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Review

Microbial colonization at the implant-abutment interface and its possible influence on periimplantitis: A systematic review and meta-analysis[☆]

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ABSTRACT

Purpose: The aim of this systematic review and meta-analysis was to evaluate the microbial colonization at the implant-abutment interfaces (IAI) on bone-level implants and to identify possible association with peri-implant conditions.

Study selection: The focus question aimed to answer whether two-piece osseointegrated implants, in function for at least 1 year, in human, relate to higher bacterial count and the onset of periimplantitis, compared to healthy peri-implant conditions. Search strategy encompassed the on-line (MedLine, Google scholar, Cochrane library) literature from 1990 up to March 2015 published in English using combinations of MeSH (Medical Subject Headings) and search terms. Quality assessment of selected full-text articles was performed according to the ARRIVE and CONSORT statement guidelines. For data analysis, the total bacterial count of *Porphyromonas gingivalis*, *Tannerella forsythia*, *Treponema denticola*, *Prevotella intermedia*, and *Fusobacterium nucleatum* was calculated and compared to IAI with or without peri-implant pathology.

Results: A total of 14 articles, reporting data from 1126 implants, fulfilled the inclusion criteria and subjected to quality assessment. The selected studies revealed contamination of the IAI, in patients who received two-piece implant systems. Meta-analysis indicated significant difference in total bacterial count between implants affected by periimplantitis versus healthy peri-implant tissues (0.387 ± 0.055 ; 95% CI 0.279–0.496). Less bacterial counts were identified in the healthy IAI for all the investigated gram-negative bacteria except for *T. forsythia*.

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Conclusions: Significantly higher bacterial counts were found for periodontal pathogenic bacteria within the IAI of implants in patients with periimplantitis compared to those implants surrounded by healthy peri-implant tissues.

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1. Introduction

Microgaps at the implant-abutment interface (IAI) are typical for two-piece osseointegrated dental implant systems and seem to play a significant role in bacterial colonization at the peri-implant sulcus [1,2]. This, in turn, may yield to peri-implant inflammatory reactions and subsequently loss of supporting bone [2-7]. Bacterial leakage at the IAI along with the abutment screw assemblies that act as bacterial reservoir may trigger a host response with inflamed soft tissues and possible marginal peri-implant bone loss [8-12].

Bacterial colonization of the gap at the IAI has also been implicated in the physiological biologic width establishment [1,2]. The major part of the marginal bone loss was reported during the first year after implant placement, whereafter, in patients with adequate levels of oral hygiene, the marginal bone levels stabilized over years. The microleakage at the gap between the implant and the abutment may allow the passage of acids, enzymes, bacteria and/or their metabolic products that directly affect the periodontal tissue, causing bleeding, swelling and odor [9]. Nevertheless, Morse taper connections are supposed to present lower levels of microleakage and marginal bone loss than external connection implants [2,14].

A recent review of literature described *Porphyromonas gingivalis*, *Treponema denticola*, and *Tannerella forsythia*, founded in subgingival biofilm samples, as micro-organisms having a moderate evidence of association with the onset of

periimplantitis. On the contrary, only some evidence was found for *Prevotella intermedia* and *Campylobacter rectus* [13]. In the anaerobic conditions, like those present inside the IAI, the microbiologic figures could be responsible for the selection, in the middle-long term, of microbiologic species able to trigger the periimplantitis process.

The objectives of this systematic review and meta-analysis were to evaluate the microbiological colonization at the implant-abutment interface on two-piece, bone level implants, independently from the configuration of the connection, and investigate whether it relates to the onset of periimplantitis.

2. Study selection

This systematic review conformed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (<http://www.prisma-statement.org>) [15]. The protocol of this systematic review has been published in the international prospective register of systematic reviews (PROSPERO, <http://www.crd.york.ac.uk/PROSPERO/>) with registration number CRD42016037481. The focused question of the review was to identify whether there is a relationship between the presence of higher bacterial count and the onset of periimplantitis, compared to healthy peri-implant conditions in patients with two-piece osseointegrated implants after at least 1 year of function. Periimplantitis was defined by the presence of peri-implant probing depth ≥ 5 mm associated with bleeding on probing and/or suppuration, and

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