Managing Peri-implantitis

Namita Khandelwal
University of New England, nkhandelwal@une.edu

Follow this and additional works at: http://dune.une.edu/cdm_facpubs
Part of the Oral and Maxillofacial Surgery Commons, and the Prosthodontics and Prosthodontology Commons

Recommended Citation
http://dune.une.edu/cdm_facpubs/5

This Article is brought to you for free and open access by the College of Dental Medicine at DUNE: DigitalUNE. It has been accepted for inclusion in Dental Medicine Faculty Publications by an authorized administrator of DUNE: DigitalUNE. For more information, please contact bkenyon@une.edu.
Managing Peri-implantitis

Educational Objectives

Following this unit of instruction, the practitioner should be able to:

1. Understand the etiology and presentation of peri-implantitis.
2. Discuss different methods used to manage peri-implantitis.
3. Understand the limitations of surgical and non-surgical approaches used to manage peri-implantitis.
4. Recognize the importance of searching the available literature to stay current with effective methods to manage peri-implantitis.

Introduction

Dental implants are often offered as an option to replace missing natural teeth. The predictability of implants has led to increased popularity among both clinicians and patients over the past several decades. Implant placements worldwide have increased exponentially and are now estimated to be about 15 million annually.¹ Much attention has been given over the past decade to inflammatory pathology occurring around implants. Two types of peri-implant diseases have been identified: a) peri-implant mucositis - a reversible, inflammatory process in the peri-implant region presenting as reddening, swelling and bleeding on probing without loss of supporting bone,² and; b) peri-implantitis - an inflammatory process resulting in progressive loss of supporting bone around the implant (Figure 1).³

There has been no consensus regarding clearly defined criteria for peri-implantitis, with at least thirteen different definitions being presented. There are also multiple different classifications of the disease. One of the classification systems (Froum and Rosen) classified peri-implantitis into three categories based on pocket depth and bone loss (Table 1).⁴ The reported prevalence of peri-implant mucositis is 43% with a range of 19-65%. Peri-implantitis prevalence is reported at 22% with a range of 1- 47.1%.⁵ The enormous range in these estimates is due to varying case definitions, study designs and population sizes, as well as subjects with different risk profiles.

![Figure 1](image_url)

Clinical and radiographic appearance of Peri-implantitis with loss of supporting bone.
Peri-implantitis demands aggressive management compared to peri-implant mucositis. Hence, this Quality Resource Guide will focus on peri-implantitis, its risk factors, prevention and management.

**Risk Factors for Peri-implantitis**

There are a number of factors that have been implicated in the development of peri-implantitis; however, poor oral hygiene leading to the development of a pathogenic microbial biofilm or plaque is probably the most apparent concern in most of our patients. Incomplete plaque removal around an implant can result initially in the development of peri-implant mucositis. Peri-implant mucositis represents the soft tissue inflammatory response to bacterial challenge by the microbial biofilm and is considered an important precursor for peri-implantitis. As we continue to enhance our understanding of the role for maturation of a pathogenic biofilm in developing periodontal disease, we are beginning to see evidence of similar biofilm development on implant surfaces. Pre-existing peri-implant mucositis without maintenance significantly increases the incidence of peri-implantitis, demonstrating clinical consequences of a maturing pathogenic biofilm.

There appears to be a strong relationship between microbiota in periodontal disease, peri-implant disease and natural teeth. Natural teeth with periodontal disease appear to act as a reservoir for pathogens in partially edentulous patients putting implants in these patients at greater risk of peri-implantitis. Individuals with history of periodontitis demonstrate a higher incidence of peri-implantitis, with deeper probing depths and increase in marginal bone loss. Clinicians need to exert extra caution in the use of implant therapy for patients with a history of periodontal disease, and certainly in those patients with active periodontal disease around remaining natural teeth.

With this well-established cause and effect relationship between poor oral hygiene and peri-implant disease, the role for a preventive maintenance program becomes critical to long-term implant success. Often oral hygiene and maintenance therapy may be further compromised by complex prosthetic designs. Where possible, both prosthetic designs and maintenance regimens should be adjusted with these factors in mind to enhance the possibility of long-term success.

