ASSESSMENT OF THE INCIDENCE AND LOCATION OF TRAUMATIC ULCERATIONS SUBSEQUENT TO THE PLACEMENT OF COMPLETE DENTURE WITH AND WITHOUT THE USE OF PRESSURE INDICATING PASTE

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Abstract

Introduction. Denture-induced traumatic mucosal ulcerations appear most often after the placement of a new denture, despite careful attention paid to details in the fabrication of complete dentures. Aim. Determination of the ratio of patients requiring denture adjustments following the placement of denture with and without the use of pressure indicating media and evaluation of the ratio of maxillary and mandibular denture-induced irritation. Materials and methods. An in vivo study was conducted to evaluate and compare the frequency and location of traumatic ulcerations following the placement of complete denture with and without the use of pressure indicating paste. 26 patients were enrolled in the study, 13 in each of the two groups considered for the study. In test group (A), pressure indicating paste was used during denture insertion and post insertion adjustment appointments. In control group (B), pressure indicating paste was not used during insertion and review appointments. The results were analyzed for statistical comparison and significance by using the ‘z’ test. A Statistical package SPSS 13.0 (Microsoft version, Chicago) software was used for statistical analysis. A value of p<0.05 is considered statistically significant. Results and discussion. A significantly higher number of mucosal ulcerations was observed in the control group, compared to the test group, at each adjustment visit. The results also revealed more numerous mucosal ulcerations in the mandibular denture bearing areas, compared to the maxillary denture bearing areas. These ulcerations were reduced during the subsequent adjustment visits, compared to the higher number of ulcerations observed in the control group as against the test group. Conclusions. A higher incidence of denture adjustments was observed in patients in whom pressure indicating paste was not used. Therefore, the use of a pressure indicating medium should become a mandatory procedure. Keywords: denture sore, denture-induced ulceration, pressure indicating paste.

1. INTRODUCTION

Complete denture prosthodontics involves the replacement of the lost natural dentition and associated structures of the maxilla and mandible in patients who have lost all their remaining natural teeth. In spite of the advances occurring in preventive dentistry, partial and complete edentulism has been observed in elderly patients. In addition, despite the success of osseointegrated implants for prosthetic rehabilitation, the treatment with conventional complete dentures is still common for this group of patients.

The success depends on accurate clinical and laboratory procedures with the insertion of the prosthesis as the culmination of treatment [1]. Inevitably, a plethora of complete denture problems may arise after insertion and during the review appointments following it. Even with meticulous attention paid to details in the fabrication of complete dentures, the variable soft-tissue behavior during impression-making procedures and the dimensional changes involved in processing various denture base materials often require adjustment to relieve soft tissue irritation and improve comfort for the patient [2].

Some problems manifested during insertion may be transient, so that they may be essentially disregarded, or they may be serious enough to result in patients’ impossibility to tolerate the dentures. Post-insertion problems associated
with dentures, especially for new denture wearers, include gagging, excessive salivation, discomfort, altered taste perception, difficulty in talking and ulceration [3-5]. An empirical mode of treatment may involve a cure or improvements of symptoms even in the absence of the knowledge or of understanding why and how such results are obtained [6].

Although making of complete dentures is a most precise procedure, it is difficult to determine exactly the extent of soft tissue irritation and correlate it accurately to the morphology of the intaglio surface of the denture [7-10].

Although numerous studies devoted to the post-insertion problems following complete denture insertion have been published, few reports are available on the relation of pressure indicating paste and denture adjustments [10-14]. In addition, limited studies analyze comparatively the location and frequency of traumatic ulcerations following placement of complete denture with and without the use of pressure indicating paste [15-18].

**Aim and objectives**

- Assessment of the incidence of traumatic ulcerations following placement of complete denture with and without the use of pressure indicating media.
- Determination of the ratio of patients requiring denture adjustments following placement of denture with and without the use of pressure indicating media.
- Evaluation of the ratio of maxillary and mandibular denture-induced irritation.

