The duration of denture wearing is increasing more and more as the life span is progressively prolonged. When ill-fitting dentures are used for long periods of time, the residual ridge may become severely resorbed because of rolling and pitching of the denture. Furthermore, the tissues surrounding the dentures, including the residual ridges, may become atrophied with aging.

In the case of an extremely resorbed residual ridge, the denture-bearing area is reduced and the overlying mucosa decreases in thickness and lacks elasticity. As a result, the residual ridge is unable to adequately support the occlusal force. If conventional acrylic resin dentures are inserted, pain may occur under the denture during mastication; this pain is difficult to relieve regardless of careful adjustments. In such a situation, a soft denture liner may be used to compensate for the lost thickness and viscoelasticity of the mucosa. The pain is relieved by reducing the impact force during mastication because of the cushioning effect of the soft liner. Today, soft denture liners are widely used to relieve the pain that occurs during mastication because of the thin overlying mucosa. However, there is some doubt as to whether the elasticity of the soft liner disturbs masticatory function because denture wearers may need extra force to compress the soft liner, leading to muscular fatigue.

Purpose: The purpose of this study was to examine changes in the masticatory function of complete denture wearers after relining the mandibular denture with a soft liner.

Materials and Methods: Conventional complete dentures were fabricated for 6 completely edentulous patients. One month after completing adjustments of the dentures, maximum biting force, masticatory performance, and electromyography of the masseter muscle during mastication were recorded. Chewing strokes, chewing time, muscular activity, and masticatory rhythm were calculated using the recorded electromyography. The mandibular dentures were then relined with a soft liner. One month after finishing adjustments of the relined dentures, the same tests were performed. These values were compared using a paired t test (α = 0.05). Results: When using the soft liner, masticatory performance and maximum biting force were significantly greater (P = 0.019 and P = 0.023, respectively). In addition, the number of chewing strokes was significantly lower (P = 0.020), and chewing time was reduced (P = 0.010). A more stable masticatory rhythm was also found in the initial chewing stage. The muscular activity tended to decrease after the insertion of the lined denture, but no significant difference was found between before and after relining. Conclusion: It was shown that applying a soft lining material to the mandibular dentures of 6 edentulous patients improved masticatory function with no adverse effect on the muscular task. Int J Prosthodont 2000;13:227–231.
There have been several reports regarding the physical properties and contamination of soft liners,4–6,11,17–25 There have also been numerous studies on the masticatory function of denture wearers,26–31 However, there have been few studies on the effects of soft denture liners on masticatory function.6,12,13,23 None of the reports has satisfactorily clarified how masticatory performance and muscle activities are affected by the use of these soft materials.

The purpose of this study was to examine changes in the masticatory function of complete denture wearers after relining the mandibular denture with a soft liner.

Materials and Methods

Six edentulous subjects (one man and five women, 69 to 86 y old, mean age 73.3 ± 6.4 y) who were treated at the dental hospital of Tokyo Medical and Dental University for new complete dentures volunteered to participate in this study. Their residual ridges appeared flat, V-shaped, or shaped between U and V using Kapur’s classification.32 Thus, the residual ridges were not severely resorbed, and no history or clinical signs of disorder were found in their stomatognathic systems. The patients had worn dentures for more than 10 years.

Complete dentures (conventional denture) were fabricated from a heat-polymerized acrylic resin (Acron, GC). One month after completing the appropriate adjustments, the patients were satisfied and free of any chewing discomfort with the dentures. Maximum biting force, masticatory performance, muscular activity, chewing time, chewing strokes, and masticatory rhythm were examined. Following completion of these tests, the mandibular denture was relined with a soft denture liner (Kurepeet Dough,7 Kureha) using the indirect lining method (lined denture). One week was required to reline the dentures, during which time the patients presumably used their old dentures. After the relined dentures were inserted, the same procedures and tests were carried out (Fig 1).

The maximum biting force of each subject was measured using a hand-held occlusal force meter (Model GM10, Nagano) located in the first molar area on the preferred chewing side. The measurement was carried out 3 times at intervals of 3 minutes to prevent muscular fatigue.

