

Venoarterial Flow Index Steadily Improves After Endovenous Laser Treatment of the Great Saphenous Vein

KNUTH RASS, MD,* CHANTAL PASQUINI, MD,* CORINNA HAMSCH, MD,[†] STEFAN GRÄBER, MD,[‡] NORBERT FRINGS, MD,[§] AND WOLFGANG TILGEN, MD*

BACKGROUND Endovenous laser treatment (EVLT) is a minimally invasive procedure to ablate varicose veins. The venous arterial flow index (VAFI) represents a quantitative duplex ultrasound parameter to characterize venous hemodynamics, which has not been investigated in EVLT so far.

OBJECTIVE To analyze the hemodynamic improvement of EVLT of the great saphenous vein (GSV) according to VAFI measurement.

MATERIALS AND METHODS One hundred thirty-three participants with complete GSV insufficiency were treated with 810-nm EVLT. VAFI as a ratio of venous and arterial flow volumes of the common femoral vessels and digital photoplethysmography (DPPG) were assessed before and 3 ($n = 129$) and 12 months ($n = 71$) after EVLT.

RESULTS EVLT was performed with an energy fluence of 22.5 J/cm², resulting in an occlusion rate of 98.4%. Duplex recurrence rates were 9.4% at 3-month and 15.5% at 12-month follow-up. VAFI significantly improved from 1.395 to 1.242 and 1.167 ($p < .001$) 3 and 12 months after EVLT. Venous refilling time (DPPG) accordingly increased from 20.0 to 36.9 seconds ($p < .001$) 3 months postoperatively.

CONCLUSION EVLT improves hemodynamic alterations in people with incompetent GSVs as demonstrated using VAFI and DPPG. VAFI might be a suitable diagnostic tool to quantify venous hemodynamics in people with varicose veins.

The authors have indicated no significant interest with commercial supporters.

Chronic venous insufficiency caused by varicose veins is a common disease, with prevalences up to 27.8% in men and 34.1% in women in Germany.¹

Diagnostic procedures to determine the individual cause of venous dysfunction are based on Doppler and color-coded duplex sonography.² To assess the severity of venous disorders and the hemodynamic impairment of the disease, functional tests such as phlebodynamometry (PDM, invasive venous pressure measurement), digital photoplethysmography (DPPG), air plethysmography, and strain gauge plethysmography are applied. Disadvantages of PDM are invasiveness, complexity, and restricted repeatability. The other methods mentioned are well standardized but in part (DPPG) able to reflect

venous hemodynamics only indirectly. Therefore, an additional quantitative and direct approach to illustrate venous hemodynamics would be beneficial, especially for severity grading, treatment decision-making, and outcome assessment.

Duplex ultrasound allows the direct assessment of hemodynamic alterations caused by venous insufficiency in a quantitative manner,^{3,4} but reflux velocity and duration measurements are difficult to standardize because several factors, such as participant cooperation during the Valsalva maneuver in the supine position and muscle relaxation in the standing position, influence those parameters. A novel approach to evaluate hemodynamics to score the severity of venous diseases using duplex ultrasound

*Department of Dermatology, Venereology, and Allergology and [†]Institute of Medical Biometry, Epidemiology and Medical Informatics, Saarland University Hospital, Homburg, Germany; [‡]Department of Dermatology, University of Heidelberg, Heidelberg, Germany; [§]Clinic for Vein Disorders, Bad Bertrich, Germany