The Denture Foundation and Successful Complete Denture Therapy

When practitioners plan treatment for prosthodontic patients, investigation of foundation adequacy is critical. For fixed prosthodontics, the teeth and periodontal structures need to be evaluated; for implant prosthodontics, the hard and soft tissues in regions of planned implant placement need to be evaluated; for removable prosthodontics, we must first look at the residual edentulous ridges. Frequently, the condition of the residual denture foundation dictates the planned therapy and patient satisfaction. Practitioners must identify a wide variety of conditions that impact the hard and soft denture-supporting tissues. An effective assessment of the denture foundation permits an informative pretreatment discussion with the patient.

Jawbone Resorption Among Denture Wearers

A universal side effect of complete denture wearing is the continuous reduction of residual ridges. The process appears to be multifactorial, with a wide variance among individuals in the rate of bone loss and no single dominant factor. Studies have shown that excessive and constant pressure on the jawbone leads to bone resorption. Carlsson from Göteborg University, Sweden, reviewed the literature to assess the impact of pressure on bone resorption in the jaws of denture wearers.

Individuals wearing dentures appear to have more residual ridge resorption than those who do not wear dentures, yet the difference may primarily be the result of the quality and function of the dentures. Defective occlusion, poorly fitting dentures and unfavorable loading may cause trauma to the tissues supporting the dentures; however, the evidence to support this as a cause of bone resorption is primarily anecdotal. Combination syndrome, a complete denture in one jaw facing natural anterior dentition in the other jaw, has been posited as a possible factor based on the clinical experience of prosthodontists, yet again systematic evidence is lacking.

Asthma has also been a significant risk factor for severe residual ridge resorption, but this may result from corticosteroids typically used to treat asthma rather than from the condition.
Jawbone Resorption Among Denture Wearers
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Consumption itself. People who have used fluoridated water for >10 years have higher ridges than do those who used fluoridated water for shorter periods. Alcohol intake may correlate to less maxillary ridge resorption.

The single factor consistently shown to reduce bone loss in the jaw is the use of dental implants and implant-supported prostheses instead of complete dentures. This may be due to the altered stress distribution on the jawbone, leading to more adequate functional stimulus to the bone tissue.

Comment
The best method of avoiding resorption of the jawbone remains the retention of as much of the natural dentition as possible. In patients for whom this is not an option, implant-supported prostheses appear to offer the next best hope of avoiding residual ridge resorption.


Treating Burning Mouth Syndrome

Burning mouth syndrome, a burning sensation of the oral mucosa in the absence of clinically apparent mucosal alterations, has a reported overall prevalence ranging from 0.7% to 7%, increasing to as much as 18% among postmenopausal women. Sun et al from National Taiwan University reviewed current knowledge and treatment of burning mouth syndrome.

This oral burning or pain, often in the tongue, lips, and hard and soft palate, should be present and unremitting for at least 4 to 6 months and may be relieved by eating and drinking. Two clinical forms exist:

1. Primary burning mouth syndrome is essential or idiopathic, and involves peripheral and central neuropathological pathways. Patients have significantly lower epithelial nerve fiber density than do controls and decreased somatosensory and gustatory perception, as well as brain hypoactivity.

2. Secondary burning mouth syndrome may be caused by local factors (e.g., poorly fitting prostheses, parafunctional habits, dental anomalies, allergic reactions, xerostomia), systemic factors (e.g., hypothyroidism, diabetes, menopause, vitamin and mineral deficiencies, gastrointestinal and urogenital diseases) or psychological factors (e.g., anxiety, depression, psychosocial stress).

Treatment begins with a review of the patient’s medical and dental history. Any factors associated with secondary burning mouth syndrome should be addressed first; their resolution often resolves the oral burning and pain. If symptoms persist, several drug therapies are available: capsaicin, α-lipoic acid, clonazepam, antidepressants, vitamin supplementation (vitamin B<sub>12</sub>, folic acid, iron, zinc) and hormone replacement therapy, along with topical applications of

➤ capsaicin
➤ clonazepam
➤ lidocaine
➤ benzydamine hydrochlorate
➤ aloe vera

Cognitive behavior therapy is a therapeutic option.

Comment
Addressing and eliminating possible underlying causes of burning mouth syndrome usually results in significant clinical improvement. If that course of action fails to bring relief, drug therapy and/or psychotherapy may be successful.


Hypermobile Tissue Under Maxillary Full Dentures

One result of an edentulous maxilla opposed by natural mandibular anterior teeth is flabby tissue in the anterior portion of the maxillary ridge. A lack of posterior occlusal contact may create increased force between the natural mandibular teeth and maxillary dentures, causing bone resorption in the anterior part of the maxilla.

Sülün et al from Istanbul University, Turkey, studied the impact of natural mandibular anterior teeth on hypermobile tissue, an indicator of resorption in the anterior maxillary alveolar ridge of edentulous patients. The study included 410 patients (mean age, 70 years)
with maxillary complete dentures who were divided into 6 groups based on their mandibular dentition. Nearly 90% of the patients had edentulous mandibles (66.1%; 271 patients) or bilateral posterior edentulous mandibles (23.7%; 97 patients). Statistical analysis was limited to these groups.