**2. MATERIALS AND METHODS**

This prospective study was conducted in the Department of Prosthodontics, Manipal College of Dental Sciences, Mangalore, after the approval of the Ethical Committee of the College (Annex 1). 26 apparently healthy male and female patients, with completely edentulous maxillary and mandibular ridges, firm resilient mucosa and adequate interarch space, were considered for the study, irrespective of their age, after having signed a written consent.

Patients with extended bone abnormalities or with evidence of mucosal alteration (redundant tissues, possible ulcerative manifestations of autoimmune diseases), old denture wearers with extended bone abnormalities or with evidence of mucosal alteration, ridges with unfavorable undercut were excluded from study.

After reviewing the medical, dental history and clinical examination of completely edentulous patients, based on inclusion and exclusion criteria, 26 (18 female and 8 male) patients were considered for the study, being divided into two groups, a test group “A” (13 patients) and a control group “B” (13 patients). In the test group (A), pressure indicating paste was used during denture insertion and post insertion adjustment appointments. In control group (B), pressure indicating paste was not used during insertion and review appointments. Normal prosthodontic procedures were followed in the fabrication of new complete maxillary and mandibular dentures. To standardize the denture construction procedure, all clinical and laboratory procedures were performed by the same clinician. The primary impressions were made using a modeling plastic impression compound (Pinnacle; Dental Products of India Ltd, Mumbai, India). The impressions were poured using Type II dental plaster (Plaster of Paris; Perumalpatte, India). Full spacer with modeling wax (Hindustan Modelling wax; Hindustan dental products, Hyderabad, India) was adapted on primary casts and custom trays were fabricated using auto polymerizing acrylic resin (Dentsply Rapid Repair; Gurgaon, India). Sectional border molding was done with a low fusing compound (Pinnacle; Dental Products of India Ltd, Mumbai, India). Definitive impressions were made using zinc oxide eugenol impression paste (DPI impression paste; Dental Products of India Ltd, Mumbai, India) evaluated for accuracy and acceptance, and the master casts were prepared and indexed for future remounting. Jaw relations were recorded and the casts were mounted on an articulator. Prosthetic teeth arrangement (Premadent; Super dental product, Delhi, India) was done. Try in appointment was then accomplished. The dentures were processed by the compression moulding technique using heat polymerizing acrylic resin (Trevalon; Dentsply, Gurgaon, India). Laboratory remounting was done for the correction of occlusal errors. The processed
dentures were trimmed and polished, and evaluated for acceptability. Prior to insertion, the intaglio surface was inspected as to the presence of spicules or projections, to ensure a smooth polished surface and no obvious overextension. For group “A”, the pressure areas at the intaglio surfaces and denture borders were localized at delivery and at every adjustment session. Dentures were dried before brushing a thin layer of indicating paste (Pressure Indicator Paste; Mizzy, Inc, Cherry Hill, NJ) on denture bases, so that the material should adhere to the denture surface. The oral mucosa, however, was left moist, so that the paste does not adhere to it. Dentures were inserted using mouth mirrors to retract the commissures, so that the material should not be wiped away from the denture borders during insertion. Wherever dentures could not be placed without touching the lips or cheeks, the right and left quadrants were evaluated separately. Patients were asked to perform functional movements - like opening and closing of the mouth, swallowing, tongue movements along the lips, smiling and saying “ah” for maxillary dentures.

3. RESULTS

The dentures were removed and examined for three distinct patterns:

1. Areas where streaks remained, representing areas of no contact with tissues.
2. Areas with paste but no streaks, where acceptable contact was possible.
3. Areas without paste, which suggested excessive pressure or impingement.

<table>
<thead>
<tr>
<th>Table 1. Number of dentures requiring adjustment during the first, second, third and fourth adjustment visit</th>
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<tr>
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<tr>
<td>Maxillary</td>
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<tr>
<td>Mandibular</td>
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<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Fig. 1. Pressure indicating paste applied on dentures to record the pressure areas
Red - suggests excessive pressure or impingement
Orange - acceptable contact
Purple - no contact

