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After Superficial Ablation for Superficial Reflux Associated with Primary Deep Axial Reflux, Can Variable Outcomes be Caused by Deep Venous Valve Anomalies?

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WHAT THIS PAPER ADDS

When superficial and associated primary deep reflux are treated by superficial ablation alone, the variable outcomes may be caused by deep valve anomalies. Good results have been obtained in series when the deep incompetent valves have symmetrical leaflets. Conversely, when the leaflets are asymmetrical, no improvement can be obtained. If leaflet conformation is identified from the outset in patients affected by chronic venous insufficiency, femoral valvuloplasty and superficial ablation may be recommended. However, current routine investigations at the pre-operative stage cannot detect such leaflet asymmetry.

Objective: To identify which deep anatomical anomalies can explain variable hemodynamic outcomes in patients with superficial reflux associated with primary deep axial reflux who underwent isolated superficial vein ablation without improvement.

Methods: This is a retrospective study of deep venous valve anomalies in patients who underwent superficial vein ablation for superficial and associated deep reflux. A group of 21 patients who were diagnosed with saphenous reflux associated with primary deep axial reflux, were submitted to great saphenous vein ablation. In 17 patients the deep reflux was not abolished. In this subgroup, surgical exploration of the deep valve was carried out using venotomy for possible valve repair.

Results: Among the 17 subgroup patients, four post-thrombotic lesions were discovered intra-operatively in four patients; they underwent different surgical procedures. In 13 of the subgroup patients, primary valve incompetence was confirmed intra-operatively. In 11 cases the leaflets were asymmetrical and in only two were they symmetrical. After valvuloplasty, deep reflux was abolished in all 13 patients. Clinical improvement was obtained in 12/13 patients (92%). It is noteworthy that abolition of deep reflux was associated with significant improvement in air plethysmography data as well as with improvement in clinical status measured on CEAP class, VCSS and the SF-36 questionnaire.

Conclusion: Failure to correct deep axial reflux by superficial ablation in patients with superficial and associated primary deep axial reflux may be related to asymmetry in the leaflets of the incompetent deep venous valve.

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INTRODUCTION

The Vein Term Consensus article[1] considers three aetiologies in deep venous reflux (DVR): primary, secondary, and congenital. Secondary DVR involves valve damage, as in post-thrombotic syndrome (PTS). Congenital DVR usually implies valve agenesis or hypoplasia. Primary DVR is neither congenital nor post-thrombotic, in other words no specific cause is identified. Primary DVR is often associated with varicose veins and perforator incompetence;[2] however, their respective role in pathophysiology is not yet well established.

Some authors have reported resolving DVR in more than 90% of patients by treating the superficial system alone[3,4] or in association with subfascial endoscopic perforator surgery.[5] Conversely, other authors[6,7] found that DVR was not abolished after saphenous ablation, and others reported series in which abolition of axial DVR was achieved in approximately one third of patients only.[5,8] Axial reflux is defined as reflux in the entire great saphenous vein (GSV) to

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below the knee or in the entire femoral vein from the thigh region to the popliteal vein below the knee.[9]

Notwithstanding the success rate, it is admitted that deep venous system competence can be restored, in certain cases, after superficial ablation alone, without intervening on the deep venous system. A possible explanation for this phenomenon may be overload theory.[3,4] According to this theory, the overflow produced by significant varicose veins through re-entry perforators might increase the calibre and volume of the deep venous system, impeding deep valve competence. Valve competence is a function of the shape of the valve itself, thus an increased lumen diameter in turn enlarges the diameter of the sinus and this could impede correct valve function. Unfortunately, this theory has not been clearly demonstrated, and even if this concept is admitted, it is common experience that the reduction in overload is not always followed by restoration of deep vein competence. The key point is why, in certain cases, DVR is abolished and not in others.

