denture wearers presented different complete denture wearing habits and denture stomatitis prevalence. Comparisons indicate that proper denture wearing habits decrease the prevalence of denture stomatitis. *Int J Prosthodont 2006;19:621–625.*

Published reports show that wearing complete dentures may result in a negative effect on the underlying denture-bearing mucosa. The soft tissues may undergo histopathologic changes, such as inflammation and degeneration, or morphologic changes, such as traumatic ulcers, hyperplasia, and denture stomatitis. The latter clinical term is usually limited to the bearing mucosa of a maxillary denture and is classified as 3 types: I (pinpoint hyperemia), II (diffuse hyperemia), and III (inflammatory papillary hyperplasia).[1]

Denture stomatitis is the most common mucosal lesion in complete denture wearers, and its etiology is multifactorial.[2–4] Cited related factors include mechanical irritation from ill-fitting dentures, maxillary denture relief chambers,[5–10] continuous denture wearing,[3,6,11–15] poor oral and denture hygiene,[6,9,11,16–18] *Candida albicans* infection,[2,3,7,9,11,12,14–19] blocking of the minor salivary glands,[1] chemical irritation,[2,3,11,13,16,20] elevated temperature under the denture,[16] specific systemic diseases,[9,12,16,17] and immunologic reactions.[21] Most patients are unaware of their condition but occasionally complain of a painful sensation, burning mouth, dryness, or bad odor.

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Table 1 Comparison of Denture Stomatitis Prevalence Between the 2 Patient Groups

	Group A (n = 115)	Group B (n = 136)	*P*	χ^2	*df*
Denture stomatitis	27%	39.7%	< .05	4.52	1

The aim of this cross-sectional study was to profile denture wearers from 2 different population groups. The primary goals were: *(1)* to consider possible relationships between the prevalence of denture stomatitis and the factors involved in complete denture wearing, and *(2)* to compare the denture stomatitis prevalence in the 2 groups.

Materials and Methods

The 2 nonrandomized and unmatched population groups comprised patients who attended the clinics of the Dental School and Hospital, University of Bristol, United Kingdom (group A), and the Dental School, University of Athens, Greece (group B), for the construction of complete dentures.

An approximately equal number of patients (115 for group A and 136 for group B) were selected for each group. The selection addressed the following inclusion criteria: *(1)* the patients had been wearing complete dentures for at least 1 year, and *(2)* they were free of systemic diseases and medications that might predispose to denture stomatitis (eg, severe anemia, diabetes mellitus, hypoparathyroidism, tranquilizers).

The study included:

- *Data collection:* The patients' gender, age, years wearing a complete denture, number of dentures used, duration of current denture's usage, and daily time period of denture wearing were recorded.
- *Clinical examination:* The oral mucosa covered by the maxillary complete denture was examined. Denture wearers who presented with any visible sign of inflammation according to Newton's classification[1] (type I: pinpoint hyperemia; type II: diffuse erythema; type III: papillary hyperplasia) formed the denture stomatitis group.
- *Inspection of vertical dimension of occlusion:* A vertical dimension of occlusion providing interocclusal rest space of 2 to 4 mm was considered correct. The determination of the vertical dimension of occlusion was made using the postural rest position of the mandible and the Willis method.

Two examiners were calibrated to discriminate the existence of denture stomatitis and determine the vertical dimension of occlusion. If there was a disagreement between the examiners, the case was rejected.

Statistical Analysis

Data were analyzed using the chi-square test.

Results

The collected data and the statistical analysis are presented in Tables 1 to 3.

