Frequency and Location of Traumatic Ulcerations Following Placement of Complete Dentures

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Purpose: To determine the location of mucosal injuries that appear following placement of complete dentures, as well as the number of adjustments necessary to achieve patient comfort. The frequency of mucosal injuries in female and male patients and their connection with clinical anatomic features were also investigated. ***Materials and Methods:*** Sixty-one completely edentulous healthy patients who wore dentures (47 women and 14 men) took part in the study; 122 newly fabricated complete maxillary and mandibular dentures were investigated. All patients were seen for a 1-week adjustment appointment. Areas where signs of denture-induced mucosal injuries appeared were marked on an anatomic illustration. The follow-up period was in 1-week increments as deemed necessary by the patient. Associations between variables were analyzed with analysis of variance. Results were recorded as mean ± SD. Statistical significance was set at $P \leq .05$. ***Results:*** Eighty-seven percent of the dentures required adjustment at week 1, 50% at week 2, and only 7% at week 3. No patients required a further visit. Most frequently injured maxillary areas were the vestibular sulcus (41%), maxillary tuberosity (21%), and hamular notch (12%). In the mandible, the most frequently injured areas were the retromylohyoid area (17%), lingual sulcus (14%), and vestibular sulcus (13%). Denture-induced irritations were detected in a higher ratio in the mandible ($P < .001$), especially in male denture wearers at the first adjustment ($P < .05$). Men had a higher ratio of lesions at the region of the maxillary vestibular sulcus between the labial and buccal frenum and at the mandibular vestibular sulcus of the buccal shelf region ($P < .001$). ***Conclusions:*** Denture-induced irritations appeared most often in the vestibular sulcus of the maxilla and mandible, indicating that it is necessary to evaluate the area of the facial seal of the prosthesis by applying a medium- or a heavy-pressure indicator paste to the borders, and to make adjustments at the delivery stage and subsequent adjustment appointments. Denture placement must not be the final patient-clinician encounter when treating with complete dentures. Denture adjustments are very important clinical phases of denture fabrication and essential in patient care. *Int J Prosthodont 2007;20:397–401.*

Denture-induced traumatic mucosal ulcerations (mucosal decubitus, decubital ulceration) may appear in different shapes and sizes. A decubital lesion is usually round or oval with a diameter of 1 to 8 mm. A deep red color typifies a moderate case, whereas a greyish or white lesion surrounded by a reddish inflammation is characteristic of more serious cases. A typical location of denture irritation is either the nonmobile oral mucosa or the regions where the mucosa is mobile during functional movements.

Denture-induced lesions are the most common symptoms among patients following placement of complete dentures. Mucosal irritations appear most often at the frena and muscular attachment regions.[1,2] The primary cause of a denture sore is the sharp edges of denture surfaces; a secondary cause may be premature contact of the occlusal surface.[1,2] Premature

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contact can also cause discomfort, resulting in mucosal ulceration or occlusal discrepancy. These complaints may lead to such a level of discomfort that the patient is unable to wear the denture and may even result in psychologic disorders.[1,2] Psychologic factors seem to be extremely important in the acceptance of and adaptation to removable dentures.[2] The reasons for denture-induced ulcerations can be technological,[3,4] osteogenic,[5–7] mucosal,[7] related to denture instability,[4,8] occlusal,[9] or related to general health infirmaries.[10] According to a study by Cleary et al,[11] modified diet also ameliorates soreness during the adjustment to new complete dentures. Technological causes may include superficial irregularities, unevenness, porosity, increased monomer content, alteration in shape, and unsatisfactory finishing and polishing.[12] Inappropriate marking of the casts may also result in harmful edges in the posterior palatal seal region. Ostogenic causes may include exostosis (bony irregularities), sharp irregular marginal ridges, bony undercuts, and special anatomic features (palatal or mandibular torus). A lack of submucosal supportive tissue between the mucosa and bone, caused by various factors (old age, osteoporosis, overloading) may result in a thin and highly sensitive mucosal surface[13] and residual ridge resorption, which is an inevitable consequence of tooth loss and denture wearing, with no dominant causative factor.[2] Problems related to denture stability may follow the unsatisfactory formation of the unpolished denture surface (impression surface), failed polished surface shaping (flange), or failure in the organization of occlusion (imbalance, false centric occlusion, premature contact, or parafunctional activity).[12] It should be noted, however, that according to a study by Drago,[14] the use of different border-molding methods does not influence the accuracy. Different general health conditions associated with symptoms such as xerostomia, hyposalivation, and parafunctional activity may result in increased sensitivity of the oral mucosa and cause a higher risk of oral mucosal inflammations (diabetes,[15] immunologic disorders,[10] and neurologic or psychiatric diseases[16]).

