Comparative study of wavelengths for laser lipolysis

Serge Mordon[1], Jaouad Zemmouri[2], Philippe Rochon[2], Benjamin Wassmer[2]
[1] INSERM U 703, Lille University Hospital, Lille
[2] OSYRIS, Hellemmes, France

Background and Objectives: Laser lipolysis is fast becoming a recognized technique for fat reduction. It has been demonstrated that i) fat liquefaction is induced through a temperature elevation of the adipocyte cells, ii) fat volume reduction depends on total cumulative energy delivered at the treatment site. This study aims to evaluate the role of different wavelengths (920nm, 980nm, 1064nm, 1320nm, 1440nm) in laser lipolysis.

Study design/ Materials and Methods: The optical coefficients and the total attenuation for fat tissue were determined in the 400-1500nm window. Numerical simulations were performed to estimate final fat reduction as a function of wavelength.

Results: At around 1.5 mm, the penetration depth of wavelengths between 900 and 1320 nm are largely similar, with only minor differences, notably 1440 nm being more highly absorbed by subcutaneous fat. The irreversibly damaged volume of tissue estimated by our numerical simulation is similar for wavelengths between 920 and 1320 nm. We obtain a final volume of 4 cm^3 with 3750 J delivered.

Discussion: With laser lipolysis, thermal elevation of a given volume can be obtained provided that the penetration depth remains in this nominal range. This explains why similar end results can be obtained using 920 nm, 980 nm, 1064 nm and 1320 nm. Thermal build-up is the main factor behind adipocytolysis and skin contraction. Successful outcomes are dependent on the movement of the optical fiber inside the tissue and even and stable delivery of energy.