

# THERAPY OF PERI-IMPLANT DISEASES. WHERE IS THE EVIDENCE?

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## ABSTRACT

Peri-implant diseases are a common problem in dentistry today and no definitive treatment protocol exists for their treatment. The purpose of this review was to examine the evidence concerning the management of these diseases. The evidence provided suggests that peri-mucositis can be managed with use of mechanical non-surgical therapy. Peri-implantitis does not respond to nonsurgical therapy. Various surgical methods have been proposed for management of peri-implantitis with some success; however, no single method can be promoted based on the current evidence.

## INTRODUCTION

Peri-implant diseases are a set of infectious diseases categorized as either peri-implant mucositis or peri-implantitis. Peri-implant mucositis is an inflammatory reaction to mucosa adjacent to implants<sup>1</sup> and can be recognized by the presence of bleeding on probing.<sup>2</sup> Peri-implantitis (**Fig. 1**) is similar except that there is also the presence of loss of supporting bone.<sup>1</sup> Other diagnostic factors include the presence of increased peri-implant probing depths and suppuration.<sup>3</sup> Various risk indicators have been identified for the development of peri-implant diseases, which include poor oral hygiene, history of periodontal disease, and cigarette smoking.<sup>2,4-6</sup> The prevalence of peri-implant mucositis in one study was reported in 80% of subjects and 50% of implants.<sup>3,7</sup> Peri-implantitis prevalence has a reported range between 28% and 56% of subjects and 12% to 40% of implants.<sup>7-9</sup> As the use of dental implants continues to increase, the frequency with which clinicians will be confronted with peri-implant diseases can be expected to increase. Thus, it is important to consider the treatment options available for the management of peri-implant diseases. The treatment modalities that have been suggested to achieve this objective can be broken down into 2 broad categories: nonsurgical and surgical.

## NONSURGICAL TREATMENT OF PERI-IMPLANT DISEASES

### Peri-implant mucositis

According to the literature, implants with peri-implant mucositis in cynomolgus monkeys treated with mechanical therapy using plastic scalers had improved clinical and histological healing versus untreated control implants with peri-implant mucositis.<sup>10</sup> Additionally, the use of chlorhexidine irrigation and gel had outcomes similar to the mechanical therapy alone.<sup>10</sup> Human studies have also demonstrated the

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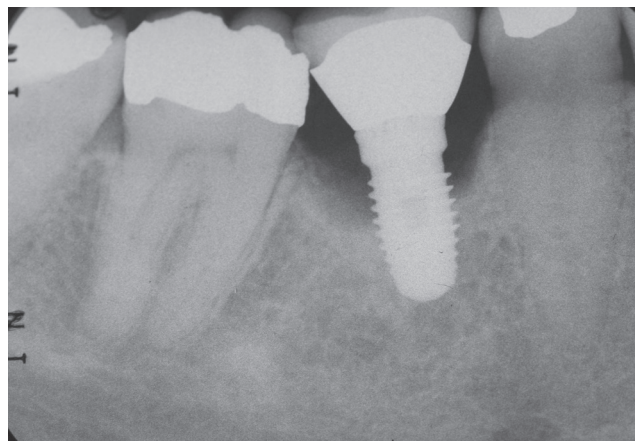
**J Evid Base Dent Pract 2012;S1:  
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1532-3382/\$36.00

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doi: [Txt variable-doi]

