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# Evaluation of a Unique 1319 nm Nd:YAG Laser for the Endovenous Ablation of the Saphenous Vein

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## Abstract

Endovenous ablation of the saphenous vein for greater saphenous insufficiency is now widely accepted as a primary treatment. In this study, thirty patients with documented saphenous insufficiency were evaluated using a unique 1319 nm (Sciton Inc. Palo Alto, CA) wavelength. Three different energy levels were used in two or three patients in each group. Follow-up ultrasounds were performed at two days, one month, and three months. Findings by ultrasound reveal all veins were successfully treated with no flow at day two. At one month, two patients showed flow in the previously treated saphenous vein. In each case this was less than 5 cm in length. Results at three months showed no variation. Early studies confirm the 1319 nm is a safe and effective wavelength to use in endovenous ablation.

## Introduction

Endovenous ablation of the saphenous vein for greater saphenous insufficiency is now widely accepted as a primary treatment. Three to five year follow-up continues to support its efficacy.

Current wavelengths of laser used include the 810, 940, 980, and 1320 nm. This study evaluated another wavelength, the 1319 nm (Sciton Inc, Palo Alto, CA).

## Methods

Thirty patients were evaluated. Informed consent was obtained. The size of the greater saphenous vein at the sapheno femoral junction ranged from 10-20 mm. All patients had documented saphenous insufficiency. The majority was in CEAP class, 2-4 with one patient in class 5, and one a class 6.

Three different energy levels were used and in two or three patients in each group, histological evaluation of a portion of the treated vein was undertaken. Follow-up ultrasounds were performed at two days, one month, and three months.

Procedures were carried out as has previously been described.[1,2] Access was either percutaneous or by cut down when resecting a small portion of the saphenous vein for histological study.

A 600-micron filament was inserted through a 5-Fr. catheter to within 2-3 cm of the sapheno femoral junction. Ultrasound confirmation was obtained as well as visual confirmation of the aiming beam. With ultrasound assistance, the dilute Xylocaine solution (tumescent) was delivered by percutaneous needle throughout the tract of the saphenous vein. A continuous pullback was used at 1 mm/s (Trak Back® II – Volcano Therapeutics). A small portion of the superficial treated saphenous vein was obtained in seven patients.

## Results

Findings by ultrasound reveal all veins were successfully treated with no flow at day two. At one month, two patients showed flow in the previously treated saphenous vein. In each case, this was less than 5 cm in length. One patient had an incompetent Hunter's perforator and the other a large branch emptying into the vein. There was no clinical correlation with recurrent veins or symptoms at the time of evaluation. Results at three months showed no variation.

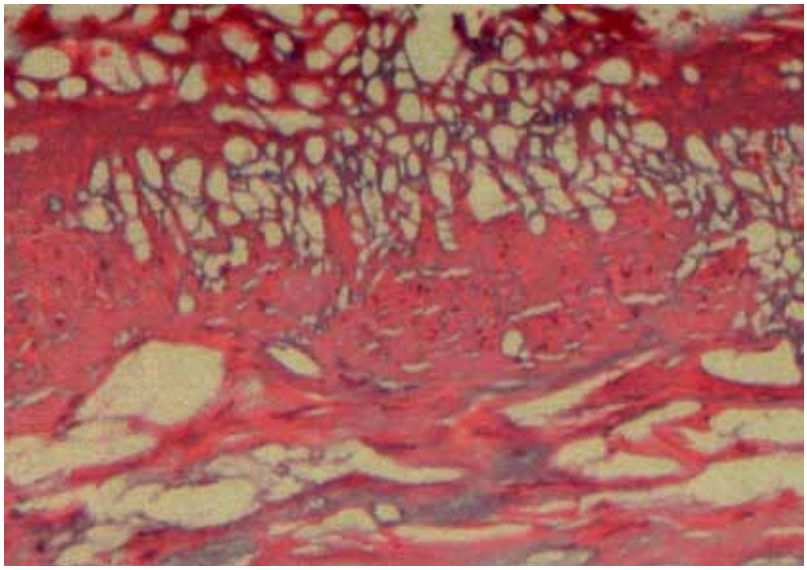
Histological findings were determined for energy levels at 7.4 W, 8.4 W, and 9 W. See Table 1. In all categories, there was no evidence of endothelium or subendothelium. Only in the group treated with 9 W was there a gross perforation of the vein. This is a similar finding with the 810, 980, and 940 nm wavelengths. With energies of 7.4 W and 8.4 W, there was no perforation.

One finding histologically not found in our study with other wavelengths (to be described later) was a marked vacuolization in the smooth muscle layer (Figure 1). This was most apparent on the veins treated with 9 W, but also present in the other 1319 nm treated veins to a lesser degree.

*Table 1*

| | Absence endothelium | Absence subendothelium | Perforation | Subendothelial changes |
|---|---|---|---|---|
| 7.4 Watts | Yes | Yes | No | + |
| 8.4 Watts | Yes | Yes | No | + |
| 9.0 Watts | Yes | Yes | Continuous | +++ |

*Figure 1*



## Discussion

From our early study and preliminary findings, the following observations were made.

First, due to the 1319 nm wavelengths greater absorption by water, more transmural damage will occur. There is less absorption by blood as compared to other wavelengths, (i.e., 940, 980, and to a lesser extent the 810 nm).

On ultrasound examination during firing there was considerably more steam bubble formation. The sapheno femoral junction must be compressed when using this wavelength during the initial 3-4 inches of laser activation in the vein. In our early cases, clot was present in the junctional area (no continuation into the femoral). In many of the early cases, there was an absence of flow in the inferior epigastric vein, even when the laser was placed 2-3 cm distal. This is no longer occurring when sapheno femoral junction compression is done at the time of firing. There appears to be slower resolution on ultrasound exam of the 1319 nm treated veins. It is too early to tell if this is of clinical significance. With use of 7.4 W and 8.4 W energy levels, there is minimal bruising and postoperative discomfort.

With 9 W of 1319 nm, bruising is similar to other wavelengths. Further studies could be done at lower energy levels, but 7.4 W seems to effectively cause endothelial and subendothelial destruction without vessel perforation. On our histological examinations, there does not appear to be a difference in comparing elastin stains of the different wavelengths.

## Conclusions

Early studies confirm the 1319 nm is a safe and effective wavelength to use in endovenous ablation. There appears to be energy damage at the subendothelial level. From initial evaluation, 7.4-8.4 W seems to be the ideal energy level. Long-term follow-up and careful analysis is needed in comparing these higher wavelength lasers to other wavelengths used for the last five years.

## References

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