Peri-implant Disease: The Basics

By Arun Garg, DMD

Peri-implant disease includes the spectrum of conditions that affect the gingiva and underlying bone at the site of implant placement. Despite the tremendous growth in fixed implant utilization over the last two decades, few implant publications address the topic of peri-implant disease from an all-encompassing approach. This article summarizes current research on the topic and provides background on the risk factors, etiologies, and treatment for peri-implant mucositis and peri-implantitis.

Peri-implant Diseases

Two disease states are typically described in literature addressing inflammatory processes affecting gingiva and bone surrounding the implant. Peri-implant mucositis and peri-implantitis are differentiated by the involvement of bone and the reversibility of the subsequent damage. Universal definitions of these conditions, pertaining to extent of inflammation, depth of pocket involvement, and bleeding or friable gum tissue, are still debated in the literature and remain vague. Different authors tend to use different parameters, but the universal understanding of the two conditions is that peri-mucositis involves the mucosa, not the bone, and peri-implantitis involves the underlying bone as well as the mucosa and, therefore, is irreversible.

Authors Zitzmann and Berglundh endeavored to tease out the prevalence of these two conditions in a thorough literature search and critical review.1 Their results suggest that the prevalence of peri-mucositis is as high as 79%-90%; it should be noted that the authors had strict inclusion criteria, excluding all studies that did not include bleeding on probing (BoP) as part of the definition of peri-implant disease, and those studies that had fewer than 50 subjects or an implant function time of less than five years. Because differences in the definitions of these conditions exist, criteria for inclusion as one condition vs. the other may alter the actual prevalences of disease. It is important to note that these conditions do not apply to the short-term issues surrounding fresh placement of an implant; rather, they are chronic conditions that develop years after successful osseointegration.

The aforementioned authors note...
Risk Factors for Peri-Implant Disease

Risk factors for disease are best assessed in prospective, longitudinal studies, yet few of these exist in the literature pertaining to peri-implant disease. Rather, cross-sectional and retrospective studies review groups of patients who have a specific complication after implant placement. Author Heitz-Mayfield reviews the literature on the diagnostic indicators and risk factors for peri-implant diseases. Analysis, according to the author, required precise indicators of disease, a difficulty given the extent of research and the variability in definitive nomenclature and diagnostic assessment tools. Looking at a vast expanse of literature on the topic, Heitz-Mayfield delineates specific diagnostic tools: peri-implant probing with specific probing forces (0.25N of force defined as “light pressure”), bleeding on probing, microbial diagnostic testing (Aggregatibacter actinomycetemcomitans, Prevotella intermedia, Porphyromonas gingivalis, and Treponema denticola were considered causative agents), and radiographic evidence of early bone changes via panoramic radiography, multi-slice CT, and cone-beam volume imaging. All are used as means to assess the development of a peri-implant process like mucositis or implantitis. Studies looking at these measures of assessment were not reviewed if they had follow-up times less than three years.

Looking at four systematic reviews, the author concludes that a history of periodontitis is an independent risk factor for the development of peri-implantitis and peri-mucositis. She also concludes that poor oral hygiene and cigarette smoking lead to peri-implantitis at higher rates than non-smoking and good oral hygiene.

Heitz-Mayfield also looked at alcohol consumption, diabetes, presence of keratinized mucosa and implant surface and their roles as predictors of peri-implant disease. She concludes that there is limited evidence that diabetes (especially poorly controlled diabetes) is associated with peri-implant disease, and that alcohol consumption in excess of 10 mg per day may be associated with higher rates of peri-implant mucositis and peri-implantitis.

Treatment of Peri-implant Disease

Peri-implant disease has, at its core, a biological struggle between host and pathogen; the degree to which the implant recipient can fend off local and pathogenic bacteria known to exist at the gingival margin so that they do not colonize the implant is the difference between suppuration and bleeding on probing vs. no change in the appearance of the gingiva or bone around the implant site. Extent of disease determines bone involvement. Nonsurgical treatment options include mechanical therapy, antimicrobial mouthwashes such as chlorhexidine, and laser therapy. Any treatment that confers local bactericidal properties will target the cause of peri-implant disease; namely, bacterial colonization at a vulnerable point of entry. Of course, if the biofilm layer of bacterial adherence is not altered, damage can continue and more invasive treatment may be required, especially if the implant is loose — a sign that osseointegration has been disrupted. Very few studies assess comparative analyses of treatment measures in the case of implant failure secondary to bacterial infection several years after implantation. Some studies suggest systemic antibiotic use may improve surgical options. Others offer that local antimicrobials should suffice. One point is clear: bone grafting...
Table 1: Summary of Zitzmann and Berglundh’s Research