**Keywords:** peri-implant mucositis; peri-implantitis; therapy

**Figure 1. Peri-implant crestal bone loss as a result of inflammatory bony reaction .**



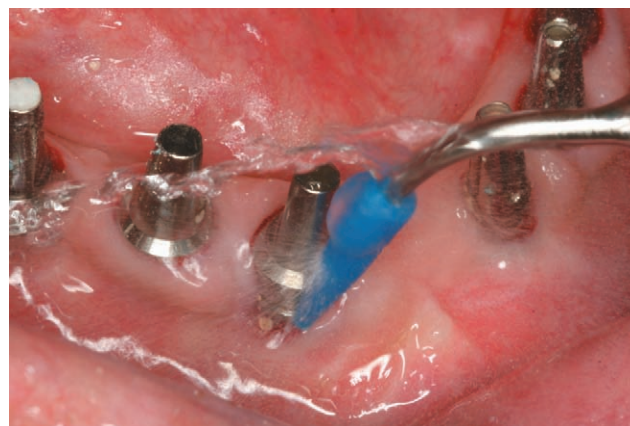
effectiveness of oral hygiene and mechanical therapy in the treatment of peri-implant mucositis.<sup>11-13</sup> The adjunctive use of professional subgingival irrigation with chlorhexidine was not found to provide a benefit over mechanical therapy alone.<sup>11</sup> Similarly, an adjunctive benefit of chlorhexidine gel over mechanical therapy alone has not been demonstrated.<sup>11,13</sup> Other clinical studies have found no additional benefit to the use of a chlorhexidine rinse over mechanical debridement alone.<sup>14</sup> Patient-delivered chlorhexidine irrigation has been shown to be more effective than using chlorhexidine mouthrinse,<sup>15</sup> and Listerine mouthwash (Johnson & Johnson, Skillman, NJ) has been shown to decrease mean plaque indexes and marginal bleeding scores more than placebo.<sup>16</sup> Also, the use of triclosan-containing dentifrice has been suggested to decrease bleeding on probing and probing depths compared with a non-triclosan-containing dentifrice.<sup>17</sup>

The use of a local delivery antimicrobial agent (specifically tetracycline fibers) has not demonstrated an adjunctive benefit over mechanical therapy alone.<sup>18</sup> Therefore, nonsurgical therapy, using mechanical therapy (**Fig. 2**) and oral hygiene instruction can be effective in the management of peri-implant mucositis.<sup>12</sup>

### Peri-implantitis

Methods of nonsurgical mechanical therapy that have been proposed for the treatment of peri-implantitis include the curettes, ultrasonic devices, air-abrasives, and laser therapy. A clinical trial comparing the effectiveness of ultrasonic and curette debridement in the treatment of peri-implantitis lesions demonstrated that neither treatment modality resulted in probing pocket depth reduction.<sup>19</sup> Furthermore, neither treatment method has been shown to eliminate or reduce the microbiota around implants with peri-implantitis.<sup>20</sup> Lack of effectiveness of air-abrasives was demonstrated in a comparison of mechanical debridement with curettes, in which

**Figure 2. Mechanical therapy using ultrasonic scaler with a plastic tip.**



neither treatment intervention produced significant probing pocket depth changes.<sup>21</sup>

Nonsurgical laser therapy with the Er:YAG laser has produced a similar lack of effectiveness over other therapeutic methods.<sup>22-24</sup> In fact, one study<sup>23</sup> had 100% recurrence of peri-implantitis at 1 year after treatment, which resulted in re-treatment.

Adjunctive antibiotic therapy, either local or systemic, has been suggested in the nonsurgical management of peri-implantitis. Some improvement in terms of probing depths and bleeding index were noted in a case series involving tetracycline fibers as an adjunct to mechanical debridement.<sup>25</sup> The adjunctive use of slow-release doxycycline demonstrated a clinical benefit over mechanical therapy alone,<sup>26</sup> as did the adjunctive use of minocycline microspheres.<sup>19,27,28</sup> Several case series included the use of adjunctive systemic antibiotics with improved clinical outcomes following therapy<sup>29-32</sup>; however, the specific contribution of the systemic antibiotics remains uncertain. A review of the topic suggested that nonsurgical management of peri-implantitis is not effective.<sup>12</sup>