Apart from microbial biofilm accumulation, various other local and systemic factors have been implicated as risk factors that increase risk of peri-implantitis. Renvert and Quirynen examined the available evidence and listed the following as risk factors for peri-implantitis:

- Poor hygiene
- Smoking
- History of periodontitis
- Restorative cement overflow
- Occlusal overload
- Poor restoration design

**Systemic Factors**

- Diabetes
- Cardiovascular diseases

Systematic reviews suggest peri-implantitis may occur in smokers about four times as often as non-smokers (odds ratios between 3.6-4.6). Another important local factor associated with peri-implantitis is retained cement. Cement overflow may occur during implant crown cementation and act as foreign body, triggering inflammation. Peri-implantitis is seen in 85% of implants that exhibit incidental cement remnants. Implants with cemented restorations have 3.6 times more risk of peri-implantitis than those with screw retained restorations. Unfortunately, radiographs are unreliable in detecting excess cement and provide little evidence of cement overflow, increasing the need for careful clinical assessment. Occlusal overload remains controversial as a risk factor for peri-implantitis, with studies both supporting and refuting its role in leading to peri-implantitis. While occlusal overload remains questionable as a causative agent, care should be given to assure that it is minimized.

Peri-implantitis is most prevalent in mandibular posterior regions and least prevalent in the maxillary anterior region. Implants placed in the maxilla have shown a rate of failure three times higher than those placed in the mandible. This has been attributed to the poorer bone quality in maxilla, especially in posterior regions. The bone type at specific sites may also play a role in success of implant. All bone types, except type 2*, have reported almost two times greater risk for early implant failure, and type 4 bone* has shown the greatest failure rate (63%).

Table 1 - Classification of Perio-Implantitis

<table>
<thead>
<tr>
<th>Type</th>
<th>PD&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Bone loss</th>
<th>Probing depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early</td>
<td>4mm (bleeding and/or suppuration on probing)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&lt;25% of implant length&lt;sup&gt;c&lt;/sup&gt;</td>
<td>&gt;6mm (bleeding and/or suppuration on probing)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Moderate</td>
<td>probing depth &gt; 6mm (bleeding and/or suppuration on probing)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>25-50% of implant length&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>probing depth &gt; 8mm (bleeding and/or suppuration on probing)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&gt;50% of implant length&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Probing Depth  
<sup>b</sup> Noted on two or more aspects of the implant.  
<sup>c</sup> Measured on radiographs from the time of definitive prosthesis loading to current radiograph.  
If not available, the earliest available radiograph following loading should be used.
Apart from local factors, systemic conditions may also play a role in progression of peri-implantitis. In the past, some have stated that implants were contraindicated in diabetic patients. However, in the recent years, implants have been successfully placed in patients with poorly controlled diabetes. When comparing the clinical outcomes between well and poorly controlled diabetics, little difference was noted in prevalence rate of bleeding on probing, however, the prevalence of bone loss was higher in the poorly controlled group (60% vs. 45%).

Retrospective analysis reported cardiovascular disease as a risk factor for peri-implantitis (odds ratio 8.7) and a high likelihood of comorbidity. One of the study’s limitations was that cardiovascular disease was self-reported, reducing the reliability of the reported data. Overall, there is limited data demonstrating that cardiovascular disease affects bone loss. Other systemic factors, such as osteoporosis and radiation therapy in head and neck region, can affect osseointegration and are considered as contraindications to implant placement.

Due to multifactorial peri-implant disease model, one should be mindful of possible correlation of local and systemic factors. Biofilm is considered as the primary offending factor responsible for marginal bone loss. Hence, it is important to establish an implant maintenance program that is designed based upon the patient’s difficulty in consistently removing plaque from the implant region and the presence of other risk factors. It should be adjusted as necessary.

**Diagnostic Criteria for Peri-implantitis**

Early detection of peri-implant mucositis progression results in better case management and an increased chance of implant survival. Peri-implant mucositis is a reversible process. Control of local factors can help improve clinical parameters and halt progression to irreversible peri-implantitis.