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<thead>
<tr>
<th>Disease</th>
<th>Definition</th>
<th>Prevalence of Disease</th>
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<tr>
<td>Peri-mucositis</td>
<td>BoP (Bleeding on Probing) present (with or without suppuration)</td>
<td>80% of subjects, 50% of implants</td>
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<tr>
<td>Peri-implantitis</td>
<td>Peri-mucositis with PPD (probing pocket depth) &gt; 6 mm OR attachment loss/bone loss ≥2.5 mm</td>
<td>28% and 56% of subjects, 12%, and 43% of implant sites (based on 2 studies)</td>
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Out of 683 titles listed in PubMed through December 2007, only two met criteria for inclusion by the above standard definitions and sample size greater than 50 subjects.¹

(autogenous or freeze-dried) to diminish probing depths and repair the damage of peri-implantitis without debridment of the area of inflammation is more of a “band-aid” than a true therapeutic measure; supplemental grafting techniques will be problematic if the root of the problem — the underlying gingival infection — is not addressed. In as much as new dental implants tend to fail more often in patients with chronic periodontitis (unless prophylactic treatment in advance of implant placement is initiated), so too will peri-implantitis continue to affect those with chronic infection at the site of the implant if it is not properly treated with antibiotics and local debridement. Despite the fact that peri-implantitis-associated failure is a rare condition, it does occur; treatment should focus on debridment and decontamination of the site surface before alternate measures are attempted to restore the implant with regenerative grafting techniques. In that light, systemic antibiotics may further improve infection control and healing, though literature on the topic is scant.⁵

References

Case Study: The Burning Mouth

By Arun Garg, DMD, and Ghislaine Guez, MD, MBA

A 56-YEAR-OLD FEMALE PRESENTED TO THE dental office with complaints of oral discomfort, which she described as a “tingling tongue” with “numbness” and “burning” pain. She describes the discomfort as a 6/10 on a pain scale, and has tried analgesics for pain relief and avoidance of certain foods, with little improvement. She also reports disturbed sleep and a metallic taste. Lab exams reveal no abnormalities. She has two dental implants, placed four years ago, and is currently taking captopril for blood pressure control. She is notably anxious on exam, and tells you that she was diagnosed with cancer six months ago and has undergone several rounds of chemotherapy.

Evaluation of the Burning Mouth

Glossodynia, stomatopyrosis, and oral dysesthesia have all been used to describe this vague and often troubling condition that affects as much as 5% of the general population.¹ Predominantly, sufferers of burning mouth syndrome are women. The etiology of the condition remains hotly debated — it is unclear at present whether the disease has a physical component, psychological component, or both. Some studies suggest defects in the peripheral or central nervous systems; others offer the etiology as hormonal dysregulation.²

A useful tool for triage of these patients is the exclusion of specific abnormal intra-oral pathology (Table 2). An oral exam should look for evidence of geographic tongue, candidiasis, lichen planus, xerostomia, and contact stomatitis. Once these conditions have been ruled out, further work-up should target more latent causes of disease. Medical, dental, and psychological history are especially relevant here. Evaluation can then be divided into mechanical, medication-related, metabolic, and exposure-related causes. Exam of denture or implant design is essential, as part of the mechanical arm of disease. Lab studies for fasting glucose levels, vitamins B1, B6, B2, and B9, and iron levels are useful. Specifically, a CBC looking for a macrocytic anemia is warranted, as are B12 and folate levels. Endocrine evaluation (TSH level for thyroid hormone level and hemoglobin A1C) may be useful as well. A thorough medication history should be taken, as many patients experience dry-mouth, metallic taste, and other oral/sensory changes while taking specific medications. Exposure history should
look for recent changes in environment and diet. New-onset allergens should also be addressed — a patch test and allergist referral would be useful at this juncture. Of course, tobacco use should be discontinued and oral irritants avoided. Treatment of underlying medical conditions and/or removal of offending medications or exposures should be attempted. Finally, in the absence of other potential causes, chronic pain management with topical agents or selective serotonin reuptake inhibitors (SSRIs) and/or benzodiazepines may be useful.