The sieving method described by Manly and Braley26 was used to evaluate masticatory performance. There were 15 g of peanuts divided into five 3-g portions, and each subject was instructed to masticate each portion with 20 chewing strokes in their habitual manner.

Electromyographic (EMG) recordings were obtained from the subject’s left and right masseter muscles during the chewing of a peanut (1 g). The EMG recordings were made 3 times for each test. EMG activities were measured from the beginning of chewing until swallowing. The muscular task is defined as the integration of the full-wave rectified EMG from the beginning of chewing until swallowing. The sum of both the left and right masseter muscle activity values were used. Chewing time was measured from the beginning of chewing until swallowing. Chewing strokes were obtained by counting the number of EMG bursts during this period. The initial 5 strokes and the consecutive stable 5 strokes in the middle chewing stage when the test food was moderately broken were chosen to assess the masticatory rhythm. The coefficients of variation for 3 rhythm parameters—duration, interval, and cycle of EMG activity—were calculated to assess the masticatory rhythm.

A paired t test was performed to compare the maximum biting force, muscular task, chewing strokes, chewing time, masticatory performance, and the coefficients of variation for the 3 rhythm parameters before and after the insertion of lined mandibular dentures, with a 0.05 level of significance.

Results

After insertion of dentures with soft liner, the mean maximum biting force increased by one third and the mean masticatory performance improved by one fourth (P = 0.019 and P = 0.023, respectively; Table 1). The mean number of chewing strokes was reduced by one third and the mean chewing time by one third (P = 0.020 and P = 0.010, respectively). Except for one of the 6 subjects, muscular activity also decreased, but the mean differences between before and after relining did not reach statistical significance (Table 1).

During the initial chewing stage, the coefficient of variation of the cycle, duration, and interval significantly decreased after the insertion of the lined dentures (P = 0.006, P = 0.025, and P = 0.039, respectively; Table 2). These results demonstrated that when using the soft liner, masticatory rhythm became more stable. The coefficient of variation in the middle chewing stage tended to decrease, but the difference was not statistically significant.

Discussion

Our study showed, in a small sample of subjects, that several variables related to masticatory function improved after insertion of soft-lined dentures. Soft liners possess properties that reduce and disperse the
The use of soft liners significantly improves masticatory performance. Emura et al. reported that the number of occlusal contacts tended to increase when using lined dentures and suggested that the deformation of soft lining materials causes a slight movement of the mandibular dentures into the most stable position. During mastication, the soft lining material may also improve the occlusal balance by its deformation because of elasticity, and consequently the masticatory performance could increase. The improvement in masticatory performance may affect chewing strokes and chewing time. More chewing strokes and longer chewing time are usually considered compensation for a reduction in masticatory function. In this study, subjects showed a remarkable reduction in chewing strokes and chewing time after relining. These results indicate that masticatory function improved with the use of lined dentures.

Table 1 Differences Between Conventional Dentures and Lined Dentures

<table>
<thead>
<tr>
<th></th>
<th>Conventional Dentures</th>
<th>Lined Dentures</th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum biting force (N)</td>
<td></td>
<td></td>
<td>87</td>
<td>40</td>
<td>0.023</td>
</tr>
<tr>
<td>Masticatory performance (%)</td>
<td></td>
<td></td>
<td>118</td>
<td>49</td>
<td>0.019</td>
</tr>
<tr>
<td>Chewing strokes</td>
<td></td>
<td></td>
<td>34</td>
<td>14</td>
<td>0.020</td>
</tr>
<tr>
<td>Chewing time (s)</td>
<td></td>
<td></td>
<td>65</td>
<td>22</td>
<td>0.010</td>
</tr>
<tr>
<td>Muscular activity (µVs)</td>
<td></td>
<td></td>
<td>42</td>
<td>14</td>
<td>0.110</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>65</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>48</td>
<td>22</td>
<td></td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>35</td>
<td>18</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>667</td>
<td>409</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>470</td>
<td>312</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Differences Between Conventional Dentures and Lined Dentures During Initial and Middle Chewing Stages