Important diagnostic criteria for peri-implantitis are bleeding and/or suppuration on probing, with progressively increasing probing depths. It is extremely important to probe the implant region initially to establish a baseline, and then at each maintenance visit to detect any increases in probing depths. As anatomic factors associated with differing implant designs may greatly alter what would be considered normal probing depths in that specific circumstance, the identification of a change from baseline probing depth serves as a critical indicator. Healthy sulcular depths may vary because of differences in implant systems, depth of abutments, positioning of implant margins relative to adjacent bone levels, as well as surgical and loading protocols. Using a reference point on the restoration, probing depth is measured from the base of the implant sulcus to the crest of gingival margin. The clinician must remember that the soft tissue attachment to the implant differs from that to natural teeth; lighter probing is encouraged around dental implants than around teeth. There is no evidence that the type of probe (metal or plastic) affects probing depth assessment or has any clinical impact on the implant surface. It is more critical to obtain accuracy in probing than be concerned about potential impact to the implant surface. It is also important to consider changes in probing depths as a consequence of marginal tissue inflammation rather than bone loss. Given the altered soft tissue attachment to the implant surface, inflammation in these tissues creates greater disruption of the tissue integrity and may allow the probe tip to penetrate to the bone crest. Therefore, critical appraisal of the probing needs to consider the baseline measurements were most likely made in the absence of inflammation. Alterations in probing depths need to be considered relative to the level of inflammation present, knowing that the latter circumstance may better reflect the position of the bone crest.

**Treatment of Peri-implantitis**

Both surgical and non-surgical approaches have been evaluated for the management of peri-implantitis. The treatment approach employed is determined by probing depth and defect characteristics. A non-surgical approach involves surface detoxification using mechanical, chemical, lasers and antibiotic therapy (locally and/or systemically). Surgical approaches include access flap, as well as resective and regenerative surgical techniques.

**Non-Surgical Approaches**

Implant surface detoxification is a common step for both surgical and non-surgical approaches. The goal of detoxification is to reduce the bacterial load on the implant surface and render it free of bacterial by-products. Often, detoxification is accomplished using periodontal curettes. Curettes used for debridement of the implant surface must be softer than the material comprising the implant. Traditional stainless steel curettes have higher external hardness than titanium and will result in scratches on the implant surface. They should not be used on titanium implants, however they can be safely employed if the implant is made of titanium zirconoxide or titanium oxinitride. Titanium-coated curettes are similar in hardness to titanium implants and minimize scratching of the implant surface. Non-metal curettes can successfully remove biofilm from implant and abutment surfaces, and are recommended for titanium implants.

Non-metal curettes are similar in hardness to titanium implants and minimize scratching of the implant surface. Air-powder abrasive polishing has been shown to be effective in biofilm removal from an implant surface. Air abrasives containing glycine powder, as opposed to those comprised of sodium bicarbonate powder, are recommended due to effective biofilm removal without any damaging effects on hard and soft tissues.

Detoxification of the implant surface may also be achieved with application of hydrogen peroxide, EDTA, chlorhexidine, citric acid, saline or the local application of antibiotics. Soaking an implant surface with 3% hydrogen peroxide for one minute demonstrated inactivation of attached bacteria.

Following surface detoxification, local delivery system using chips were evaluated. Bone matrix chips (MatrixC) and chlorhexidine chips (PerioC) were compared for six months in sixty patients. Following the therapy, patients with initially deeper probing depth showed a reduction of
Surgical Approaches
A nonsurgical approach is recommended in shallow defects to maintain the height of the soft tissue margins.44 Non-surgical therapies, however, may offer limited access in some regions and surgical therapy may be necessary to enhance the opportunity for long-term stabilization. The surgical technique employed depends on defect morphology and typically involves an access flap and debridement/detoxification, followed by resective and/or regenerative procedures. Schwarz et al. demonstrated that a combination of resective and regenerative surgical techniques are usually more effective.45 Defect morphology can impact the treatment outcome following regenerative therapy.46

The objective of an access flap and debridement is to remove the inflamed tissue around the implant, allowing access to the osseous defect. Implant surface detoxification, as discussed earlier, can be achieved using chemical, mechanical and/or lasers following tissue reflection. In non-esthetic regions with a shallow, one-walled intrabony defect, effective therapy consists of implantoplasty and osteoplasty followed by apically repositioning of the soft tissue flap. This will result in tissue recession and a region more conducive to successful maintenance.

Multiple studies have reported various surgical approaches based on defect morphology, irrigants, employing single or multiple grafting materials and, use of resorbable or non-resorbable membrane. There is no single surgical therapy that is considered superior over other. Surgical therapy includes elevation of mucoperiosteal flap, access to implant surface and defect by removal of granulation tissue, implant surface decontamination or modification, resective or regenerative therapy and post-therapy systemic antibiotic administration.47 Implant removal should be considered if they are mobile with radiographic bone loss extending around the apex. As surgical therapies are complex procedures, it is highly recommended that they be performed by skilled clinicians with surgical training in periodontal therapies. Also, with no clear evidence supporting one specific therapy, literature should be reviewed consistently for strong evidence to support surgical approaches.

