Ceramic bracket debonding by Tm:YAP laser irradiation.

Abstract:

OBJECTIVE: The aim of this study was to prepare a simple and reliable method for ceramic bracket debonding, ensuring minimal changes in the enamel structure and an acceptable temperature rise in the pulp. BACKGROUND DATA: Ceramic bracket debonding is based on the principle of degrading the strength of adhesive resin between the tooth and ceramic bracket. The search for a safe and efficient method of adhesive resin removal following debonding has resulted in the introduction of a wide range of instruments and procedures, among which proper use of laser irradiation can be promising. METHODS: The debonding of two types of ceramic brackets utilized a diode-pumped Thulium:Ytterbium-Aluminium-Perovskite (Tm:YAP) microchip laser generating irradiation at a wavelength of 1998 nm (spot size 3 mm; focused by lens), with two power settings (1–2 W). Loss of enamel and residual resin on teeth, as well as rise in temperature inside the tooth were subsequently investigated in detail. Results: A 1 W power of irradiation during a 60-sec period resulted in a temperature rise from 3 to 4 °C in the approximate root location. This power is also suitable for debracketing from the point of view of damage to enamel lying below the bracket. Only a slight damage to the enamel was registered by SEM compared to conventional bracket removal. CONCLUSIONS: Use of a Tm:YAP laser (wavelength 1998 nm, power 1 W, irradiance 14 W/cm², interacting time 60 sec) which is at the same time compact and small enough to be used in the dental practice, together with moderate cooling, could be an efficient tool for debracketing.