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**Ultrasound-based topographic analysis of tributary vein connection with the saphenous vein during ambulatory conservative hemodynamic correction of chronic venous insufficiency**

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**Abstract**

**Objective:**Preoperative mapping of great saphenous vein (GSV) escape points to tributary veins (TVs) and targeted intervention of escape points may reduce recurrence rates of varicose veins (VVs) after endovascular treatment of saphenous veins and prevent saphenous nerve complications. The aim of this study was to perform an analysis of cartography after Doppler ultrasound mapping of escape points in patients with VVs and to suggest one point that may prevent recurrence and nerve complications.

**Methods:**Ultrasound assessment of VVs was performed from March 4, 2016, to July 15, 2016, specifically focusing on the locations of escape points from the saphenous vein to TVs. The collected data were reviewed retrospectively. The topographic distribution of escape points was as follows: from inguinal ligament to midthigh; from midthigh to knee; from knee to midcalf; and from midcalf to heel.

**Results:**Thirty patients (41 legs) with VVs underwent ultrasound examination. All VVs were characterized by reflux at the GSV. Topographic analysis revealed a total of 79 escape points in all patients. The most common location for escape points was the third part of the leg (from knee to midcalf), where 65.8% of escape points were located; 82.3% of all escape points were located below the knee. The mean diameter of the GSV at 3 cm and 15 cm from the saphenofemoral junction was 6.8 ± 1.6 cm and 5.5 ± 1.5 cm, respectively. Mean diameter of TVs was 5.1 ± 1.9 cm. The diameter was not significantly different between saphenous veins and TVs. The mean number of escape points in each leg was 1.9 ± 1.0.

**Conclusions:**Most escape points (65.8%) are located from knee to midcalf (third part of the leg), and 82.3% of all escape points are located below the knee. The diameter of TVs near the escape point is about 90% of that of the GSV. Thermal ablations of below-knee saphenous vein have potential nerve damage. Ablation of saphenous veins above the knee alone may result in residual shunting and formation of persistent reservoirs in TVs. These persistent reservoirs may be removed effectively with sclerotherapy or miniphlebectomy, especially trying to remove TVs near the escape point. Direct ligation of a TV near the escape point from the saphenous vein, just like saphenofemoral junction ligation, could be performed. These approaches may be able to prevent residual shunting and may reduce recurrence rates and nerve injury.

**Keywords:**CHIVA; Recurrence; Saphenous vein; Ultrasound; Varicose veins.

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