The principal objective of this study was to determine the ratio of patients requiring denture adjustments following placement of complete dentures, and to locate the oral mucosal surfaces most commonly irritated by dentures. A further aim was to assess possible differences in gender regarding the location and frequency of mucosal irritation and differences in the ratio of maxillary and mandibular denture-induced irritations.

Materials and Methods

The study included 61 completely edentulous patients (14 men and 47 women) who were referred to the Department of Prosthodontics of Semmelweis University, Budapest, Hungary, for fabrication of new dentures. Only patients without extended bony abnormalities and without redundant tissues were included in the study. The average age (mean ± SD) was 69 ± 8 years (range: 59 to 91 years), and all patients had worn complete dentures for at least 6 years (range: 6 to 26 years; mean: 8 ± 5 years). The study was approved by the Semmelweis University Regional and Institutional Committee of Science and Research Ethics (no. 104/2003) and carried out according to the Regulations of the Hungarian Ministry of Health.

After reviewing the patients' medical and dental histories and examining their oral tissues, the acceptable patients were provided with new complete dentures. Patients with extended bony abnormalities or with evidence of chronic mucosal alterations (redundant tissues, chronic hyperplastic candidosis, possible ulcerative manifestations of autoimmune diseases) were excluded. All dentures were fabricated in the same way and provided by the same clinician and technician in the Central Dental Laboratory of Semmelweis University. Final impressions were taken with the mucostatic technique[17] using zinc oxide eugenol paste impression material (Momax, Svedia).[18] Casts were mounted on a semiadjustable articulator (Dentatus, Dentatus). The type of occlusion followed a bilaterally balanced scheme using Vitapan anterior and Synoform posterior shallow denture teeth (Vita Zahnfabrik). All dentures were remounted in the articulators, and the occlusion was checked at insertion using a centric relation record. Pressure areas at the intaglio surfaces and denture borders were localized at delivery and at every adjustment session by brushing a thin layer of indicating paste (Pressure Indicator Paste, Mizzy) on the denture bases.[19] The patient was asked to perform functional movements (opening and closing, swallowing, tongue movement along the lips, smiling, and lip rounding for the mandibular dentures; opening and closing, smiling, lip rounding, blowing of the nose, saying "ah" for the maxillary dentures), while the practitioner applied a gentle force to the denture. Highlighted areas and areas of evident ulcerations were then corrected.

All patients were recalled for adjustments 1 week following placement. They were scheduled for second and third adjustments for weeks 2 and 3 following placement; however, they presented for these 2 follow-up appointments only if problems persisted. The location and size of the denture-induced lesions were recorded and drawn on an anatomic illustration.

Statistical tests were performed with SPSS 11.0 statistical software (SPSS). Associations between variables were analyzed using analysis of variance (ANOVA). Data from each visit were compared to data

Table 1 No. of Patients Presenting with Denture-Induced Mucosal Ulcerations at the First, Second, and Third Adjustment Visits*

		Adjustment visit		
	Total	1	2	3
Maxillary	61	47[d]	25[e]	2
Mandibular	61	59[d]	36[e]	7
Total	122[a]	106[a,b] (87%)	61[b,c] (50%)	9[c] (7%)

*Values identified by superscript letters are significantly different at $P < .05$ (a: $P = .0001$; b: $P = .0001$; c: $P = .0001$; d: $P = .001$; e: $P = .03$).

