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A comparative study of pulsed Nd:YAG and CO₂ laser effect on cardiovascular tissue

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ABSTRACT: Percutaneous laser angioplasty is receiving increasing attention, as laser ablation of atheromatous plaque presents advantages to direct surgery or balloon angioplasty. One of the main prerequisites of using powerful pulsed lasers in angioplasty is the optimum choice of the irradiation parameters (the wavelength, the pulse shape and duration, the energy parameters e.t.c.). Infrared lasers have numerous applications in surgery. Among them the pulsed CO₂ laser emitting at 10.6 μm and the pulsed Nd:YAG laser emitting at 1.064 μm are the most widely used, since the delivery of laser energy in short pulses of high peak pulse power limits distant thermal effects. The CO₂ laser wavelength is greatly absorbed by tissue water, while the Nd:YAG laser wavelengths is poorly absorbed by water or other tissue chromophores, affecting deeper the tissue. The CO₂ laser incises effectively the tissue, but presents inadequate coagulation, while the Nd:YAG laser seems to present better coagulation properties.

In this work, a comparative study of pulsed Nd:YAG and CO₂ lasers in ablating cardiovascular tissues, is presented. The irradiation regime of the two lasers was determined, for the specific tissue or/and pathology. Also the depth of thermally induced coagulation was determined. The results are presented according to the efficacy of each laser for incision or/and coagulation. The benefits of combined action of the two lasers are also discussed.