This patient’s presentation is interesting because it underscores the fact that many cases of burning mouth syndrome are multi-factorial and require evaluation of multiple causative agents. For example, this patient’s use of an angiotensin converting enzyme (ACE) inhibitor is likely associated with the metallic taste. Her recent initiation of chemotherapy puts her at risk for immunosuppression and subsequent oral Candida albicans infection (Figure 1). This patient’s anxiety and stress regarding recent life events may be exacerbating her chronic pain. Persistence and detective work go a long way in this frustrating and difficult condition that often stumps patients and practitioners alike. On the plus side, most cases spontaneously remit within a few years of onset, or diminish when the offending agents are withdrawn.

Because so many vasculitic processes have definitive oral sequelae, the pathology and pathophysiology of specific rheumatologic conditions will be addressed in a future article.

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By Arun Garg, DMD, and Ghislaine Guez, MD, MBA

At times, the initial patient visit can be unapologetically brief. The reality in today’s financial climate is that busy dental practitioners have a significant amount of ground to cover in only a limited amount of time. It can be tempting to gloss over some of the details of the patient’s life, and maybe even skip some of the facets of their remote medical history. After all, are childhood diseases really relevant to the dental-implant specialist? Rather than dwell on the more inane aspects of a patient’s background, it might be easier and faster to go straight to imaging and the oral exam to fill in the gaps before an implant procedure. A word of caution — and a bit of old fashioned wisdom: In dentistry, as in life, Murphy’s Law applies — everything that can go wrong will go wrong. A thorough patient history can forestall some of the pitfalls that could occur in even the simplest patients.

General Information
It is simply common sense to keep track of a person’s general demographic information. At the very least, this should include the patient’s name and contact information, age, sex, marital status, employment, insurance information, financial information, and emergency contact.

In addition to this general information, specific and detailed information regarding a patient’s medical background must be obtained prior to any dental intervention. Accurate documentation, like consultation forms, oral self-care checklists, and yes/no medical condition and medication questionnaires will go a long way to assure that nothing is overlooked during a patient interview.

Medical History
Some medical conditions can minimize implant success — and these generally include anything that affects healing time, susceptibility to infection, bleeding and clotting, and bone formation. Table 3 describes specific medication conditions that can severely affect implant outcomes and jeopardize patient well-being. Practitioners should be wary that more complications may occur in these patients for specific reasons, as listed. To some extent, the medical conditions reviewed in Table 3 are considered relative, if not absolute contraindications to implant placement or dental procedures, unless specific strategies are used to manage potential complications.

While some patients may have been patients for years, it is important to always ask and document any recent changes in medical history, including allergies and medications. An exhaustive list goes a long way to ensure all the bases are covered (see Table 4).

Specific conditions, like diabetes, are especially prevalent in the population. Numerous studies have shown that uncontrolled glucose levels predispose to higher rates of infection. Oftentimes, a patient is hyperglycemic without carrying the diagnosis of type 2 diabetes. Pointed questions about excessive thirst or more frequent urination are useful to elucidate this condition, and a fasting

Table 3: Medical Conditions Associated with Significant Side Effects of Dental-Implant Placement

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<tr>
<th>Medical Condition</th>
<th>Potential Problems</th>
<th>Intra- or post-operative symptoms</th>
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<tr>
<td>Narcotic abuse</td>
<td>Intractable pain postoperatively</td>
<td>Anxiety, poor pain tolerance</td>
</tr>
<tr>
<td>Head and neck cancers with a history of chemotherapy or radiation</td>
<td>Poor bone healing around implants; implant failure; osteoradionecrosis (rare)</td>
<td>Pain, swelling, trismus, pathologic fracture, oral cutaneous fistula</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Significantly elevated blood pressure secondary to pain or anxiety</td>
<td>Headache, dizziness, nausea, vomiting; may precede ischemic event like myocardial infarction, or stroke</td>
</tr>
<tr>
<td>Bleeding disorders: thrombocytopenia, clotting factor deficiencies</td>
<td>Intractable bleeding</td>
<td>Hypotension, transient anemia, hematoma</td>
</tr>
<tr>
<td>Immune deficiency</td>
<td>Oral or systemic infection</td>
<td>Pain, abscess, poor wound healing, mucositis</td>
</tr>
<tr>
<td>Cancer</td>
<td>Neutropenia</td>
<td>Neutropenic fevers, poor wound healing, bleeding</td>
</tr>
<tr>
<td>Autoimmune disorders, including vasculitides, lupus erythematosus, rheumatoid arthritis</td>
<td>Infection resulting from immune compromise secondary to immune-modulating drugs like cyclophosphamide and prednisone</td>
<td>Poor wound healing, mucositis, peri-implantitis, implant failure, oral abscess</td>
</tr>
<tr>
<td>Valve replacement</td>
<td>Endocarditis</td>
<td>Fever, bacteremia, septicemia, septic emboli</td>
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glucose level can clinch the diagnosis in advance of an implant procedure.