The highlighted areas and also the areas of evident pressure were then corrected. For group “B”, dentures were adjusted without using pressure indicating paste. Patients were consulted 24 hours after the placement of complete dentures. Patients from groups “A” and “B” were examined and any denture-induced lesion present was recorded. For group “A”, pressure indicating paste was used in the same manner as in the insertion appointment. The highlighted areas and areas of evident pressure were then corrected. For group “B”, dentures were adjusted without using pressure indicating paste. All patients were scheduled for follow up 1, 2 and 3 weeks after the placement, being examined for the presence of possible lesions. Each time, the location of the denture-induced lesions was recorded and the necessary adjustments were done.
All patients returned for the 24 hour appointment. Out of the 52 dentures, 14 in the test group and 16 in the control group needed adjustments at the first appointment visit. The results also showed that the number of dentures needing correction during the second adjustment visit was lower than during the first and, similarly, the number of adjustments needed during the fourth visit was significantly lower than that of the third visit.

In addition, the results also showed that a significantly higher number of mandibular dentures in the control group required corrections during the first, second, third and fourth adjustment visits, respectively. Further on, none of the maxillary dentures in the test group needed adjustment during the fourth adjustment visit.

The most frequent regions of denture irritation in order of percentage were in the maxillary vestibular sulcus, between the labial and the buccal frenum, and in the vestibular sulcus between the buccal frenum and the maxillary tuberosity (18.96%), maxillary tuberosity (17.24%), edentulous ridge and vestibular sulcus at molar tuberosity region (13.79%), buccal frenum (8.62%), labial frenum (6.89%) and the hard palate (1.72%).

The most frequent regions of denture irritation in order of percentage were in the mandibular lingual pouch (18.75%), edentulous ridge and vestibular sulcus at buccal shelf region (14.58%), lingual sulcus at paralingual region (12.5%), lingual sulcus at sublingual region (11.45%), vestibular sulcus between labial and buccal frenum (9.37%), buccal frenum (4.16%), mylohyoid ridge (4.16%), vestibular sulcus at massetric groove (4.16%), labial frenum (2.08%), *plica sublingualis* (2.08%) and retromolar pad (2.08%).

### Table 2. Number of denture-induced mucosal ulcerations recorded during the the first, second, third and fourth adjustment visits

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>24 hours</th>
<th>1st week</th>
<th>2nd week</th>
<th>3rd week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Maxillary</td>
<td>26</td>
<td>13</td>
<td>12</td>
<td>9</td>
<td>11</td>
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<tr>
<td>Mandibular</td>
<td>26</td>
<td>21</td>
<td>25</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>34</td>
<td>37</td>
<td>13</td>
<td>28</td>
</tr>
</tbody>
</table>

### Table 3. Ratio of patients who required denture adjustments following placement of denture with and without the use of pressure indicating media

<table>
<thead>
<tr>
<th></th>
<th>24 hours</th>
<th>1st week</th>
<th>2nd week</th>
<th>3rd week</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>8</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>B/A=11/10=1.1</td>
<td>B/A=8/8=1.0</td>
<td>B/A=9/7=1.28</td>
<td>B/A=4/1=4.0</td>
<td></td>
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</tbody>
</table>

The results obtained show a higher incidence of denture adjustments in the control group, compared to the test group, during all adjustment visits. Furthermore, the results showed a significantly higher ratio of patients in the control group who required corrections during the final adjustment visit.
Table 4. Ratio of mandibular and maxillary dentures which required adjustment during the first, second, third and fourth adjustment visits

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>24 hours</th>
<th>1st week</th>
<th>2nd week</th>
<th>3rd week</th>
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<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Maxillary</td>
<td>26</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Mandibular</td>
<td>26</td>
<td>7</td>
<td>10</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Ratio</td>
<td>17/13=1.30</td>
<td>14/12=1.16</td>
<td>11/8=1.37</td>
<td>3/1=3.0</td>
<td></td>
</tr>
</tbody>
</table>

The results show a higher incidence of denture adjustments in mandibular dentures in all patients, irrespective of the use of pressure indicating paste, as well as a significantly higher ratio of mandibular adjustments during the final adjustment visit, irrespective of the use of pressure indicating paste.

The results of this study, presented in Tables 1 to 4, were analyzed for statistical comparison and significance by using the ‘z’ test. Statistical package SPSS 13.0 (Microsoft version, Chicago) software was used for statistical analysis. A value of p< 0.05 is considered to be statistically significant.

