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Reconstruction of Peri-implant Osseous Defects: A Multicenter Randomized Trial

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Abstract

There is a paucity of data for the effectiveness of reconstructive procedures in the treatment of peri-implantitis. The objective of this study was to compare reconstruction of peri-implant osseous defects with open flap debridement (OFD) plus porous titanium granules (PTGs) compared with OFD alone. Sixty-three patients (36 female, 27 male; mean age 58.4 y [SD 12.3]), contributing one circumferential peri-implant intraosseous defect, were included in a multinational, multicenter randomized trial using a parallel-group design. After OFD and surface decontamination using titanium brushes and hydrogen peroxide, 33 defects received PTGs. The implants were not submerged. All patients received adjunctive perioperative systemic antibiotics. The primary outcome variable (defect fill) was assessed on digitalized radiographs. Clinical measurements of probing depth (PPD), bleeding on probing (BoP), suppuration, and plaque were taken by blinded examiners. After 12 mo, the test group (OFD plus PTG) showed a mean radiographic defect fill (mesial/distal) of 3.6/3.6 mm compared with 1.1/1.0 in the control group (OFD). Differences were statistically significant in favor of the test group ($P < 0.0001$). The OFD plus PTG group showed a mean reduction in PPD of 2.8 mm compared with 2.6 mm in the OFD group. BoP was reduced from 89.4% to 33.3% and from 85.8% to 40.4% for the test and control groups, respectively. There was no significant difference in complete resolution of peri-implantitis (PPD ≤4 mm and no BoP at six implant sites and no further bone loss), because this finding was accomplished at 30% of implants in the test group and 23% of implants in the control group. Reconstructive surgery using PTGs resulted in significantly enhanced radiographic defect fill compared with OFD. However, limitations in the lack of ability to discern biomaterial from osseous tissue could not be verified to determine new bone formation. Similar improvements according to clinical measures were obtained after both surgical treatment modalities (ClinicalTrials.gov NCT02406001).

Keywords: debridement, peri-implantitis, surgical therapy, titanium granules, bone regeneration, dental/oral implants

Introduction

Peri-implant osseous defects are often the result of peri-implantitis defined as inflammation of peri-implant tissues accompanied by peri-implant bone loss with bleeding on probing (BoP) and/or suppuration (PuS), with or without concomitant deepening of peri-implant pockets (Lang and Berglundh 2011). According to recent reviews, this infectious condition has a prevalence of 20% in patients with implants (Klinge and Meyle 2012; Mombelli et al. 2012; Atieh et al. 2013; Derks and Tomasi 2015).

Various protocols, including mechanical debridement, the use of antiseptics and local or systemic antibiotics, as well as access and regenerative surgery, have been proposed for the treatment of peri-implantitis. There is currently no reliable evidence to identify the most effective intervention for treating peri-implantitis (Esposito et al. 2012).

Surgical methods are commonly applied for the management of moderate and advanced peri-implantitis (Aljateeli et al. 2012). One of the goals of surgical therapy is access for implant surface decontamination. An anti-infective protocol, incorporating surgical access, surface decontamination, and systemic antimicrobials was shown to be effective in a 12-mo follow-up (Heitz-Mayfield et al. 2011). Regenerative procedures, using bone grafts or bone substitutes, sometimes in

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A supplemental appendix to this article is published electronically only at http://jdr.sagepub.com/supplemental.

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