It can be supposed that what is called primary DVR actually involves different valve abnormalities. These abnormalities might explain a malfunction independent of the vein and sinus diameter. Accepting this hypothesis, reducing the blood load by superficial ablation cannot achieve restored function because the malfunction is the result of other factors, such as morphological anomalies in the valve itself.

The aim of this study was to support this hypothesis, retrospectively studying 21 patients affected by chronic venous insufficiency (CVI) classified according to advanced CEAP:[10] $C_{2,3,4a,4b,5,6,S}$, E_p, $A_{s,p,d}$, $P_{r2,3,5,11,13,14,15,18}$. Outcomes and valve features were then correlated.

Table 1. Demographic data, CEAP classification, VCSS, and SF-36 evaluation before treatment.

Demographic data	Number of patients
Patients	21
Gender	
Male	9
Female	12
Mean age (range),	56 y (25—78 y)
Comorbidities	
Hypertension	8
Diabetes	2
Obesity	3
COPD	3
Congenital defects	0
Advanced CEAP classification	**Number of patients**
C_2	21
C_3	19
C_{4a}	1
C_{4b}	6
C_5	3
C_6	11
E_P	17
E_S	4[a]
$A_{S,D,P}$	21
$P_{R\ 2,\ 3,\ 5,\ 11,\ 13,\ 14,15,18}$	21
Score and QoL	**Median (range)**
VCSS baseline (21 patients)	19 (11—27)
SF-36 PH baseline (21 patients)	40.22 (26.29—55.75)
SF-36 M baseline (21 patients)	42.10 (15.98—59.35)

COPD = chronic obstructive pulmonary disease; VCSS = venous clinic severity score; SF-36 = short form-36 quality of life questionnaire; PH = physical health evaluation; M: = mental evaluation; y = years.

[a] Intra-operative diagnosis.

MATERIALS AND METHODS

Population

From May 2009 to December 2015, 21 patients were analysed retrospectively. Demographic data are listed in Table 1.

All patients were affected by CVI related to axial DVR and concomitant GSV incompetence. The superficial reflux extended from groin to ankle, involving the saphenous vein and calf perforators, as reported in Table 2. The diameter of the GSV was measured 5 cm from the sapheno-femoral junction. The diameter was between 12 to 24 mm (mean 17 mm).

Patients were further evaluated using Venous Clinic Severity Score (VCSS) and Quality of Life (QoL) questionnaire SF-36 (Table 1).

Ulcer duration in the C6 patients was 3—15 months (mean 9.8 months). One limb presented more than one ulcer. All patients had been treated previously by compression but healing was not achieved.

Exclusion criteria for this study were patients with CVI associated with a history of possible previous deep venous thrombosis (DVT), previous superficial vein treatment (surgical, thermal ablation, or sclerotherapy), associated deep obstruction, valve agenesis, and suspected signs of DVT detected by duplex ultrasound (DUS) and venography.

Diagnostic evaluation

Patients were submitted to the standard protocol routinely applied at the study centre: DUS, air plethysmography (APG), venography, and intravascular ultrasound (IVUS), when needed. DUS scanning (LOGIQ P5, GE Medical Systems) of the inferior cava system was performed. The iliocaval system was examined in the supine position to verify patency. The flow curve in the common femoral vein was evaluated to detect normal respiratory fluctuation.

The common femoral, femoral and popliteal segments were evaluated in the supine and standing positions to detect reflux and obstruction. Possible morphological signs of PTS were identified. The reflux at common femoral level was always evaluated, both before and after exclusion, by compression at the sapheno-femoral junction. This was to neutralise refluxes determined by the aspirated action of superficial reflux.

Reflux was evaluated in the standing position by manual compression and calf release. Reflux was defined as reverse flow lasting >0.5 s.[11—13] In patients with a large calf, a calf cuff was applied to evaluate reflux. The duration of reflux at popliteal vein level varied from 2 to 9 s (mean 4.04 s). The saphenous system was evaluated and the extent of reflux was gauged.

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