

X-Runner in Clinical Practice

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SUMMARY

The aim of this study, started four years ago, was to evaluate the possibility of transferring the same type of scanner technology that is widely utilized in dermatology to the dental field. The first “in vitro” tests were performed on extracted teeth by using a scanner and a dermatological Er:YAG laser. Due to fact that this particular dermatological device operates without water, it was necessary to modify it by adding a double external pipeline in order to deliver an air/water spray at the point of the laser’s impact on the tooth.

The results of this first sequence of tests were very promising and convinced the manufacturer Fotona to invest in a major research and development effort to construct a scanner handpiece of reduced size, able to be employed intra-orally.

Once developed, the new dental-optimized scanner was given another series of “in vitro” tests, and after the safety of its utilization was demonstrated via K-thermocouple records, optical microscope and SEM observation, it was subsequently applied to “in vivo” tests on human subjects.

The laser appliance used was a LightWalker device, which is the latest generation of dental lasers from the manufacturer Fotona (Fig. 1).



Fig. 1: LightWalker AT

The X-Runner handpiece is very similar to the usual non-contact Er:YAG laser handpiece. The automatic beam guiding mechanism is integrated inside an ergonomic box that lies on the operator’s hand and a supplementary electrical cable delivering the digital information connects the laser device to the X-Runner mechanism (Fig.2). Its application is very easy and practically the same as with the usual non-contact handpiece; the only difference is that it covers a bigger area than the standard handpiece.

However, it is very useful because it can cover a larger area, or by pressing the button on the screen, it can be used as a classical one-spot laser handpiece. The X-Runner handpiece can thus be used for all kinds of treatments just by switching from the area modality to classic handpiece modality, without swapping handpieces.



Fig. 2: First digitally controlled handpiece for dental lasers with instantly adjustable spot size and shape – X Runner.

The following settings are available for the X-Runner handpiece on the touch screen (Fig. 3):

- treatment shape (circular, rectangular, hexagonal),
- size of the treatment area (width and length of the rectangle, diameter in the case of the circle and hexagon),
- number of laser beam passages (a function of the requested ablation depth),
- delay between consecutive passages (duration of the pause between passages).

Moreover, all parameters available with the classic handpiece (energy, frequency, mode, spray) are also used with the X-Runner handpiece.



Fig. 3: LightWalker AT

By reducing one of the sides of the rectangular shape, it is possible to obtain a linear cut without moving the handpiece, for instance to cut the root apex during endodontic surgery or to perform an incision in soft-tissue surgery. Some clinical applications are shown which illustrate the advantages of this new Er:YAG laser technology.

The first clinical situation where it was decided to apply the X-Runner handpiece was the first step of the fixed orthodontic treatment, to prepare the surface of the enamel before bonding the brackets.

The main advantage was given by the possibility to prepare a surface of the same dimension of the bracket, without using screens or templates, in a very short working time.

Subsequently, it was employed in conservative dentistry to prepare cavities with precise and pre-programmed shape and depth.

The results were very interesting, in particular from the point of view of “minimally invasive dentistry,” which is one of the main goals of modern dental treatments, but also from an ergonomic point of view, thanks to greatly reduced times needed for clinical treatments.

Beyond the other classical characteristics of the Er:YAG laser, i.e. the pain and discomfort reduction, the overall patient satisfaction was very high.

All the clinical cases reported in this preliminary study confirmed that the “X-Runner” handpiece represents a new way and concept to improve the quality of Er:YAG laser dental treatments with the added benefit of shorter working time.

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