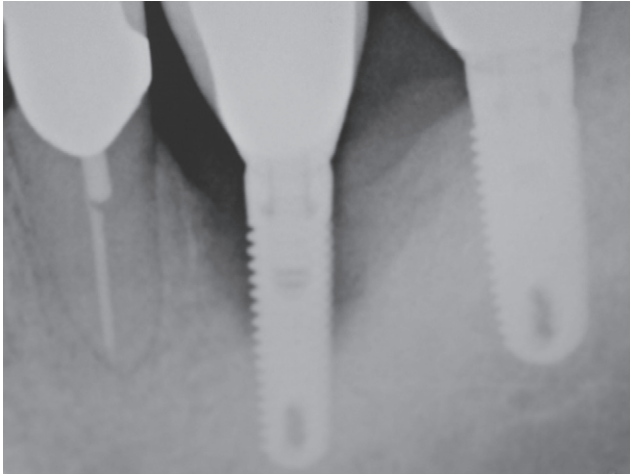
### Surgical treatment

Several surgical treatment methods have been proposed for the management of peri-implantitis. One approach is the use of an access flap for surgical debridement. In a case series, Leonhardt et al<sup>33</sup> showed resolution of disease in 58% of implants treated with this approach; however, 15% of implants showed progression of disease and 27% of implants were lost. A resective approach to surgical management has also been proposed. In a comparison of resection with and without smoothing of the implant surface, no additional clinical benefit was demonstrated with alteration of implant surface topography,<sup>34</sup> although radiographic benefits were noted.<sup>35</sup>

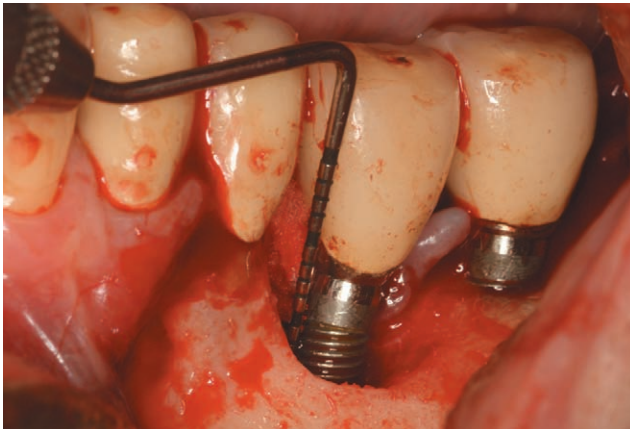
A regenerative approach to surgical peri-implantitis management has also been proposed. A number of case series<sup>36,37</sup> have demonstrated favorable clinical and radiographic results

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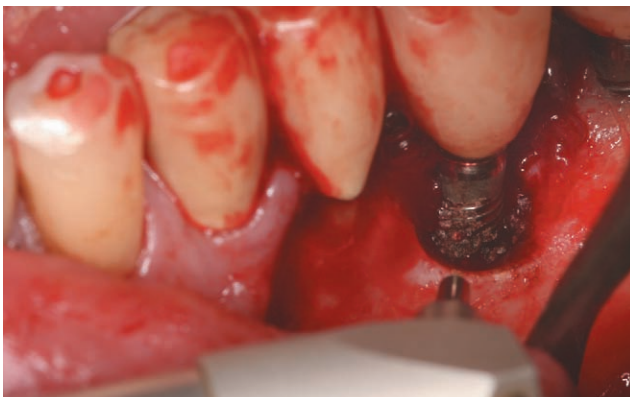
**Figure 3. (A) Peri-implant bone loss as a result of intrabony inflammatory reaction.**