Bone resorption in the group with a bilateral posterior edentulous mandible was greater than that of the fully edentulous group, although the difference did not quite reach statistical significance (Table 1). Patients with an edentulous maxilla and natural mandibular anterior teeth were approximately 2× as likely to show a risk of developing hypermobile tissue in the anterior maxilla; edentulous periods >30 years in the maxilla increased this risk approximately 4-fold.

**Comment**

This study failed to find any relationship between hypermobile tissue in the anterior maxilla and either poor adaptation of dentures or types of occlusal contacts. The presence of natural anterior mandibular teeth can be a risk factor for developing hypermobile tissue in the anterior maxilla under a complete denture. Any method to ameliorate this consequence remains undiscovered.


<table>
<thead>
<tr>
<th>Dentition</th>
<th>Bone resorption present</th>
<th>Bone resorption absent</th>
<th>Odds ratio (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edentulous maxilla/fully edentulous mandible</td>
<td>59 (21.8%)</td>
<td>212 (78.2%)</td>
<td>1.609 (0.958–2.702)</td>
<td>&lt;.071</td>
</tr>
<tr>
<td>Edentulous maxilla/posterior edentulous mandible</td>
<td>30 (30.9%)</td>
<td>67 (69.1%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CI, confidence interval.

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**Incidence and Treatment of Dental Stomatitis**

As many as two-thirds of all removable complete denture wearers suffer from denture stomatitis, inflammation and erythema of the oral mucosal areas covered by the denture. Its etiology is most likely multifactorial. Gendreau and Loewy from GlaxoSmithKline Consumer Healthcare, New Jersey, performed a literature search to determine the available information on the epidemiology and etiology of dental stomatitis.

The authors found 31 studies published between 1975 and 2009 that reported the epidemiology of dental stomatitis in populations from 15 countries. The study cohorts ranged in size from 37 to 3875 and in population from random national samples to elderly residents of long-term care facilities.

The Third National Health and Nutrition Examination Survey (NHANES III) and a representative national population-based study from Finland, each including >3000 denture users, found a 28% and 48% prevalence of denture stomatitis, respectively; 3 smaller studies reported prevalence rates of 70%, while other studies reported prevalence rates as low as <15%. The wide variations in study population and the multiple grading scores to evaluate dental stomatitis made it impossible to compare results.

Studies to identify etiological factors associated denture stomatitis with poor denture hygiene, leading to accumulation of denture plaque, and bacterial and yeast contamination of denture surfaces. Constant wearing of removable dentures maintains relatively anaerobic and low-pH conditions between the denture base and the mucosa, promoting the overgrowth of Candida and other pathogenic yeasts.

Improved denture hygiene prevents recurring denture stomatitis. Oral fluconazole (50 mg/day for 14 days) or topical miconazole (2% gel 3×/day for 14 days) significantly reduced yeast colonization and mucosal inflammation, as did...
treatment with nystatin (as a topical powder or as an oral rinse).

Comment
Denture stomatitis is clearly related to poor denture care and hygiene, and the resultant establishment of a biofilm and accumulation of denture plaque. Dental clinicians need to instruct denture wearers on proper maintenance of denture hygiene. Dentures need to be checked to ensure proper fit and carefully inspected for any denture plaque at regular follow-up visits.


Palatal Morphology and Strain in Maxillary Complete Dentures

Wearers of complete dentures often suffer from deformation of the denture base that may lead to fracture, while generating adverse compressive stresses to the supporting tissues. Takahashi et al from Osaka University Graduate School of Dentistry, Japan, conducted a preliminary investigation to assess the influence of palatal morphology on the deformation of maxillary complete dentures.

The dentures of 8 patients (4 men, 4 women; age range, 55–83 years; mean age, 72.5 ± 7.4 years) were duplicated, and a strain gauge was attached at the first molar position at the midline of the polished surface of each denture where most denture repairs occur. Patients bit down on a metal bar placed at the denture’s first molar region; a 3-dimensional model was generated from a scan of the maxillary cast.

Palatal width, palatal depth and radius of curvature were measured at the first molar position. While strain correlated poorly with palatal width, it demonstrated a significant negative correlation with palatal depth and a significant positive correlation with radius of curvature (Figure 1).

Comment
The results of this preliminary study raise the possibility that maxillary dentures of patients with wide, shallow palates may be more susceptible to deformation. Such dentures should be reinforced and given optimal occlusal arrangements to avoid development of adverse midpalatal forces. Large-scale studies need to be undertaken to confirm these results.


Figure 1. Correlation between strain and (A) palatal width, (B) palatal depth and (C) radius of curvature

In the Next Issue
Evolving understanding of bruxism

Our next report features a discussion of this issue and the studies that address it, as well as other articles exploring topics of vital interest to you as a practitioner.

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