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Review

# Periodontally compromised vs. periodontally healthy patients and dental implants: A systematic review and meta-analysis

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ABSTRACT

*Objectives:* To test the null hypothesis of no difference in the implant failure rates, postoperative infection, and marginal bone loss for the insertion of dental implants in periodontally compromised patients (PCPs) compared to the insertion in periodontally healthy patients (PHPs), against the alternative hypothesis of a difference.

*Methods:* An electronic search without time or language restrictions was undertaken in March 2014. Eligibility criteria included clinical human studies, either randomized or not.

*Results:* 2768 studies were identified in the search strategy and 22 studies were included. The estimates of relative effect were expressed in risk ratio (RR) and mean difference (MD) in millimetres. All studies were judged to be at high risk of bias, none were randomized. A total of 10,927 dental implants were inserted in PCPs (587 failures; 5.37%), and 5881 implants in PHPs (226 failures; 3.84%). The difference between the patients significantly affected the implant failure rates (RR 1.78, 95% CI 1.50–2.11; $P < 0.00001$), also observed when only the controlled clinical trials were pooled (RR 1.97, 95% CI 1.38–2.80; $P = 0.0002$). There were significant effects of dental implants inserted in PCPs on the occurrence of postoperative infections (RR 3.24, 95% CI 1.69–6.21; $P = 0.0004$) and in marginal bone loss (MD 0.60, 95% CI 0.33–0.87; $P < 0.0001$) when compared to PHPs.

*Conclusions:* The present study suggests that an increased susceptibility for periodontitis may also translate to an increased susceptibility for implant loss, loss of supporting bone, and postoperative infection. The results should be interpreted with caution due to the presence of uncontrolled confounding factors in the included studies, none of them randomized.

*Clinical Significance:* There is some evidence that patients treated for periodontitis may experience more implant loss and complications around implants including higher bone loss and peri-implantitis than non-periodontitis patients. As the philosophies of treatment may alter over time, a periodic review of the different concepts is necessary to refine techniques and eliminate unnecessary procedures. This would form a basis for optimum treatment.



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## 1. Introduction

In an attempt to decrease implant failure rates, more attention is being placed on understanding the etiologic and risk factors that lead to the failure of dental implants.[1] The question if patients with a history of periodontitis are more at risk for peri-implant disease has received increasing attention in the last years.[2] There is some evidence that patients treated for periodontitis may experience more implant loss and complications around implants including higher bone loss and peri-implantitis than non-periodontitis patients.[3] A history of treated periodontitis does not seem to adversely affect implant survival rates over short times of follow-up.[4] A small number of periodontal maintenance patients seem to be refractory to treatment and go on to experience continued and significant tooth loss. These subjects also have a high level of implant complications and failure.[5] However, the finding that titanium implants are but foreign bodies have resulted in a general questioning whether periodontitis and peri-implantitis are at all related forms of disease.[6]

Some clinicians assume that periodontally compromised patients (PCPs) present a potentially higher risk for implant failure than healthy individuals. The reason for this assumption is that a similar pathological bacterial flora forms around diseased teeth and diseased implants, though with some differences in partially and completely edentulous patients.[7] Implants are rapidly colonized by indigenous periodontal pathogens in partially dentate patients harbouring periodontal lesions.[7] Moreover, long-term outcomes demonstrated that implants in non-smoking PCPs previously treated for periodontitis were more prone to developing marginal bone loss compared with those in PHPs.[8] These results were obtained despite the fact that all patients were regularly enrolled in and were compliant with a supporting periodontal therapy (SPT) programme over 10 years.[8] Fardal and Linden[5] observed that smoking, stress and a family history of periodontal disease were identified as factors associated with a refractory outcome, and these variables remained significant after multivariate analysis. Another study showed that marginal bone level at 10 years was significantly associated with smoking, implant location, full-mouth probing attachment levels, and change, over time, in full-mouth probing pocket depths.[9] Having said this, a recent investigation demonstrated significantly different mRNA signatures between periodontitis and peri-implantitis.[10]

Therefore, a pertinent question in relation to implant therapy in patients susceptible to periodontitis is whether these patients may also show an elevated risk for peri-implant tissue destruction. Thus, the aim of this meta-analysis is to compare the survival rate of dental implants, postoperative infection, and marginal bone loss of dental implants inserted in PCPs and in periodontally healthy patients (PHPs). The present study presents a more detailed analysis of the influence of periodontal disease on the implant failure rates, previously assessed in a published systematic review.[1]

## 2. Materials and methods

This study followed the PRISMA Statement guidelines.[11] A review protocol does not exist.

### 2.1. Objective

The purpose of the present review was to test the null hypothesis of no difference in the implant failure rates, postoperative infection, and marginal bone loss for the insertion of dental implants in PCPs compared to the insertion in PHPs, against the alternative hypothesis of a difference.

### 2.2. Search strategies

An electronic search without time or language restrictions was undertaken in March 2014 in the following databases: PubMed, Web of Science, and the Cochrane Oral Health Group Trials Register. The following terms were used in the search strategy on PubMed:

(dental implant [Text Word]) AND periodontal disease [Text Word]
(dental implant [Text Word]) AND periodontitis [Text Word]

The following terms were used in the search strategy on Web of Science, in all databases, refined by selecting the term 'dentistry oral surgery medicine' in the filter 'research area':

(dental implant [Topic]) AND periodontal disease [Topic]
(dental implant [Topic]) AND periodontitis [Topic]

The following terms were used in the search strategy on the Cochrane Oral Health Group Trials Register:

(dental implant OR dental implant failure OR dental implant survival OR dental implant success AND (periodontal disease OR periodontitis))

A manual search of dental implants-related journals, including British Journal of Oral and Maxillofacial Surgery, Clinical Implant Dentistry and Related Research, Clinical Oral Implants Research, European Journal of Oral Implantology, Implant Dentistry, International Journal of Oral and Maxillofacial Implants, International Journal of Oral and Maxillofacial Surgery, International Journal of Periodontics and Restorative Dentistry, International Journal of Prosthodontics, Journal of Clinical Periodontology, Journal of Dental Research, Journal of Dentistry, Journal of Oral Implantology, Journal of Craniofacial Surgery, Journal of Cranio-Maxillofacial Surgery, and Journal of Maxillofacial and Oral Surgery, Journal of Oral and Maxillofacial Surgery, Journal of Oral Rehabilitation, Journal of Periodontology, and Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontology was also performed.

The reference list of the identified studies and the relevant reviews on the subject were also scanned for possible additional studies. Moreover, online databases providing information about clinical trials in progress were