**Figure 3. (B) Peri-implant intrabony bony defect.**

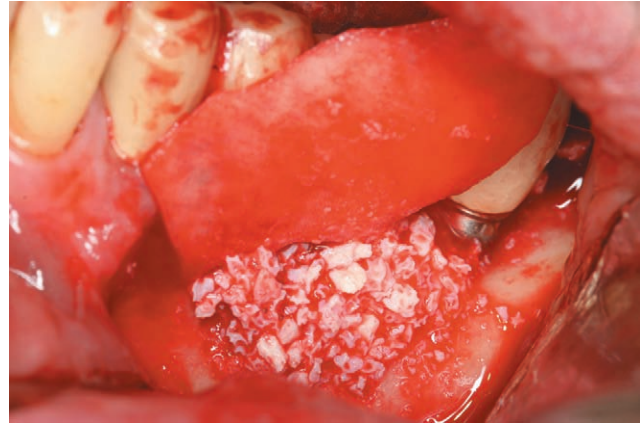


**Figure 3. (C) CO2 laser irradiation, for implant surface decontamination.**

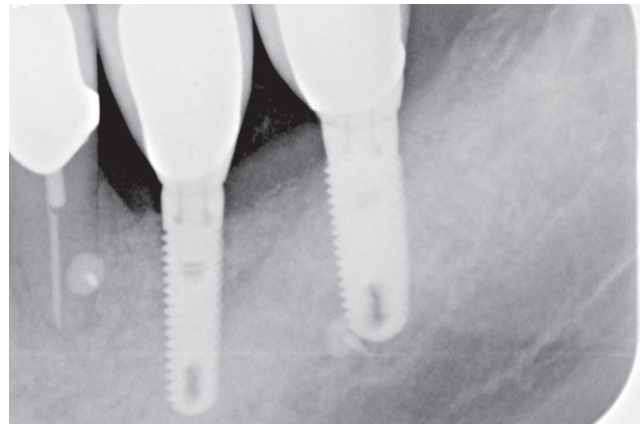


up to 3 years with the use of autogenous bone grafts. Favorable results have been demonstrated with other grafting materials as well.<sup>38,39</sup> The additional use of membranes over grafting materials has failed to show an additional benefit to the use of barrier materials.<sup>32,40</sup> Schwarz et al<sup>41</sup> suggested that success of treatment might be dependent on defect

**Figure 3. (D) Augmentation using cancellous mineralized bovine bone grafting material.**



**Figure 3. (D) Radiologic view of bone-fill 5 months after peri-implantitis therapy using CO2 laser decontamination.**



morphology, with circular defects with intact surrounding walls having better clinical results compared with defects that featured a dehiscence.

Implant surface decontamination is a feature of most study protocols. Various materials have been advocated, such as citric acid, chlorhexidine, hydrogen peroxide, local antibiotics, and combinations of numerous materials. Thus far, no single method of surface decontamination has shown superiority.<sup>42</sup>

Lasers have been suggested as an adjunct to conventional surgical treatment. Specifically high- (surgical) and low-power (nonsurgical) lasers, as well as photodynamic therapy,<sup>43</sup> have been used for implant surface decontamination with significant improvement of the clinical and radiological parameters, especially after the use of the CO2 laser for implant surface decontamination.<sup>44,45</sup> Because this wavelength does not provide negative effects on implant surfaces<sup>46</sup> and irradiation with this laser does not increase the temperature over the critical threshold,<sup>47</sup> this laser type may be beneficial for daily practice. Different case series suggest that in deep peri-implant intrabony defects a successful implant surface



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decontamination can be performed in conjunction with augmentation using BioOss cancellous, bovine grafting material, followed by coverage with a collagen membrane. This resulted in a long-term significant decrease in probing pocket depth in addition to significant radiographic bone fill (**Fig. 3**). According to in vitro studies with cell cultures, independent of the surface characteristics, CO<sub>2</sub> laser irradiation does not have negative effects on osteoblast proliferation or cellular attachment to the implant surface.<sup>46</sup> Animal studies suggest that this type of implant surface decontamination is responsible for re-osseointegration in vivo.<sup>48</sup> Despite the success of laser decontamination in some studies, others have observed a lack of improvement of clinical results<sup>49</sup> and some suggest that documentation of the adjunctive effect of lasers is weak.<sup>42</sup> Similarly, the adjunctive effect of systemic antibiotics in the surgical management of peri-implantitis is difficult to ascertain.<sup>42</sup> However, more experience and focus on modern laser technology may have the advantage of controlling peri-implant inflammatory reactions and regenerating the crestal bone of failing implants.

## CONCLUSION

Evidence concerning the management of peri-implant diseases is still in its relative infancy. Nonsurgical therapy appears effective in the management of peri-implant mucositis, but is not effective in the management of peri-implantitis. Various surgical methods for treatment of peri-implantitis have shown promise.

Unfortunately, many of the studies concerning the management of peri-implant disease are case series and are subject to inherent bias. Most study protocols feature complex and extensive therapies that make it difficult to determine the relative impact of individual aspects of the treatment protocol. No comparative clinical studies or randomized controlled clinical trials are available to provide the best protocol for treatment of peri-implant diseases and therefore no evidence for a definitive treatment protocol exists. Thus, more evidence is required to elucidate the most effective method of management of peri-implant diseases, including the relative impact of different adjunctive therapies and surface decontamination techniques. With an expected increase in prevalence of peri-implant diseases, the importance of future research concerning their management must be emphasized. Animal studies and randomized clinical trials are needed to determine the best treatment to control peri-implant diseases.

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