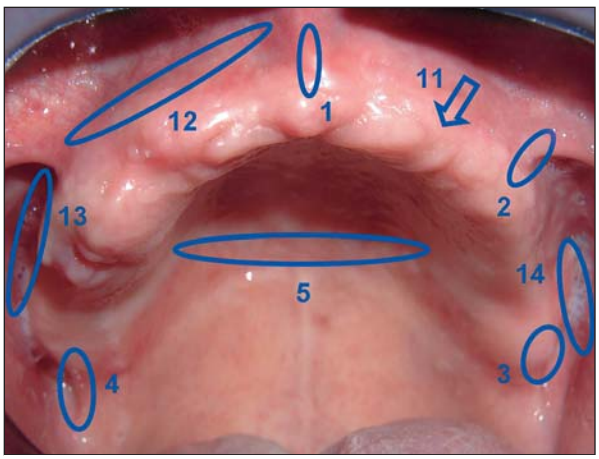

Fig 1 Most common sites of decubital lesions in the maxilla (see Table 2 for corresponding number/anatomic site).

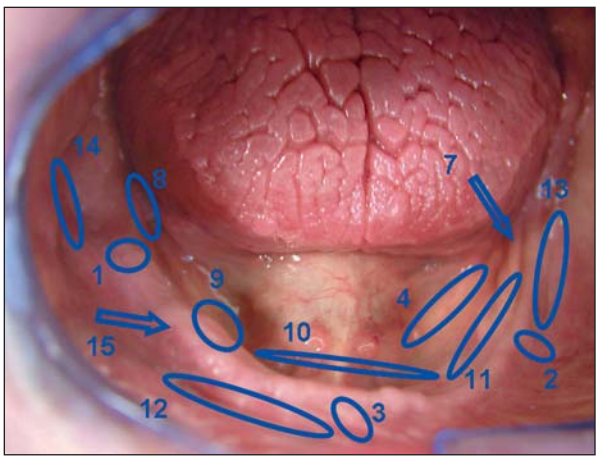

Fig 2 Most common sites of decubital lesions in the mandible (see Table 3 for corresponding number/anatomic site).

from other visits. The total number of patients requiring adjustments at each week and the difference between the number of maxillary and mandibular dentures requiring adjustment each week were analyzed (Table 1). Comparisons were made between genders for the total number of adjustment sites at each week and between anatomic sites for the number of all corrections at each site (Tables 2 and 3). Results were recorded as mean ± SD. Statistical significance was set at $P \leq .05$.

Results

All patients returned for the 1-week appointment. Of the 122 total dentures, 106 (87%) needed adjustment because of discomfort caused by slight or severe irritation or lesions on the oral mucosa. This amount was statistically significant (ANOVA, $P < .001$). The number of patients who returned for the second adjustment was significantly lower than for the first adjustment, and the number of patients who returned for the third adjustment was significantly lower than for the second (Table 1). None of the patients needed a fourth adjustment visit. Regarding the number of maxillary and mandibular dentures causing mucosal injuries, a significantly higher number of mandibular dentures required corrections in the first and second week (Table 1).

The most frequent regions of denture irritations were the maxillary vestibular sulcus between the labial and buccal frenum (44%), maxillary tuberosity (37%), maxillary vestibular sulcus in the molar tuberosity region (18%), retromylohyoid area (18%), lingual sulcus at the paralingual region (14%), and mandibular vestibular sulcus at the buccal shelf region (13%) (Tables 2 and 3, Figs 1 and 2).

