

# Use of the erbium, chromium:yttrium–scandium–gallium–garnet laser on human enamel tissues. Influence of the air–water spray on the laser–tissue interaction: scanning electron microscope evaluations

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**Abstract** The study investigated the influence of varying amounts of air/water spray and the energy used by an erbium, chromium:yttrium–scandium–gallium–garnet (Er,Cr:YSGG) 2,780 nm laser when treating dental tissues. The morphological effects produced by the laser interaction on healthy human enamel were evaluated by scanning electron microscopy (SEM). The vestibular and lingual surfaces of ten molars were treated with laser at different power settings; each surface was subdivided into cervical, median, and occlusal parts and treated with different proportions of water spray; the series contained 60 tooth portions. Treatment differed in terms of power setting and air/water percentage. All specimens were then subjected to dehydration and metallisation. At SEM evaluation, the classic aspect of laser-treated enamel was visible: grooves, flakes, shelves and sharp edges, indicative of micro-explosion rather than melting. Vaporisation of the tissue created a clear delimita-

tion from surrounding healthy tissue, with partial respect to the prismatic structure of the treated enamel. The aspect of the enamel was rarely type 1 Silverstone but more frequently type 2 or 3, with prismatic structure not respected and/or completely disordered. These morphological differences appeared to be correlated with the inclination of the laser beam aimed at the enamel prisms and with the percentage of air/water used. The laser system analysed showed itself to be effective at removing human dental enamel. The results appeared to be closely correlated with the variation of the percentage of the laser's water–air spray.

**Keywords** Erbium, chromium:yttrium–scandium–gallium–garnet (Er,Cr:YSGG) laser · Water spray · Enamel · Scanning electron microscopy (SEM) · Surface morphology

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