

## Prevalence and Distribution of Venous Insufficiency in Patients with Post-Thrombotic Scar

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**Abstract:** Chronic venous insufficiency of deep venous system in most cases is an acquired disorder which occurs following deep vein thrombosis, and can subsequently followed by skin changes and disability. Color Doppler sonography is the main diagnostic tool for chronic venous insufficiency, and also is a useful tool for identifying the distribution and extent of venous reflux. The aim of this study was to evaluate the prevalence and distribution of venous insufficiency in patients with post-thrombotic scar at lower extremity venous system. Fifty three limbs of 48 subjects were evaluated. Patients with previous deep vein thrombosis of the lower limbs presented with skin ulcers, variceal veins or leg edema were included in the present study. Venous Doppler scanning was commenced at external iliac vein (EIV) and moved to common femoral vein (CFV), saphenofemoral junction (SFJ), superficial femoral vein (SFV), greater saphenous vein (GSV), popliteal vein (POPV), saphenopopliteal junction (SPJ), lesser saphenous vein (LSV), calf veins (CV), and perforator veins (PV), respectively. The results showed that prevalence of thrombotic scar was more common in proximal deep veins of the limbs. Moreover, popliteal vein was the most common insufficient vein (58.5%). Perforator veins also had no thrombotic scar but they were insufficient in 3 patients (5.66%). This study also showed that severe stenosis or occlusion was most common in external iliac veins (12 patients). In conclusion, the chronic post-thrombotic scar was common at proximal veins. Moreover, deep vein insufficiency was more common than superficial system. In addition, POPV was found as the most common insufficient vein.

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**Keywords:** Venous insufficiency; post-thrombotic scar; Doppler ultrasound; deep vein thrombosis; venous reflux

### 1. Introduction

Chronic venous insufficiency (CVI) in the lower limbs is a common and progressive disease. It occurs as a result of post-thrombotic valve destruction or primary valvular incompetence (Callam, 1994; Chiesa et al., 2005). Insufficiency of the saphenous system is the most common form of chronic venous insufficiency giving rise to primary varicose veins. Chronic venous insufficiency of deep venous system in most cases is an acquired disorder which occurs following deep vein thrombosis, and can subsequently followed by skin changes and disability (Burnand, 1988).

Color Doppler sonography (CDS) is the main diagnostic tool for chronic venous insufficiency, and also is a useful tool for identifying the distribution and extent of venous reflux (Baker et al., 1993). The factors affecting the development of post-thrombotic scar are not fully understood. However it might be caused by gravitational venous reflux, venous stenosis or occlusion (Meissner et al., 1998; Haenen et al., 1998). The aim of this study was to evaluate the prevalence and distribution of venous insufficiency in patients with post-thrombotic scar at lower extremity venous system.

### 2. Material and Methods

From January 2010 to September 2012, 53 limbs of 48 subjects (22 men and 26 women) aged 20 to 78 years (median age of 51 years) were evaluated. Patients with previous deep vein thrombosis of the lower limbs presented with skin ulcers, variceal veins or leg edema were included in the present study. Examinations were performed using a HITACHI EUB-525 color Doppler ultrasonography with 5-7.5 MHz linear probe (Ghabili et al., 2009; Ardalan et al., 2009; Nemati et al., 2010; Ansarin et al., 2010; Farhoudi et al., 2011; Babil et al., 2011; Babil et al., 2012). All examinations were performed with the patient on supine and stand positions. The Doppler settings of duplex sonography were optimized routinely and an angle (<60°) of insonation was ensured. Reflux is usually defined as reverse flow that lasted longer than one second for deep and superficial veins and 0.35s for perforator veins (Labropoulos et al., 2003). Venous Doppler scanning was commenced at external iliac vein (EIV) and moved to common femoral vein (CFV), saphenofemoral junction (SFJ), superficial femoral vein (SFV), greater saphenous vein (GSV), popliteal vein (POPV), saphenopopliteal junction (SPJ), lesser saphenous vein (LSV), calf veins (CV), and perforator veins (PV), respectively.

Data were presented as mean  $\pm$  standard deviation (SD) or percentage. Statistical analysis was performed with SPSS for windows (v 13.0; SPSS Inc, Chicago, IL). A *P* value  $<0.05$  was considered statistically significant.

### 3. Results

Table 1 shows the anatomic distribution of chronic thrombotic scar in lower limbs. It shows that prevalence of thrombotic scar is more common in proximal deep veins of the limbs.

Table 1. Anatomic distribution of chronic thrombotic scar in the studied patients (CFV, common femoral vein; SFV, superficial femoral vein; POPV, popliteal vein; CV, calf veins; EIV, external iliac vein)

Sites	Number	%
CFV + SFV + POPV + CV	30	56.6
EIV + CFV + SFV	13	24.5
POPV + CV	3	5.6
SFV	1	1.8

Table 2 shows the anatomic distribution of venous insufficiency in lower limbs. It shows that popliteal vein is the most common insufficient vein (58.5%). Perforator veins also had no thrombotic scar but they were insufficient in 3 patients (5.66%).

Table 2. Anatomic distribution of venous insufficiency in the studied patients (CFV, common femoral vein; SFV, superficial femoral vein; POPV, popliteal vein; CV, calf veins; EIV, external iliac vein; PV, perforator veins)

Sites	Number	%
CFV + SFV + POPV + CV	15	28.3
EIV + CFV + SFV	12	22.6
POPV + CV	5	9.4
POPV	11	20.7
PV	3	5.6

This study also showed that severe stenosis or occlusion was most common in external iliac veins (12 patients), causing reverse of flow at SFJ, and the extremity venous blood draining through the collateral veins of pelvis. Only in one patient acute thrombosis in deep veins was detected. Moreover, in two patients insufficiency was noted at GSV, while no insufficiency was seen at LSV.

### 4. Discussion

Color Doppler ultrasound can accurately show the extent of chronic or post-thrombotic venous scar and also the extent of venous insufficiency in the lower limbs. In the majority of the healthy controls, the reflux time is  $<0.5s$  and usually the criterion for

reflux in incompetent veins is  $>1s$  (Campbell et al., 1996). In this study, the chronic post-thrombotic scar was common at proximal veins and it is in competent of more prevalence of acute thrombosis at proximal veins of the lower limbs. Cogo and associates (1993) found that 88% of their patients had thrombi in proximal veins. However, in the previous studies, deep vein thrombosis was considered to originate from distal veins and then extend to proximal veins (Weinmann and Salzman, 1994). In a recent study, Yamaki and Nozaki (2005) showed that the overall incidence of DVT involving the proximal veins was 67%. In our study, deep vein insufficiency was more common than superficial system (96.2% vs. 3.8%). In the study of Magnusson and coworkers (2001), deep vein incompetence was common (38%) and isolated superficial veins (7%) but mixed deep and superficial venous insufficiency was more common (49%) and it was in contrast with our study.

In this study, POPV was the most common insufficient vein (58.5%). Haenen and associates (1999) demonstrated that advanced chronic venous insufficiency was found in FV and POPV with reflux. Yamaki and coworkers (2005) found that the proportion of venous insufficiency was significant in patients who had multisegment disease. In this study we found PV insufficiency in 5.6% of patients. In the study of Delis (2004), the presence and number of PV insufficiency both increased with CVI severity and it was inconsistent with of our study.

In conclusion, the chronic post-thrombotic scar was common at proximal veins. Moreover, deep vein insufficiency was more common than superficial system. In addition, POPV was found as the most common insufficient vein.

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