P023

BATTERIOLOGIA

ANTIMICROBIAL AND ANTIBIOFILM PROPERTIES OF GRAPHENE OXIDE ON ROOT DENTINE: A PILOT STUDY

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INTRODUZIONE

Graphene has many derivatives, such as graphene oxide (GO), reduced graphene oxide (rGO) and Graphene nanoplatelets (GNP). They differ from each other in terms of surface properties, number of layers, and size. Based on few articles, it is known that graphene and GO can inhibit the growth of some dental pathogens as E. coli, S. aureus and B. subtilis. E. faecalis, that is known for its ability to form intra- and extraradicular biofilms, can be resistant to endodontic therapy procedures and may serve an important role in contributing to endodontic treatment failure. The aim of this study is to determine the antimicrobial and antibiofilm properties of GO on root dentin surfaces.

METODI

Twelve single-rooted teeth (maxillary incisors, maxillary canines and maxillary premolars) were selected for this study. After root canal preparation, the teeth were sliced using a water-cooled diamond saw and 30 disks (3-3,5 mm thick) were prepared. Root-Disks were attached to 24-Well Plate microtiter and each specimen was sterilized with plasma sterilization (Steris V-PRO® maX Low Temperature Sterilization System Group, Bordeaux, France). Fifteen samples were treated with GO (particles size < 10 µm) (Graphenea - Graphene Oxide Water Dispersion, 0.4 wt% concentration, San Sebastián,Spain) using the Drop Casting Method (Go Group) and fifteen samples were not treated (NT Group). Then, the specimens inside 24-Well Plate, were inoculated with 1 ml of suspension of E. faecalis (ATCC 29212). After 48 hours, bacteria were spread on ESA-plates. After overnight incubation at 37°C, colonies on the plates were counted to determine the number of CFU. Moreover, the specimens were observe under an electronic scanning microscope (SEM) and the presence of clumps were evaluated using a semi-qualitative evaluation .The data were analyzed using Kruskal-Wallis test ($p<0.05$).

RISULTATI

The CFU of GO Group and NT Group showed a statistical significant differences ($p<0.05$). The SEM results (clamps) showed a statistical significant difference between groups ($p<0.05$)

CONCLUSIONI

Several studies have shown the antimicrobial efficacy of GO. Indeed, GO can interact and have effects on bacterial cells. In this study, the GO on root dentin showed an antimicrobial efficacy. Moreover SEM analyses highlighted GO inhibited bacterial aggregation and biofilm formation. Further studies are necessary to assess the interaction between GO and root dentin.