Discussion

Denture stomatitis is multifactorial in nature, with trauma being a major independent cause. The trauma may originate from ill-fitting or continuously worn dentures, or dentures that do not have correct vertical and horizontal arch relations.[3,5–15,22]

Denture stomatitis prevalence was 27% in group A and 39.7% in group B (Table 1). These rates lie between the 11% to 67% range limits reported in the literature.[3] Current studies report a denture stomatitis prevalence of 14.3% in a sample of 500 Thai patients,[18] 25% in 260 Finnish patients,[23] and 50.6% in 77 Brazilian patients.[24]

In both groups, denture stomatitis prevalence was greater in women than in men, although this was not statistically significant (Table 2). This finding corroborates with previous reports that denture stomatitis was more prevalent in women,[6,10,14,18,25] but not with studies reporting a higher incidence in men.[26,27]

No statistically significant ($P > .05$) age-related differences were noted (Table 2), as reported by Budtz-Jorgensen and Bertram[6] and Ettinger.[25]

There was no statistically significant difference ($P > .05$) between denture stomatitis prevalence and the years of denture-wearing experience for group A, whereas there was a significant difference ($P < .01$) for group B (Table 2). This finding supports the conclusion of a study that suggested that the longer the period of denture experience, the greater the denture stomatitis prevalence,[7] as well as of another study that showed that becoming a denture wearer at a young age may lead to relatively frequent occurrences of denture stomatitis.[28]

Additionally, denture replacement does not seem to have any statistically significant relationship ($P > .05$) to denture stomatitis prevalence (Table 2), as described in a previous report.[6]

Denture stomatitis prevalence in group A was not related to the duration of the current denture's usage, whereas it was highly significant for group B (Table 2). This supports a previous report that denture stomatitis

Table 2 Comparisons Between Denture Stomatitis Prevalence and Involving Factors

	Group A (n = 115)				Group B (n = 136)			
	%	*P*	χ^2	*df*	%	*P*	χ^2	*df*
Sex								
Male	13.4	> .05	0.9	1	17.6	> .05	0.3	1
Female	13.9				22.1			
Age (y)								
< 60	2.6				5.2			
60–69	5.2	> .05	3.76	2	23.0	> .05	0.6	2
> 69	19.1				17.6			
Denture experience (y)								
1–9	0.0				7.3			
10–19	2.6	> .05	0.89	2	21.3	< .01	11.2	2
> 19	24.3				11.0			
Sets of dentures used								
1 pair	2.6				28.7			
2 pairs	2.6	> .05	2.7	2	7.4	> .05	2.7	2
> 2 pairs	21.7				3.8			
Current denture usage (y)								
1–9	17.4				15.4			
10–19	5.2	> .05	3.3	2	17.6	< .001	17.4	2
> 19	4.3				6.6			
Daily usage								
Day	23.5				8.8			
Day and night	1.7	> .05	1.5	2	27.2	< .0001	21.8	2
Random	1.7				3.7			
Vertical dimension of occlusion								
Increased	2.6				0.7			
Correct	7.8	> .05	2	2	11.0	> .05	5.6	2
Decreased	16.5				27.9			

Table 3 Comparisons of the Subjects' Profiles and Denture-Wearing Habits

	Group A (n = 115)	Group B (n = 136)	*P*	χ^2	*df*
Sex					
Male	40.9	52.2	> .0500	3.6	1
Female	59.1	47.8			
Age (y)					
< 60	17.4	14			
60–69	26.1	45.6	< .0100	10.3	2
> 69	56.3	40.4			
Denture experience (y)					
1–9	1.7	35.3			
10–19	11.3	41.2	< .0001	103.1	2
> 19	87.0	23.5			
Sets of dentures used					
1 pair	6.1	64.0			
2 pairs	18.3	23.5	< .0001	116.5	2
> 2 pairs	75.7	12.5			
Current denture usage (y)					
1–9	61.7	60.3			
10–19	28.7	27.9	> .0500	0.3	2
> 19	9.6	11.8			
Daily usage					
Day	87.0	41.9			
Day and night	9.6	44.1	< .0001	54	2
Random	3.5	14.0			
Vertical dimension of occlusion					
Increased	6.1	2.2			
Correct	23.5	39.7	< .0500	8.9	2
Decreased	70.4	58.1			

prevalence is greater as the years of the current denture's usage increase.[6]