<table>
<thead>
<tr>
<th></th>
<th>Conventional Dentures</th>
<th>Lined Dentures</th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial chewing cycle</td>
<td></td>
<td></td>
<td>24</td>
<td>7</td>
<td>0.006</td>
</tr>
<tr>
<td>Initial chewing duration</td>
<td></td>
<td></td>
<td>14</td>
<td>5</td>
<td>0.025</td>
</tr>
<tr>
<td>Initial chewing interval</td>
<td></td>
<td></td>
<td>29</td>
<td>10</td>
<td>0.039</td>
</tr>
<tr>
<td>Middle chewing cycle</td>
<td></td>
<td></td>
<td>19</td>
<td>9</td>
<td>0.067</td>
</tr>
<tr>
<td>Middle chewing duration</td>
<td></td>
<td></td>
<td>30</td>
<td>4</td>
<td>0.565</td>
</tr>
<tr>
<td>Middle chewing interval</td>
<td></td>
<td></td>
<td>19</td>
<td>4</td>
<td>0.093</td>
</tr>
</tbody>
</table>

SD = standard deviation.
The effect of soft lining materials on muscular task is controversial. The inconsistencies in previous reports may have resulted from differences in the measured period during mastication. The entire masseter muscle activity, from when the mastication of one peanut began until it was ready to swallow, was recorded on the EMG and used in our experiment to calculate the muscular task. By using the entire EMG recordings, inconsistency of different experimental conditions was eliminated. The use of a soft liner did not seem to require extra muscular activity during mastication in our study. There was, rather, a tendency for lower muscular activity when using dentures with soft liner than with conventional dentures, although the difference was not statistically significant. By using a soft liner that possessed a cushioning property, maximum biting force and masticatory performance improved. There was also a reduction in the number of chewing strokes and chewing time. Therefore, it is possible that all of these effects might have led to the decrease in the total muscular activity during mastication.

Chewing rhythm is considered to be a measure for evaluating masticatory ability. Some researchers have suggested exclusion of the initial chewing stage. However, when using soft lining materials it may be considered that the effect of the liner will be found in the initial chewing stage. The rhythm of muscular activity when using lined dentures was significantly more stable than that of conventional dentures during the initial chewing stage. This tendency was also observed in the middle chewing stage, even if no significant difference was found. It could be considered that mastication may even be stabilized in the early chewing stage when the food bolus was not sufficiently formed, since the soft lining material could reduce the impact of the occlusal force and the sense of incompatibility the patient feels for the denture base. It has been reported that even the load, which is not perceived as pain by the patient, may influence muscular activity and mandibular movement during mastication. In this study, the improved masticatory rhythm in the initial chewing stage indicates that the soft liner may influence the subject’s feeling of comfort when wearing the denture.

Conclusions

Within the limitations of this experimental design and considering the small sample size, the following conclusions were established:

1. Masticatory performance and maximum biting force improved significantly after relining the mandibular dentures with a soft liner.
2. The number of chewing strokes decreased significantly and chewing time was significantly reduced when using the lined dentures.
3. A more stable rhythm was found during the initial chewing stage when using the lined dentures.

References

Psychosocial profiles of patients with burning mouth syndrome.

Burning mouth syndrome (BMS) is a condition involving unexplained complaints of burning pain in the oral mucosa that are associated with no recognizable or apparent clinical abnormalities. Between 1% and 5% of the adult population is affected, women more often than men. Several recent reviews have concluded that patients with BMS generally report psychologic distress. The aim of this study was to examine the psychosocial profiles of BMS patients and to determine whether self-reported psychologic symptoms were clinically significant and related to pain reports. From the Orofacial Pain Center at the University of Kentucky, 33 BMS patients were recruited; their mean age was 62 years, and 88% of the sample was female. These patients completed 3 psychometric instruments after they had been examined clinically by a dentist with advanced training in oral medicine. The psychometric questionnaires were analyzed, summarized, and presented in standardized format to enable comparisons with larger population samples that included both a chronic pain population and a normal, nonclinical sample. For the entire BMS sample, there was no evidence of significant clinical elevations on any of the SCL-90R subscales, including depression, anxiety, and somatization. The patients also reported significantly fewer disruptions in normal activities as a result of their burning pain than did a large sample of chronic pain patients. The conclusion from this study was that the BMS patients as a group did not report significant psychologic distress. Psychometric data indicated, however, a likelihood of psychologic distress in individual cases (7 of 33, or 21%).