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Oral microbial colonization on titanium and polyetheretherketone dental implant healing abutments: An in vitro and in vivo study

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ABSTRACT

Statement of problem. Although polyetheretherketone (PEEK) implant healing abutments have become popular because of their esthetic, mechanical, and chemical properties, studies analyzing oral polymicrobial adhesion to PEEK abutments are lacking.

Purpose. The purpose of this in vitro and in vivo study was to evaluate oral microbial adhesion and colonization on titanium (Ti) and PEEK healing abutments.

Material and methods. Ti (N=35) and PEEK substrates (N=35) were evaluated in vitro in terms of the initial adhesion (1 hour) or biofilm accumulation (48 hours) of *Candida albicans* and a polymicrobial inoculum using stimulated human saliva to mimic a diverse oral microbiome. Surface decontamination ability was evaluated after 24 hours of in vitro biofilm formation after exposure to an erbium-doped yttrium aluminum garnet (Er:YAG) laser. Conventional and flowable composite resin veneering on PEEK was also tested for microbial adhesion. In addition, an in vivo model with 3 healthy volunteers was conducted by using a palatal appliance containing the tested materials (3 or 4 specimens of each material per appliance) for 2 days to evaluate the effect of substrate on the microbial profile. Biofilms were evaluated by live cell counts and scanning electron microscopy images, and the microbial profile by Checkerboard deoxyribonucleic acid (DNA)-DNA hybridization. The *t* test and Mann-Whitney test were used to compare the groups (α=.05).

Results. PEEK and Ti materials showed similar fungal adhesion ($P>.05$). Although the PEEK surface limited the initial in vitro polymicrobial adhesion (approximately 2 times less) compared with Ti ($P=.040$), after 48 hours of biofilm accumulation, the microbial load was statistically similar ($P=.209$). Er:YAG laser decontamination was more effective on PEEK than on Ti surfaces, reducing approximately 11 times more microbial accumulation ($P=.019$). Both composite resins tested showed similar microbial adhesion (1 hour). In vivo, the PEEK material showed reduced levels of 6 bacterial species ($P<.05$), including the putative pathogen *Treponema denticola*.

Conclusions. Although PEEK and Ti had similar bacterial and fungus biofilm attachment and accumulation, PEEK promoted a host-compatible microbial profile with a significantly reduced *T. denticola* load. (J Prosthet Dent xxxx;xxx:xxx-xxx)

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