Continuous denture wearing has been reported[3,6,11–15,29] as a major factor in denture stomatitis, as it increases the likelihood of local injury and affects the frequency and density of *C albicans* on the fitting surface of the maxillary denture. Ritchie et al[12] reported that 74% of patients with denture stomatitis wore their dentures continuously. Love et al[11] reported that denture stomatitis incidence was 10 times greater in patients who wore their dentures when sleeping. Gerrish et al[13] reported that of a total of 93 patients who wore their dentures continuously, 48% had denture stomatitis. Fenlon et al[29] reported that nighttime wear of complete dentures was found to be significantly associated with the prevalence of denture stomatitis. The current study corroborates the above-mentioned reports, as well as those of Budtz-Jorgensen and Bertram,[6] Arendorf and Walker,[3] and Walker et al.[14] However, Nyquist[5] observed no difference in denture stomatitis prevalence between those who wore their dentures at night and those who left them out at night. In group A, 87% wore their dentures only in the daytime, while in group B, this dropped to only 41.9%, a statistically highly significant difference (Table 3).

The statistically significant relationship found for group B between years of denture-wearing experience, years of current denture usage, and time period of continuous denture wearing with denture stomatitis prevalence may be explained by the very strong effect of continuous denture wearing ($P < .0001$) demonstrated in group B.

Vertical dimension of occlusion is regarded as a contributing mechanical factor in denture stomatitis occurrence.[5,6,16] This study suggests that vertical dimension of occlusion may play a role in denture stomatitis prevalence, even though no statistically significant relationship was shown in either group. Patients who presented with an incorrect vertical dimension of occlusion (increased or decreased) exhibited increased denture stomatitis prevalence when compared to those with a correct vertical dimension of occlusion (Table 2).

It appears that continuous complete denture wearing is of major importance in denture stomatitis prevalence. While dental schools teach the importance of removing complete dentures at night,[30–32] it seems that this instruction is only partially followed by patients. Straus et al[33] reported that most of the complete denture patients who participated in their study followed all instructions given by their clinicians except one: the removal of their dentures at night. Marchini et al[34] reported that only 26.3% of Brazilian complete denture wearers remove their dentures at night. While psychologic status plays a role in such behavior, statistical data support the fact that continuous denture wearing depends on the instructions, or lack thereof, given by clinicians. For example, Lambson and Anderson[35] reported that 53% of clinicians gave instructions for day and night denture wearing, while Love et al[11] cited that 28.5% of a complete denture patient group had not been given any instructions about denture usage. One clinician survey revealed that 50% were not giving any instructions about denture usage, 35.6% were recommending continuous wearing, and only 6.6% were proposing nighttime removal of the denture.[36] It is also interesting to read that one third of the clinicians who wore complete dentures themselves did not remove their denture during at night.[37]

In summary, to minimize denture stomatitis prevalence, the need to remove complete dentures for 6 to 8 hours per day should be emphasized. Patients must be encouraged to follow clinicians' instructions, which should be given verbally and in written form, and to keep a recall appointment schedule.

Conclusions

Within the limits of this study's design, the following can be concluded for both groups: *(1)* denture stomatitis affects about one third of denture wearers; *(2)* denture stomatitis is distributed normally between sexes and age groups of denture wearers; *(3)* denture wearers in group A were older, presented with greater experience in complete denture wearing, used more sets of dentures, used dentures exhibiting decreased vertical dimension of occlusion, and wore their dentures only in the daytime; and *(4)* denture wearers of group B presented with continuous day and night denture wearing and increased denture stomatitis prevalence.

Comparisons between the 2 groups, even if not always significantly different, suggest that proper denture-wearing habits decrease the prevalence of denture stomatitis.

