

Effect of Nd-YAG Laser-Irradiation on Fluoride Uptake by Tooth Enamel Surface (in Vitro)

A thesis

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Abstract

Background: The irradiation of teeth with a laser results in an interaction between the light and the biological constituents of the dental hard substance, which is converted directly into heat. This thermal effect is the cause of the structural and chemical enamel changes. The combined treatment of topical fluoride agent with laser may increase fluoride uptake, and reduce progression of caries-like lesions.

Aims of the study: This study will be conducted to measure the uptake of the acidulated phosphate fluoride and sodium fluoride to the buccal and lingual caries-like lesion enamel surfaces before and after irradiated by Nd-YAG laser in comparison with matching control group.

Materials and Methods: The sample consisted of 30 human healthy upper premolar teeth which were stored in 0.1% thymol solution after extracted. Every tooth divided into: buccal and lingual specimen, each specimen has a rectangular window which was divided to right and left halves (120 specimens). The sample was divided into 2 groups (60 specimens) for buccal surface, and the same for lingual surface. The caries-like lesion was formed for all groups except control (1), each group treated with either acidulated phosphate fluoride 1.23% or sodium fluoride 2%, (30 specimens) which contain other subgroups, these are: (10 specimens) one half treated with fluoride agent only and another half as control (first group as control (1) without caries-like lesion, and the second group control (2) with caries-like lesion, then de-ionized water only). (10 specimens) treated with fluoride agent then irradiated by Nd-YAG laser; one half with program (1) (short pulse), and another with program (2) (long pulse). (10 specimens) irradiated by Nd-YAG laser; one half with program (1) and another with program (2), then treated with fluoride agent. The specimens

of enamel were sectioned and the fluoride uptake was determined with using fluoride sensitive electrode.

Results and conclusion: There was a significant difference between the buccal and lingual enamel surfaces regarding the fluoride uptake in sound tooth, while a non-significant difference was observed after artificial caries-like lesion formation. Irradiation of Nd-YAG laser program (1) to the buccal and lingual caries-like lesion surfaces of enamel before application of fluoride agents (APF, NaF) was significantly increase fluoride uptake than that of using laser after the application of fluoride agent, as well as from using laser of program (2) after and before the application of fluoride agent, and from using fluoride agent alone in the buccal and lingual surfaces.