Real time control and visualization of 2D dosimetry in laser lipolysis.

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Introduction:

Laser adipocytolysis consists in using thermal properties of a laser beam to induce a decrease of subcutaneous fatty tissues. This operation is performed by means of a thin cannula being inserted through the thickness of the tissue. Because of the low amount of direct interaction between the laser beam and the tissue, the area to be treated has to be scanned in successive back-and-forth motions within the tissue so as to bring about a homogeneous fat lysis.

The practitioner bases his estimate of the treatment efficiency on several main indicators including: 1/ the total dose delivered to the tissue, 2/ the surface temperature, or still 3/ the resistance exerted by the tissue while the cannula is moving. Although a successful adipocytolysis is correlated with each of these parameters, the latter can however not be considered as a possible treatment target. A treatment based on the total delivered dose would indeed require an accurate knowledge of the treated tissue volume. The notion of surface temperature does not take account of the tissue thickness or potential heat leakages by deep irrigation. Finally, the fibrous nature of the tissues may considerably vary from a person to the other.

At the same time, the treatment requires the practitioner to be very skilful so that he can homogeneously apply energy while performing back-and-forth motions. This simple back-and-forth motion necessarily indeed implies longer running times at the ends of the paths (zero speed), and consequently a higher amount of energy application. Furthermore, there is no solution today for assisting the practitioner in distributing and controlling the energy distribution upon the treated area.

OSYRIS company recently developed a system designed to display in real time the mapping of the doses delivered to the fatty layer. This system, based on the 2D-registration of the cannula tip, is an essential feedback that helps the practitioner homogenizing his treatment as well as controlling the overdosed and under dosed areas. Based on the 2D-registration, the system also allows a modulation of the laser power depending on the traveling speed of the cannula so as to assure a homogeneous and safe treatment. A significant improvement of the distribution homogeneity of the energy doses with a significant drop of the overdosed spots have been noticed from the early results.

As a conclusion, 2D-dosimetry for real time control of the treated tissue volume is an innovative approach that assures a reproducibility of the treatment by taking into account the traveling of the cannula and consequently the dose being delivered at any spot.