References

1. Newton AV. Denture sore mouth: A possible etiology. Br Dent J 1962;112:357–360.
2. Stohler GS, Geering AH. The etiology of denture stomatitis. Proc Eur Prosthodont Assoc 1979:68–71.
3. Arendorf TM, Walker DM. Denture stomatitis: A review. J Oral Rehabil 1987;14:217–227.
4. Wilson J. The aetiology, diagnosis and management of denture stomatitis. Br Dent J 1998;185:380–384.
5. Nyquist G. A study of denture sore mouth: An investigation of traumatic, allergic and toxic lesions of the oral mucosa arising from the use of full dentures. Acta Odontol Scand Suppl 1952;10:1–154.
6. Budtz-Jorgensen E, Bertram U. Denture stomatitis I. The etiology in relation to trauma and infection. Acta Odontol Scand 1970;28:71–92.

7. Budtz-Jorgensen E, Bertram U. Denture stomatitis II. The effect of antifungal and prosthetic treatment. Acta Odontol Scand 1970;28:283–304.
8. Bergman B, Carlsson GE, Ericson S. Effect of differences in habitual use of complete dentures on underlying tissues. Scand J Dent Res 1971;79:449–460.
9. Zakhari NK, McMurry W. Denture stomatitis and methods influencing its cure. J Prosthet Dent 1977;37:133–140.
10. Cawson RA. Denture sore mouth and angular cheilitis. Br Dent J 1963;115:441–49.
11. Love WD, Goska FA, Mixson RL. The etiology of mucosal inflammation associated with dentures. J Prosthet Dent 1967;8:515–527.
12. Ritchie GM, Fletcher AM, Main DG, Prophet AS. The etiology, exfoliate cytology and treatment of denture stomatitis. J Prosthet Dent 1969;22:185–200.
13. Gerrish JS, Yardley A, Stafford GD, Bates JF. A dental survey of people living in residential homes for the elderly in Cardiff. J Prosthet Dent 1972;19:27–29.
14. Walker DM, Stafford GD, Huggett R, Newcombe RG. The treatment of denture-induced stomatitis. Br Dent J 1981;151:416–419.
15. Barbeau J, Seguin J, Goulet JP, et al. Reassessing the presence of *Candida albicans* in denture-related stomatitis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2003;95:51–59.
16. Nater JP, Groehman NH, Wakkers-Garritsen BG, Timmer LH. Etiologic factors in denture sore mouth syndrome. J Prosthet Dent 1978;40:367–373.
17. Renner RR, Lee M, Anders L, McNamara TF. The role of *C. albicans* in denture stomatitis. Oral Surg 1979;47:323–328.
18. Jainkittivong A, Aneksuk V, Langlais RP. Oral mucosal conditions in elderly dental patients. Oral Dis 2002;8:218–223.
19. Van Reenen JF. Microbiologic studies on denture stomatitis. J Prosthet Dent 1973;30:493–505.
20. Ali A, Bates JF, Reynolds AJ, Walker DM. The burning mouth sensation related to the wearing of acrylic dentures: An investigation. Br Dent J 1986;161:444–447.
21. Morimoto K, Kihara A, Suetsugu T. Clinicopathological study on denture stomatitis. J Oral Rehabil 1987;14:513–522.
22. Budtz-Jorgensen E. Oral mucosal lesions associated with the wearing of removable dentures. J Oral Pathol 1981;10:65–80.
23. Petrola P, Vehkalanti MM, Wuolijoki-Saaristo K. Oral health and treatment needs of the long-term hospitalized elderly. Gerontology 2004;21:93–99.
24. Pires R, Santos EFB, Bonan PRF, DeAlmeida OP, Lopes MA. Denture stomatitis and salivary *Candida* in Brazilian edentulous patients. J Oral Rehabil 2002;29:1115–1119.
25. Ettinger RL. The etiology of inflammatory papillary hyperplasia. J Prosthet Dent 1975;34:254–260.
26. MacEntee MI, Glick N, Stolar E. Age, gender, dentures and oral mucosal disorders. Oral Dis 1998;4:32–36.
27. Bhaskar SN, Beasley JD, Cutring DE. Inflammatory papillary hyperplasia of the oral mucosa: Report of 341 cases. J Am Dent Assoc 1970;81:949–952.
28. Mikkonen M, Nyyssonen V, Paunio I, Rajala M. Prevalence of oral mucosal lesions associated with wearing removable dentures in Finnish adults. Community Dent Oral Epidemiol 1984;12:191–194.
29. Fenlon MR, Sherriff M, Walter JD. Factors associated with the presence of denture related stomatitis in complete denture wearers: A preliminary investigation. Eur J Prosthodont Restorative Dent 1998;6:145–147.
30. Polyzois GL. The wearing of complete dentures: Guidance to patients. J Oral Rehabil 1983;10:229–235.
31. Tautin FS. Should dentures be worn continuously? J Prosthet Dent 1978;39:372–374.
32. Bauman R. Survey of dentists' attitudes regarding instructions for home care for patients who wear dentures. J Am Dent Assoc 1980;100:206–208.
33. Straus R, Sandifer JC, Hall DS, Haley JV. Behavioral factors and denture status. J Prosthet Dent 1977;37:264–273.
34. Marchini L, Tamashiro E, Nascimento DF, Cunha VP. Self-reported denture hygiene of a sample of edentulous attendees at a university dental clinic and the relationship to the condition of the oral tissues. Gerodontology 2004;21:226–228.
35. Lambson GA, Anderson RR. Palatal papillary hyperplasia. J Prosthet Dent 1967;18:528–537.
36. Ferenczy J, Szirmak F. Zür frage des standigen tragens von Plattenprothesen. Dtsch Zahnärztl Z 1972;27:215–219.
37. Jozefowicz W, Kepska-Pelczewska K. Some aspects of wearing removable dentures without night pause. Protet Stomatol 1975;25:179–185.