At the first adjustment visit, 21% of denture-induced mucosal lesions (related to the sum of all examined regions) were detected in men and 13% in women in the mandible. This difference is significant ($P < .05$). The regions where lesions were found in a significantly higher number in men than in women were at the mandibular vestibular sulcus at the buccal shelf region (6.2% and 0.6%, respectively; $P < .01$) and the maxillary vestibular sulcus between the labial frenum and the buccal frenum (6.1% and 2.7%, respectively; $P < .05$). These differences remained significant at the second adjustment visit for both the mandibular vestibular sulcus at the buccal shelf region (3.5% and 0.3%, respectively; $P < .01$) and the maxillary vestibular sulcus between the labial frenum and the buccal frenum (3% and 0.9% respectively; $P < .05$). The third adjustment visit did not reveal any gender inequities regarding the number or location of lesions. Figures 1 and 2 show the number of denture sores at the different anatomic sites.

Table 2 No. of Denture Sores Related to Clinical Anatomic Sites and Gender in the Maxilla (61 Patients, 180 Corrections)*

	First adjustment			Second adjustment			Third adjustment			
Site	Men	Women	All	Men	Women	All	Men	Women	All	Total
1. Labial frenum	7	9	16	1	0	1	0	0	0	17
2. Buccal frenum	0	7	7	0	4	4	0	0	0	11
3. Maxillary tuberosity	4	23	27	3	7	10	0	0	0	37
4. Hamular notch	4	9	13	5	4	9	0	0	0	22
5. Posterior palatal seal	1	0	1	1	0	1	0	0	0	2
6. Incisive papilla	0	0	0	0	0	0	0	0	0	0
7. Midpalatal suture	0	0	0	0	0	0	0	0	0	0
8. Palatal rugae	0	0	0	0	0	0	0	0	0	0
9. Palatal torus	0	0	0	0	0	0	0	0	0	0
10. Hard palate	0	0	0	0	0	0	0	0	0	0
11. Edentulous ridge	0	2	2	0	0	0	0	0	0	2
12. Vestibular sulcus between labial and buccal frenum	12[a]	18[a]	30	6[b]	6[b]	12	0	2	2	44
13. Vestibular sulcus between buccal frenum and maxillary tuberosity	0	4	4	0	6	6	0	3	3	13
14. Vestibular sulcus at molar tuberosity region	1	13	14	5	13	18	0	0	0	32
Total	29	85	114	21	40	61	0	5	5	180

*Values with the same superscript letters are significantly different at $P < .05$ (a: $P = .02$; b: $P = .02$).

Table 3 No. of Denture Sores Related to Clinical Anatomic Sites and Gender in the Mandible (61 Patients, 235 Corrections)*

	First adjustment			Second adjustment			Third adjustment			
Site	Men	Women	All	Men	Women	All	Men	Women	All	Total
1. Retromolar pad	6	11	17	1	3	4	0	0	0	21
2. Buccal frenum	2	5	7	0	4	4	0	0	0	11
3. Labial frenum	1	5	6	0	3	3	0	0	0	9
4. Plica sublingualis	0	1	1	0	1	1	0	0	0	2
5. Lingual frenum	0	0	0	0	0	0	0	0	0	0
6. Obliqual line	0	0	0	0	0	0	0	0	0	0
7. Mylohyoid ridge	0	7	7	0	2	2	0	0	0	9
8. Lingual pouch	6	17	23	2	13	15	0	3	3	41
9. Mandibular torus	1	5	6	1	4	5	0	0	0	11
10. Lingual sulcus at sublingual region	1	9	10	1	6	7	0	1	1	18
11. Lingual sulcus at paralingual region	5	10	15	4	9	13	2	3	5	33
12. Vestibular sulcus between labial and buccal frena	7	11	18	0	6	6	0	1	1	25
13. Vestibular sulcus at buccal shelf region	14[a]	5[a]	19	7[b]	3[b]	10	0	2	2	31
14. Vestibular sulcus at masseteric groove	2	5	7	1	3	4	0	0	0	11
15. Edentulous ridge	2	5	7	1	5	6	0	0	0	13
Total	47[c]	96[c]	143	18	62	80	2	10	12	235

*Values with the same superscript letters are significantly different at $P < .05$ (a: $P = .00001$; b: $P = .0001$; c: $P = .002$).

