rise in the irradiated tissue volume. When this energy is applied for long enough, heat conduction will cause a temperature rise in surrounding tissues as well. Hence, thermal effects, such as coagulation necrosis, are produced indirectly in collateral areas and are one of the mechanisms responsible for haemostasis when cutting or vaporizing with a laser.

Heat dissipation or diffusion from the irradiated tissue site will determine the extent of collateral damage seen and is largely dependant on the thermal conductivity of the tissue. The time required for diffusion of the heat or 'thermal relaxation time' is defined as the time required for the accumulated heat energy within the tissue mass to cool to 37% of its original value.[7] The degree of heat conduction and rate of tissue cooling both determine the extent of collateral tissue damage for a given wavelength of laser light and tissue type. The composition of the tissue in terms of its structure, water content and vascularity will greatly determine heat conduction/tissue cooling and therefore collateral damage. In addition, factors such as the volume and surface area of tissue irradiated have influence on the rate of heat dissipation.

With continuous laser emission there is no thermal relaxation time, but with pulsed emissions there are brief periods of time allowing for heat dissipation or cooling between pulses.[8] Tissues should be allowed a period of cooling approximately three times their thermal relaxation time to avoid accumulation of heat energy in surrounding tissue and therefore collateral damage. This can be managed effectively using a combination of appropriate power density and pulse duration for the desired procedure.[9,10]

- Photomechanical and photoelectrical: these are non-thermal interactions produced by high energy short pulsed laser light. They include photodisruption, photodisassociation, photoplasmolysis and photoacoustic interactions. Absorption of laser energy pulses results in rapid expansion or generation of shock waves that are capable of rupturing intermolecular and atomic bonds (photodisruption or photodisassociation). Hence, there is transformation of the laser light energy to vibrational or kinetic energy. The pulse of laser energy on hard dentinal tissues can produce a shock wave, which could then explode or pulverize the tissue, creating an abraded crater. This is an example of the photoacoustic effect of laser light.[11]. Photoplasmolysis is a process of tissue removal through the formation of electrically charged ions and particles that exist in a 'plasma' state, a semi-gaseous, high-energy state which is neither solid, liquid, or gas. Ionization of atoms occurs at very high-energy densities followed by plasma formation. The plasma state is maintained by the absorption of energy from the incident laser beam and through electron vibrations causes the rapid expansion and contraction that produces the disruptive shock waves that break apart target materials in photoplasmolysis.

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## Abstracts

### POST CROWNS NEED MORE THAN JUST CEMENTING

Effect of surface treatment of prefabricated posts on bonding of resin cement. A Sahafi, Peutzfeldt, E Asmussen and K Gotfredsen *Operative Dentistry* 2004; **29**: 60–68.

This *in vitro* study evaluated the effect of various surface treatments of prefabricated posts of titanium alloy (*ParaPost XH*), glass fibre (*ParaPost Fiber White*) and zirconia (*Cerapost*) on the bonding of two resin cements; *ParaPost Cement* and *Panavia F* by a diametral tensile strength test. The treatments were: 1) roughening by sandblasting and hydrofluoric acid; 2) application of primer by coating with *Alloy Primer*, *Metalprimer II* and *Silane*; 3) a combination of roughening with sandpaper and application of a primer or in the form of the *Cojet* system. Some treatments had no effect, but the conclusions may be very helpful to practitioners looking for long-term success when cementing or bonding these restorations. It was found that: 1) *ParaPost Cement* bonded better to titanium alloy and glass fibre posts, while *Panavia F* bonded better to zirconia posts; 2) for the titanium posts all the treatments improved bonding with both resin cements; 3) for the zirconia post the *Cojet* treatment improved the bonding of both resin cements, while sandblasting followed by silane application improved the bonding of *Panavia*.

Simple cementation may not be sufficient for long-tem success.

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