Literature Abstract

Effect of postoperative radiotherapy on the functional results of implants placed during ablative surgery for oral cancer

The purpose of this retrospective study was to investigate the survival of dental implants placed in ablative surgery patients diagnosed with oral squamous cell carcinoma (SCC) with or without adjuvant postoperative radiotherapy. Forty-eight consecutive edentulous patients (29 males and 19 females) with primary oral SCC treated from 1996 to 2003 were included in this study. Two to 4 Brånemark Mk II/III 2 implants were inserted in the interforaminal region of the mandible. If postoperative radiotherapy occurred, the implants were always in the radiation field. Chi-square test was used to compare the 2 groups with regards to the time interval between implant insertion and abutment placement and the number of soft tissue corrections. Twenty-one patients (61 implants) received postoperative radiotherapy and 27 patients (78 implants) did not. There was a statistically significant difference ($P = .01$) between the average time in months between insertion of implants and abutment placement for both groups (radiotherapy group = 9 [SD: 3.6], nonradiotherapy group = 4.7 [SD :1.9]). No difference was found between the 2 groups regarding the mean number of denture adjustments until satisfaction and soft tissue corrections around the implants ($P = .06$). Success rates of osseointegration were 97% in the irradiated group compared to 100% in the nonirradiated group. The prosthetic success rates were lower because in 12 patients (34 implants), a functional denture was not fabricated due to recurrence (7 patients, 22 implants) or for psychologic reasons (4 patients, 12 implants). The results of this pilot retrospective study suggest that postoperative radiotherapy does not affect the osseointegration of dental implants placed during tumor ablation surgery or the ultimate function of the overdentures.

Schepers RH, Slagter AP, Kaanders JHAM, van den Hoogen FJA, Merkx MA. *Int J Oral Maxillofac Surg* 2006;35:803–808. **References:** 23.

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