Conclusion
A number of therapy approaches have demonstrated the potential to successfully treat peri-implantitis (Table 2). Techniques for the management of peri-implantitis are still evolving. Many protocols have been tried, with some showing promising clinical results. However, there is no protocol proven to be superior over other. At this time, it appears that research supports the following conclusions:

1. Peri-implant mucositis acts as a precursor for peri-implantitis
2. Surface detoxification, along with modification of the implant and the tissue architecture to facilitate maintenance, are the most important steps in management of all peri-implantitis lesions.
3. Lasers do not demonstrate additional benefit over other detoxification techniques.
4. Defect morphology dictates type of surgical approach that should be utilized.

Table 2 - Therapeutic Options

<table>
<thead>
<tr>
<th>Non-Surgical</th>
<th>Surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Surface detoxification</td>
<td>• Resective</td>
</tr>
<tr>
<td>• Curettes</td>
<td>• Regenerative</td>
</tr>
<tr>
<td>• Airpowder abrasive</td>
<td>• Combination</td>
</tr>
<tr>
<td>• Local drug delivery</td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES


1. Peri-implantitis differs from peri-implant mucositis by
   a. Deep probing depths
   b. Bleeding on probing
   c. Loss of supporting bone
   d. Swelling around restored implant

2. Identify least potential risk factors in the etiology of
   peri-implantitis could be all of the following, **EXCEPT**:
   a. A screw retained implant crown
   b. Diabetes
   c. Poor oral hygiene
   d. Occlusal overload

3. Surface detoxification is common step for surgical and
   non-surgical approaches for treating peri-implantitis.
   a. True
   b. False

4. Implants should be managed for peri-implantitis in all
   of the cases, **EXCEPT**:
   a. Near anatomic landmark
   b. Key restorative position
   c. Intrabony defects
   d. Mobility

5. All of the following are true about implantoplasty,
   **EXCEPT**:
   a. Compromises esthetics
   b. Enables maintenance
   c. Stimulates re-osseointegration
   d. Results in soft tissue loss

6. Selection of a peri-implantitis treatment approach
   depends on:
   a. Defect morphology
   b. Probing depth
   c. Radiographic bone loss in relation to implant length
   d. All of the above

7. During surgical management of peri-implantitis,
   implants must be always submerged.
   a. True
   b. False

8. The proposed Er:Yag laser setting for peri-implantitis
   management is:
   a. 100mJ/10Hz
   b. 50mJ/15Hz
   c. 120mJ/10Hz
   d. 100mJ/20Hz

9. In a defect with less than 4mm probing depth, bleeding
   on probing, 10-15% bone loss along the implant
   length and systemically healthy patient, the following
   is approach to treating peri-implantitis would be
   generally recommended:
   a. Surgical approach
   b. Non-surgical approach
   c. Combination of surgical and non-surgical therapy
   d. No treatment

10. Access flaps allow:
    a. Removal of inflamed tissue around the implant
    b. Access to peri-implantitis defect
    c. All of the above
    d. None of the above
Quality Resource Guide - Managing Peri-implantitis

Providing dentists with the opportunity for continuing dental education is an essential part of MetLife’s commitment to helping dentists improve the oral health of their patients through education. You can help in this effort by providing feedback regarding the continuing education offering you have just completed.

Please respond to the statements below by checking the appropriate box, using the scale on the right.

1. How well did this course meet its stated educational objectives?  
2. How would you rate the quality of the content?  
3. Please rate the effectiveness of the author.  
4. Please rate the written materials and visual aids used.  
5. The use of evidence-based dentistry on the topic when applicable.  
6. How relevant was the course material to your practice?  
7. The extent to which the course enhanced your current knowledge or skill?  
8. The level to which your personal objectives were satisfied.  
9. Please rate the administrative arrangements for this course.  
10. How likely are you to recommend MetLife’s CE program to a friend or colleague? (please circle one number below):  

What is the primary reason for your 0-10 recommendation rating above?

11. Please identify future topics that you would like to see:

Thank you for your time and feedback.

To Complete Program Traditionally, Please Mail Your Post Test and Evaluation Forms To:

MetLife Dental Quality Initiatives Program  
501 US Highway 22  
Bridgewater, NJ 08807

www.metdental.com