Innovative pathways for extensive and efficient tissue removal with Er:YAG laser

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_Introduction_

The newest and most innovative handpiece for oral hard- and soft-tissue removal from Fotona is the X-Runner, an ideal accessory for the company’s Light-Walker AT laser (Er:YAG & Nd:YAG). In our daily in-office applications, we notice many remarkable advantages in the preparation of veneers and partial or full crowns, in oral surgery, especially for soft-tissue management, and in implantology for implant re-release and certain specific steps during implant setting procedures.

The X-Runner allows for precise and extensive tissue removal, defined by the choice between three different geometrical shapes: circle, rectangle and hexagon. These can be highlighted as full ablational areas or only active along the borders as a means to carve out just the margins, maintaining the full integrity of the inner area. The extent of ablation is gradually adjustable between 1 to 6 mm, depending on the geometry, with a variety of 1 single to 99 successive passes.

The corresponding basic and advanced settings for soft- and hard-tissue management with the Light-Walker AT laser screen in advanced mode: highlighted SX as the X-Runner handpiece and the standard settings for soft-tissue ablation by very long pulses, which enable an efficient coagulation due to the adjustable pulse duration of 700 µs and more (only possible with Fotona Er:YAG lasers). In this case, the full area of a rectangle with a 6 x 1 mm surface is active. Two of the three geometrical pre-settings (circle, rectangle, hexagon) are schematically shown as active on the full surface or only at their margins.

_Figs. 1 & 2._ Settings on the LightWalker AT screen in advanced mode: highlighted SX as the X-Runner handpiece and the standard settings for soft-tissue ablation by very long pulses, which enable an efficient coagulation due to the adjustable pulse duration of 700 µs and more (only possible with Fotona Er:YAG lasers). In this case, the full area of a rectangle with a 6 x 1 mm surface is active. Two of the three geometrical pre-settings (circle, rectangle, hexagon) are schematically shown as active on the full surface or only at their margins.

_Figs. 3 & 4._ Extensive surface preparation with the X-Runner using the geometrical setting of a rectangle with 6 x 3 mm of active area.
Figs. 5 & 6. Standard setting for veneer preparation on the LightWalker AT in QSP (Quantum Square Pulse) Mode, which allows for an efficient and fast ablation with a highly precise margin.

Figs. 7 & 8. Final surface modification, followed by the adhesive in-office protocol (Syntac Classic/Ivoclar).

Figs. 9 & 10. Before and after pics of the veneer case on the upper incisors.

Figs. 11 & 12. LightWalker AT either with the X-Runner handpiece in non-contact mode or with the H14 handpiece using different sapphire and quartz tips.
Figs. 13 & 14. Osseo-integrated implant on X-ray and the corresponding intraoral situation after the mandatory healing period of the implant in the area of the first lower left molar (Nobel Biocare).

Figs. 15 & 16. X-Runner handpiece in a fixed position with an active circle diameter of 5.5 mm, and the beginning of layer-by-layer soft-tissue ablation through multiple passes.

Figs. 17 & 18. Advanced ablation with the X-Runner and simultaneous release of the implant margins.

Figs. 19 & 20. Released implant before the impression, and Er:YAG settings in Advanced mode: SX for X-Runner, long pulse duration and circular active area of a diameter of 5.5 mm.

Figs. 21 & 22. Geometrical layer-by-layer ablation (circle) of a fibroma through multiple passes with the X-Runner in a fixed position ...
Walker AT can be directly adapted to procedures with the X-Runner, allowing for highly predefined and noticeably facilitated removal of tissue over larger areas. The Er:YAG wavelength is primarily absorbed by the water content of every tissue in the human body, and this basic nature of the Er:YAG wavelength allows for a very safe and fully manageable surgery, offering constant control of the progression of the laser-assisted ablation with no need for intervention.

To illustrate the idea, we would like to present two different clinical cases with routine indications in laser-assisted dentistry: first, a veneer preparation of the upper-central and lateral incisors and second, an implant release in the lower-left first molar area.

_Veneer preparation in the upper front_

An extended and fast mode of preparation was performed with the X-Runner using the predefined veneer prep setting on the LightWalker AT panel, followed by a final surface modification. There was no need for local anaesthesia.

At that time our tissue removal experience with the X-Runner in marginal areas was somewhat limited, so consequently we performed the finish with the cylindrical tips and the H14 handpiece. As an alternative, the X-Runner can be modified by a simple and time-saving change of the output settings to perform as a regular non-contact H02 handpiece.

The finished surfaces were bonded instantly, the impression taken, and a couple of days later the lab veneers were integrated into the patient’s smile design dimension.

_Implant release in the first lower left molar area_

After the predefined healing period, the soft-tissue above an osseointegrated implant (Nobel Biocare) was removed by multiple passes, following the preset shape and extension of the ablation area. A healing abutment was fixed on the fully uncovered implant after the impression was taken for the lab. The surgery was performed without need for local anaesthesia.

_Extended range of indications_

Aside from the standardized indications in aesthetic and conservative dentistry and soft- and hard-
Figs. 23 & 24. Followed by flap surgery with the Er:YAG Quartz tip (Varian/Fotona) and laser-assisted osteotomy during an implant bed procedure in the lower-left jaw area.

Figs. 25 & 26. Intermediate depth measurement with a perio probe to a value of around 8 mm, followed by a final classical drill by the manufacturers protocol (Nobel Biocare) and the implant in place before suturing.

Figs. 27 & 28. Postoperative photobiomodulation (PBM) of the surgical area on the right lower jaw with 810 nm diode (ARC, Nürnberg, Germany), and the three implants in place after laser-assisted surgery with X-Runner (LightWalker AT, Fotona).

tissue surgery, we also noticed some specific advantages as a support to specific steps of the implant setting procedures, with respect to other approaches developed by specialised clinical centres.

We performed an initial implant bed preparation using the X-Runner only, by choosing the geometry and corresponding area and finalising the procedure by the last step of the classical implant bed protocol. The patient presented a very solid and healthy bone of the lower jaw, so we were able to drill with the predefined shape to a depth of 8–9 mm, without the need for any classical burr-based procedures.

Our first experiences with the X-Runner handpiece used in combination with our in-office standard LightWalker AT laser (Er:YAG & Nd:YAG; Fotona) provided us with fascinating insights into new, powerful and innovative aspects of soft- and hard-tissue management that are now possible in the daily clinical practice in Er:YAG laser-assisted dentistry.

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