Allergies are also especially important and should be clearly elucidated. Specifically, patients should be asked if they are allergic to any of the following:

- antibiotics
- aspirin
- narcotic pain medications
- lidocaine
- latex
- local anesthetics
- sulfad drugs
- metals

- plastics
- sedatives

If a patient does document an allergy or adverse drug reaction, it is important to determine what happened as a result — often, patients misinterpret time-course of events surrounding what was thought to be an adverse reaction to a medication. A patient stating “It made me feel a little dizzy” might not cause too much concern to the practitioner, whereas “I got hives and had a scratchy feeling in my throat and had to go to the hospital” would certainly preclude further use of the agent in question. Further, documenting these reactions is vital. Most health-care organizations have a color-specific label on the chart to reinforce that a patient is not to receive a specific medication. Updating the allergy list also is required at every patient visit.

**Medications**

Simply asking a patient to list all the medications that he or she is taking may not provide an accurate picture of the patient’s pharmacological history. All den-
tal practitioners have had the experience wherein a patient forgets to mention the daily aspirin, the four-times-daily ibuprofen, or the herbal supplement usage during history taking. The question “Do you take any prescription medications, supplements, or over-the-counter drugs?” is much more effective in terms of scope, but still leaves the burden on the practitioner to determine the full extent of the patient’s usage. A succinct list of common medication classes and a yes/no checklist is again the better option for documentation purposes and to give the patient time to actually think about what medications or supplements he or she uses.

Table 5: Sample Patient Questionnaire — Medications.

Check the box next to any of the medications you are currently taking; please list the name and dose of the medication, if possible:

- Antibiotics
- Anticoagulants or anti-platelet medications ("blood thinners")
- Barbiturates
- Blood pressure medication
- Blood sugar medications like insulin or Metformin
- Cortisone, hydrocortisone, prednisone
- Daily vitamins
- Dietary supplements
- Diet pills
- Headache medication
- Heart medication
- Herbal supplements
- Hormones
- Muscle relaxants
- Nerve pills
- Osteoporosis medications, including bisphosphonates
- Pain medication
- Sleeping pills
- Sulfur drugs
- Tranquilizers

A list of medications is useful for history-taking and charting purposes.

Lifestyle Factors

This broad category generally includes tobacco, alcohol, and drug usage, and is an important part of the pre-implant questionnaire. As previously published in Dental Implantology Update, smoking can have a negative effect on dental-implant success rates due to the effect of local vasoconstriction, decreased immune function, and specific toxicogenetic effects of nicotine-containing products like cigarettes. Oral tobacco products, like chewing tobacco, can cause even more damage directly to gingival and buccal tissues. There is voluminous data supporting the connection between implant failure and smoking, especially in patients requiring autogenous bone grafting or sinus lift.1,3

Alcohol use often coincides with poor dentition and elevated rates of periodontitis; post-implant problems like mucositis or peri-implant abscess can occur given that the chronic alcohol user is at higher risk for infection by anaerobic species of bacteria. Alcohol also has been shown to have a toxic effect on bone marrow in some patients, causing pancytopenia that would predispose to poor wound healing, difficulty forming platelet plugs, and relative anemia. Caution should be used in these patients. Most importantly, dental practitioners need, at a minimum, to be aware of the patient’s potential risk before endeavoring to offer surgical correction.

Dental History

Dental history often provides the most useful information to implant practitioners. Patient surveys should ask specific questions about prior dental work, ill effects, or complications as a result of previous dental treatment, gingival assessment (“Do your gums bleed during brushing”), flossing and brushing frequency, jaw and tooth trauma, current dental appliances, gag-reflex issues, difficulties
chewing or swallowing, tooth sensitivity (heat, cold pressure, aching), loose or moving teeth, a history of teeth grinding or clenching, pain or clicking in the jaw, ear pain, sores or growths in the oral cavity, use of fluoride supplement, and overall satisfaction with teeth color.

At this point, the patient has had a chance to reveal pertinent medical and dental information at least twice — once on paper via questionnaire and once in the patient interview. Gaps should, theoretically, be filled by this detailed “review of systems” approach — the top down survey of the patient’s overall well being. The last step to putting the patient’s history together is to obtain medical and dental records from previous practitioners.

References