Evaluation of dental implant therapy – peri-implantitis

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Peri-implantitis is one of the most common complications affecting patients with dental implants. The condition is characterized by an inflammation in peri-implant soft tissue and loss of supporting bone. Despite several similarities in clinical features with its counterpart at teeth, the disease progression of peri-implantitis is faster than that of periodontitis. Peri-implant mucositis is the precursor to peri-implantitis as is gingivitis to periodontitis.

Clinical and experimental studies demonstrated that peri-implant mucositis and gingivitis lesions are similar in size and cell composition (Lang et al 2011). Both lesions may progress and thereby influence supporting tissues at teeth and implants. Established peri-implantitis lesions exhibit critical histopathological differences when compared to periodontitis lesions (Berglundh et al 2011). Pre-clinical in vivo studies comparing the two lesions have used experimental techniques to induce periodontitis and peri-implantitis. In one such study, Carcuac et al (2015) demonstrated that disease progression differed at teeth and implants over a six-month period. Bone loss was more pronounced at implants with modified surfaces compared to teeth and implants with non-modified surfaces. Histopathological analysis also demonstrated that periodontitis lesions were well contained and separated from the alveolar bone by a zone of non-inflamed connective tissue, while a similar border between the lesion and the supporting bone was absent in peri-implantitis sites (Figure 1). In addition, the most apical part of the peri-implantitis lesion was open towards the biofilm in the pocket, as the pocket epithelium only covered about 60-70% of the lesion. The lateral and apical portions of the peri-implantitis lesion extended to the bone crest, the surface of which was lined with osteoclasts. The histopathological discrepancies between the two types of lesions may be explained by the structural differences in the supporting tissues at teeth and implants. In a comprehensive study based on human soft tissue biopsies obtained from 40 patients with severe periodontitis and 40 patients suffering from severe peri-implantitis, Carcuac et Berglundh (2014) reported further differences between periodontitis and peri-implantitis lesions. In contrast to periodontitis samples, peri-implantitis lesions were more than twice as large and contained significantly larger area proportions, numbers, and densities of macrophages, plasma cells and neutrophil granulocytes than periodontitis lesions (Figure 2). These findings indicate a more severe disease character for peri-implantitis, which may, in part, explain the higher rate of progression.
practice have been confused. Studies evaluating the prevalence of peri-implantitis used so-called case definitions. While there is consensus concerning the use of bleeding on probing as a clinical criterion, the use of at least seven different radiographic thresholds of bone loss has been suggested to determine peri-implantitis (Tomasi et Derks 2012).

Following a meta-analysis of data from different studies, Derks and Tomasi (2015) recently reported that about 22% of patients with dental implants suffered from peri-implantitis. Similar results have been presented in other literature reviews (Mombelli et al. 2012). In a recently published nation-wide project, data from 596 patients were used to study the prevalence of peri-implantitis (Derks et al. 2015). While about 45% of the patients presented with signs of peri-implantitis, 14.5% had moderate/severe forms of the disease (bleeding on probing ≥1 mm bone loss) at ≥2 implants.

**Risk factors for peri-implantitis.** Susceptibility to periodontitis is one of the strongest risk factors for peri-implantitis. Several studies have demonstrated that such patients are overrepresented among those suffering from peri-implantitis. It should be kept in mind, however, that adequate supportive measures prevent peri-implantitis also in periodontally susceptible individuals. Thus, provided that periodontal therapy is successful and that patient compliance is maintained on a high level implants have a favourable prognosis with little risk of peri-implantitis.

An additional potential risk factor for peri-implantitis is the design of the prosthetic reconstruction. Without proper access for self-performed oral hygiene, the risk of peri-implantitis is increased. Thus, when designing the prosthetic reconstruction, it is imperative to satisfy the requirement of access for self-performed infection control.

A more controversial risk factor for peri-implantitis is the surface characteristics of the implant. While convincing pre-clinical data are available, we lack clinical documentation and comparative clinical trials, in particular. In a series of experimental studies it was demonstrated that spontaneous progression of peri-implantitis at implants with modified surfaces was more pronounced than at implants with non-modified surfaces (Berghuhn et al. 2007, Llons et al. 2012). Results from preclinical research should be interpreted with caution. This is the case for studies demonstrating potentially negative outcomes but also for studies revealing positive effects of implant surface modifications. Results from clinical reports including patient groups with different types of implants indicated that patients with rough-surface implants experienced more problems than those carrying implants with less rough surfaces (Baelum et al. Ellegaard 2004, Marnone et al. 2015). Data presented in a Spanish study suggested differences not only in the occurrence of peri-implantitis at different implants, but also differences regarding the time of onset (Mir-Mari et al. 2012). In order to identify risk factors related to patients, clinicians, and/or implants, large and randomly selected patient cohorts are required. The national wide project aforementioned includes such an evaluation of effectiveness (Derks et al. 2015). Results of the different regression analyses revealed that several of the clinician-, patient-, and therapy-related factors were associated with moderate/severe peri-implantitis. Patients presenting with periodontitis were more likely to suffer from moderate/severe peri-implantitis. Factors related to clinicians were associated with moderate/severe peri-implantitis: patients provided with prosthetic therapy performed by general practitioners presented with a higher odds ratio (4.5). In addition, certain implant brands were associated with a higher risk for peri-implantitis: Straumann implants show the lowest rates of moderate/severe peri-implantitis when compared to Nobel Biocare, Astra Tech and the other implants represented in this observational study (including Biomet 5i, CrescoTi, Xive, Frialit, Lifecore, Implant and API). Finally, a higher odds ratio (2.5) for moderate/severe peri-implantitis was observed for implants with a reduced distance (≤1.5 mm) from the prosthetic margin to the crestal bone as measured in baseline radiographs.

**References**


**Editorial note:** The full list of references is available from the publisher.