Vascular and
Endovascular Surgery
Volume 000 Number 00
Month 2009 1-6

10.1177/1538574409335916
http://ves.sagepub.com

Saphenous Laser Ablation at 1470 nm Targets the Vein Wall, Not Blood

Jose Almeida, Edward Mackay, Julian Javier, John Mauriello, and
1 Jeffrey Raines

The 2 primary objectives of this study were to investigate whether the 1470-nm wavelength can close a saphenous vein painlessly and determine safety, efficacy, and side effects of the 1470-nm laser. In all, 26 limbs were treated in the Dominican Republic, with a radially-emitting fiber at low energy ranging from 20 J/cm to 30 J/cm. Perivenous anesthesia was used selectively. Then 41 veins were treated with the 1470-nm laser at 30 J/cm at 5 watts, using standard perivenous tumescent anesthesia in Miami and compared to a historical control (980 nm, 80 J/cm, and 12 watts). We demonstrated that the 1470-nm wavelength endovenous laser system could not close saphenous veins without use of anesthesia. Closure with a dramatic reduction in energy when compared to a 980-nm wavelength control demonstrated a marked reduction in postoperative pain and ecchymosis; this implies that vein-wall perforations are minimized with this system.

Keywords: superficial venous insufficiency; thermal ablation; endovenous laser; varicose veins; eccymosis

Introduction

In 1999, Bone[1] first reported the delivery of endoluminal laser energy for the treatment of varicose veins with an 810-nm diode laser. Early success with this device prompted industry to develop other wavelengths more specific for the hemoglobin chromophore (810, 940, and 980 nm) in an effort to achieve 100% saphenous vein closure.[2-6] A multivariate analysis by Proebstle et al demonstrated that the amount of energy administered during use of an endovenous laser (EVL) was an independent predictor of great saphenous vein (GSV) occlusion rate.[7] Henceforth, many clinical trials and studies using mathematical modeling followed attempting to discover the ideal energy (ie, density) to achieve improved closure rates.[8-11] Interestingly, as the EVL community trended toward using higher energy densities, reports of bruising, transient pain, and induration of the thigh, caused by laser-induced perforation of the vein wall, became more prevalent.[12,13] However, very recently, Prince et al concluded that EVL failure is not a function of energy density.[14]

Goldman introduced the1320-nm wavelength, which better exploits water as the energy-absorbing molecule,[3] and 2 comparative studies have demonstrated that patients treated with water-specific laser wavelengths (WSLW) reported less postoperative pain, used less painkillers, and were less likely to have ecchymosis.[10,15] There is increasing focus on reducing perioperative pain and bruising while maintaining high saphenous vein ablation rates. A WSLW has become commercially available at 1470 nm in a diode platform. Because the 1470-nm wavelength is preferentially absorbed by water 40 times more than a 980-nm wavelength, the manufacturer hypothesized that it would more readily target the vein wall and more readily ablate veins at lower energy densities, with fewer side-effects.

Although more common initially with radiofrequency ablation than laser, widespread use of perivenous tumescent anesthesia was followed by a reduction in the rate of paresthesias and skin

From the Miami Vein Center, Miami, Florida (JA, JR); Mackay Vein Institute (EM); Naples Vein Center (JJ); and Vein Center at Batey Cardiovascular (JM).
2
Address correspondence to: Jeffrey K. Raines.
3