4. DISCUSSION

Denture-induced traumatic mucosal ulcerations are inevitably one of the most common problems that occur subsequent to the insertion of a new denture. Even with meticulous attention to detail in the fabrication of complete dentures, variability of soft-tissue behavior during impression-making procedures and the dimensional changes involved in processing various denture base materials often require adjustment to relieve soft tissue irritation and improve comfort of the patient [2].

Based on such results, decubital lesions in the maxillary denture bearing area appeared most commonly on the facial seal area of the denture base, i.e. in the vestibular sulcus between labial and buccal frenum and the vestibular sulcus, between the buccal frenum and maxillary tuberosity. The trauma from insertion and removal of the unyielding denture causes mucosa irritation, being probably the main reason for the high correlation between pressure and irritation on the buccal aspect of the maxillary tuberosities [18-22]. In the mandibular denture bearing area, it appeared most commonly in the lingual pouch region. The results obtained, agreeing with a previous study done by Kivovics et al. [4], can be explained by the fact that the junction between movable and nonmovable tissues is not always clearly recordable by the impression, so that the final impressions may be often overextended on movable tissues [6]. Further preprosthetic health of the denture-bearing mucosa is consistent with post insertion denture-related complaints [23]. In addition, R. C. Rodegerdts explains the relatively easy displacement of the buccinator muscle, as well as the pressure of the denture border against the unyielding zygomatic process as the possible cause for irritation in the vestibular sulcus between the buccal frenum and maxillary tuberosity [18, 24-27].

The results showed that the number of dentures needing correction for the test group during the second adjustment visit was lower than the first and, similarly, the number of adjustments needed during the fourth visit was significantly lower than that of the third visit [28]. It must be also observed that, even when adjustments are made at the delivery, further corrections may be necessary, since dentures become functional during loading [4, 29-33]. 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, essential in patient care [34].

The results also indicated the higher incidence of denture adjustments in the patients of the control group, following denture placement, which can be explained by the fact that most patients perceive as offending the morphology of the denture base, and remote from the actual areas requiring adjustment [2,35]. An accurate
location of the areas of mucosal pressure is essential for the elimination of ulcerations. Denture adjustments are more accurate and effective when made using an indicating medium [8, 9, 36].

Based on the results obtained, mandibular dentures required a higher number of adjustments compared to maxillary dentures during all adjustment visits, irrespective of the use of pressure indicating paste. These results agree with the study of D.N. Firtell, who reported that the obtained results with maxillary dentures showed higher reliability with pressure indicating paste [7, 37-39].

This is most likely related to the inferior stability of mandibular dentures on account of their reduced surface area, reduced ridge height and presence of movable tissues [7]. Landa explains that lesions in mandibular mucosa may be caused by the amount of overextension of the denture border, and also by the degree of mobility of the tissue in function, against the overextended border [6,23,40].

This study recommends the use of pressure indicating paste to ensure a higher predictibility and clinical correlation to locate the actual pressure spots and to spare more patients from post delivery discomfort [41-43].

Further investigations on the effect of the diet on denture adjustments are warranted.

5. CONCLUSIONS

Within the limitations of the present study, the following conclusions can be drawn:

1. Decubital lesions in the maxillary denture bearing area appeared most commonly on the facial seal area of the denture base, i.e. in the vestibular sulcus between the labial and buccal frenum, and in the vestibular sulcus between the buccal frenum and maxillary tuberosity. This indicates the need to apply pressure indicating paste at the borders during denture adjustment.

2. Decubital lesions in the mandibular denture bearing area appear most commonly in the lingual pouch region.

3. Higher incidence of denture adjustments was required in patients where pressure indicating paste was not used. Therefore, the use of pressure indicating medium should become a routine procedure.

4. Mandibular dentures required more adjustments during all adjustment visits, irrespective of the use of pressure indicating paste.

5. The frequency of denture corrections was reduced during each adjustment visits, which indicates that denture placement is not the final step in denture fabrication. Denture adjustments represent an important clinical phase of denture fabrication, being essential in patient care.

References

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