Discussion and Conclusions

Although all patients were seen at the 1-week appointment, only 87% required an adjustment during this visit. Since the number of adjustments necessary at the 2- and 3-week appointments dropped significantly, it seems that early denture adjustment appointments are an essential step in complete denture fabrication.

Based on the results, decubital lesions appear most commonly at the facial seal area of the denture base (mandibular and maxillary sulcus). Denture sores are often caused by improperly fitting dentures.[7] They may also be related to the accuracy of the extension of the denture base[3,4,8,12] and thus of the final impression-taking methods. Drago,[14] however, found that 2 different types of border-molding methods did not provide different results in the number of adjustment visits after insertion of new dentures.

Several authors reported that the preprosthetic health of the patient's denture-bearing mucosa is consistent with postinsertion denture-related com-

plaints.[7,10,15,16] This may be the result of many clinicians' attempts to facilitate denture retention by extending the borders as far as possible, especially in case of the edentulous mandible. The authors of the present study believe that the junction between the nonmobile and mobile mucosa is not always clearly recordable by the impression-taking techniques; thus, final impressions may often be overextended on movable tissues, resulting in denture-induced irritations. These irritations are easily corrected via adjustments.

However, it is important to apply a disclosing material to the borders and intaglio surfaces[19] of the prosthesis, and to highlight the areas with special functional movements while gentle pressure is applied by the practitioner. Recognizing the accurate location of the traumatic ulcer is also essential and can be achieved using an indelible pencil.[19] It must be noted that even when adjustments are made at delivery, further corrections may be necessary, since dentures become functional during loading. In this study, 87% of the patients required adjustment after the first week, and an additional 7% required adjustment after the third week.

Mandibular dentures required a higher number of adjustments, which is most likely related to the inferior stability of mandibular dentures.[7] Further, clinicians may attempt to extend the base as far as possible, and resorption of the supportive mandibular alveolar submucosa[12] may make the mucosal tissue extremely sensitive to injury.

It was an unexpected result that male patients had significantly more detectable lesions at the first adjustment appointment. The results of Cleary et al[11] showed that consistency-gradated diet had a significant effect in diminishing tissue ulceration during the immediate postplacement period in male complete denture wearers. It may be that women eat a softer diet during the early insertion period than men. Because of the number of dentures that required adjustment (87% at the first appointment, 50% at the second, and 7% at the third), it is obvious that denture placement is not the final step in denture fabrication. Postinsertion a djustment sessions are essential.

The most frequent regions of denture-induced irritations were the maxillary vestibular sulcus between the labial and buccal frenum (44%), maxillary tuberosity (37%), vestibular sulcus at molar tuberosity region (18%), retromylohyoid area (18%), lingual sulcus in the paralingual region (14%), and mandibular vestibular sulcus at the buccal shelf region (13%). The number of denture-induced irritations was higher in male patients at both the first and second adjustment sessions.

Placement is not the last clinical stage of making complete dentures. Denture adjustments are an important clinical phase of denture fabrication and essential in patient care. Denture-induced irritations appeared most often in the vestibular sulcus both in the maxilla and mandible. This indicates the need to evaluate the area of the facial seal of the prosthesis by applying a disclosing medium- or heavy-pressure indicator paste to the borders, and make adjustments at insertion and on additional adjustment visits if necessary.

The limitation of this study is that it did not include patients with extended bony deformations or redundant mobile tissues (eg, flabby ridge). Therefore, further investigations are suggested to reflect the postinsertion treatment needs of patients with these anatomic formations. Further, the cause of differences in the treatment needs between genders should be investigated.

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