Laser in soft tissue treatment

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The combination of a 975 nm diode laser and a 2.2 MHz radio frequency generator in one device (LaserHF; MedLas Medical) has proven to be a unique and valuable solution for the dental soft tissue management. In search for optimal instruments for dental soft tissue treatment both laser and radio frequency devices have shown a satisfying performance. In both technologies, the rapid and locally precise heating of soft tissue is used for cutting as well as for coagulating.

Laser vs. radio frequency

The well-known advantages of laser light become obvious in superficial applications, as for example in the elimination of bacteria in periodontic and endodontic treatments, to expose overgrown implants or trim gingival tissue. However, there are differences in the use of laser. Especially in surgical procedures when a higher power is requested such as in the removal of fibroma and...
haemangioma or while performing a frenectomy or in need of a larger and invasive surgical application, laser is time consuming since the cutting speed of the laser beam is always limited by the fact that tissue can be removed only in superficial layers (Fig. 1). Neither increasing laser power nor changing laser wavelengths or using laser pulses can eliminate this physical fact.

The oral tissue is very thin, delicate and has a complex structure. In addition, it is in close proximity to the jaw bone and tooth structure. Laser radiation is strongly absorbed in the tissue and converted into heat, but it is also partially transmitted through the tissue without interaction. It may thus cause unpredictable and undesired side effects in adjacent healthy areas. By contrast, with radio frequency technology the tissue is heated and cut simultaneously, homogeneously and rapidly in the entire length of the inserted metal electrode (Fig. 2). Serious damages at a working frequency of 2.2 MHz to adjacent healthy areas are unlikely to occur and if they do occur, they are predictable and can be planned.

Using very thin and flexible electrodes made of special metal alloys, the electromagnetic waves are passed into the tissue. This approach allows fast, deep, precise, pressure-free and nearly athermal cutting. In addition, bleeding is controlled effectively by the adjustable coagulation. Compared to laser, the cutting efficiency of radio frequency is much higher; because of the rigid metal electrodes the cut can be made in its full length and be done in one strike. From the view of histometry, the thermal modification in the area of the incision flanks shows a comparable thermal interaction of 125 to 150 µm in both methods. The depth of the cut with radio frequency (Fig. 3) is 0.8 to 1.0 mm, while the cut with laser (Fig. 4) is limited to 0.17 to 0.20 mm.

**Examples of application**

Due to their certain characteristics and application possibilities, laser and radio frequency can be used in different treatment settings. For the treatment of a fibroma, for example, a radio frequency device can be used to quickly remove the swelling in one strike in just five seconds with a power of 20 W and loop electrode (Fig. 5). In this setting, speed and quality of a radio frequency application has been proven. On the contrary, implant recovery is at best performed with a 975 nm laser at 3 W cw (Fig. 6). In this application, laser shows its perfect superficial power in the gentle and precise opening of the implant. A very special application is shown in Figures 7 and 8. After having performed a frenectomy with laser, the edges of the

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**Fig. 5**: Removal of fibroma with radio frequency 20 W and loop electrode.
**Fig. 6**: Implant recovery with laser 975 nm at 3 W cw.
**Fig. 7**: Frenectomy with 975 nm laser at 4 W cw.
**Fig. 8**: Wound edges after frenectomy are closed using the bipolar radio frequency forceps.
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