Is this the time of laser therapy in endodontics?

ENDO

Biomedical applications of lasers have been under investigation since Theodore Maiman used the first ruby laser in July 1960[1]. In 1971, Weichman and Johnson published 'Laser use in endodontics. A preliminary investigation'[2].

The use of lasers in endodontic therapy has been extensively studied for the last 15 years. However, the use of lasers in endodontics is today uncommon. Recently, the Erbium, Chromium:YSGG (Er,Cr:YSGG) and Erbium:Yag (Er:YAG) lasers received FDA approval for cleaning, shaping and enlarging canals. New specific radial-firing tips have been created with small diameters (275 µm) and flexible designs. Erbium lasers are mainly used because of their photoablative action similar to that in cavity preparation (thermomechanical tissue interaction).

In the field of endodontics, there are several interesting characteristics of laser application:

1. Decontamination of the endodontic system: lasers are more effective than hypochlorite in bacterial and biofilm decontamination[3]; Gordon achieved a 99.7% kill rate for *Enterococcus faecalis* in an *in vitro* study[3].
2. Penetration in dentinal tubules: laser energy can penetrate 1,000 µm inside dentinal tubules; irrigants such as sodium hypochlorite have a limited effect on *E. faecalis,* with a penetration depth of only 100 µm[4].
3. Smear layer removal: several articles have shown lasers to have a better cleaning ability compared to EDTA and citric acid on the apical third of roots; the LAI (laser-activated irrigation) technique has been shown to be more effective in removing the smear layer compared to PUI (ultrasonic irrigation) and conventional techniques[5].
4. Apical extrusion: no statistically significant difference was found between laser treatment and a conventional 25-gauge needle[6].

A definitive treatment protocol needs to be in place to reduce the intra-canal bacterial load prior to laser usage and to facilitate delivery of the laser energy to the most critical part of the root canal, the apical third.

Will the next generation of dentists forget the use of hypochlorite and NiTi instruments?

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1. Maiman TH. Stimulated optical radiation in ruby. Nature 1960;187:493–494.
2. Weichman JA, Johnson FM. Laser use in endodontics. A preliminary investigation. Oral Surg Oral Med Oral Pathol 1971;31:416–420.
3. Gordon W, Atabakhsh VA, Meza F, Doms A, Nissan R, Rizoiu I, Stevens RH. The antimicrobial efficacy of the erbium, chromium:yttrium-scandium-gallium-garnet laser with radial emitting tips on root canal dentin walls infected with *Enterococcus faecalis*. J Am Dent Assoc 2007;138: 992–1002.
4. Kouchi Y, Ninomiya J, Yasuda H, Fukui K, Moriyama T, Okamoto H. Location of *Streptococcus mutans* in the dentinal tubules of open infected root canals. J Dent Res 1980;59:2038–2046.
5. De Moor RJ, Meire M, Goharkhay K, Moritz A, Vanobbergen J. Efficacy of ultrasonic versus laser-activated irrigation to remove artificially placed dentin debris plugs. J Endod 2010;36:1580–1583.
6. George R, Walsh LJ. Apical extrusion of root canal irrigants when using Er:YAG and Er,Cr:YSGG lasers with optical fibers: an *in vitro* dye study. J Endod 2008;34:706–708.