

## ORIGINAL ARTICLE

# Extrinsic compression of left iliac vein does not predict the development of post thrombotic syndrome in left side deep venous thrombosis

Sang Jun Park, Ho Jong Park, Eun Kyoung Kwon, Sang Jin Kim, Hong Rae Cho

Department of Surgery, Ulsan University Hospital, University of Ulsan College of Medicine, Ulsan, Korea

**Purpose:** Left side deep venous thrombosis (DVT) is associated with May-Thurner's anatomical variation and is often instigated by invasive treatment. The aim of this study is to analyze the influence of left iliac vein narrowness on incidence of post thrombotic syndrome (PTS) that developed after left side DVT. **Methods:** Forty-one left side DVT cases that were followed up for more than 1 year were enrolled. The iliac vein narrowness was measured by the shortest distance from the right iliac artery to the 5th lumbar vertebra overlying left iliac vein in computed tomography (CT) scan. The incidence of PTS was measured by phone-call history taking for specific symptoms of PTS. The means of the shortest distance were compared by independent t-test. **Results:** The number of PTS cases was eleven (26.8%). The level of thrombus, demographic data and other risk factors were similar in both PTS and non-PTS groups except the mean risk factor score. The mean of the shortest distance of PTS group and non-PTS group were 5.56 mm and 5.89 mm, respectively. **Conclusion:** The degree of left iliac vein narrowness measured by the shortest distance from the right iliac artery and the 5th lumbar vertebral body was not a predictive factor for PTS.

**Key Words:** Venous thrombosis, X-ray computed tomography, Postthrombotic syndrome

## INTRODUCTION

There are two main goals in treatment of deep venous thrombosis (DVT) of lower extremities: One is to reduce the chance of fatal pulmonary embolism and the other is to prevent post-thrombotic syndrome (PTS) [1]. We try to find out a high risk patient of DVT and to prevent the development of DVT in a sense that it is not easy to achieve the former once the DVT is established. Prevention of PTS

can be a main focus of managing lower extremity DVT. Several studies have shown that the frequency of PTS to be up to 30 to 40% and PTS was associated with worsened quality of life [2,3]. Recent studies report the efficacy of early invasive treatment for acute DVT in order to achieve a high venous patency rate and to preserve valve function [4,5]. However, some researchers argue that an invasive treatment such as thrombolytic therapy couldn't prevent the long-term outcomes, PTS [6]. And proximal DVT of the

Received February 22, 2012, Revised March 27, 2012, Accepted April 12, 2012

Correspondence to: Sang Jun Park

Department of Surgery, Ulsan University Hospital, University of Ulsan College of Medicine, 877 Bangeojinsunhwan-doro, Dong-gu, Ulsan 682-714, Korea

Tel: +82-52-250-7109, Fax: +82-52-250-7350, E-mail: ud3012md@medimail.co.kr

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left side is closely related to iliac vein compression syndrome or May-Thurner syndrome [7]. We report that the minor diameter of the left iliac vein between the right iliac artery and the 5th vertebral body impacted the incidence of left side proximal DVT [8].

This study aims to investigate a new non-invasive method to predict PTS after acute DVT. We focused the left iliac vein narrowness measured by the shortest distance from right iliac artery to the 5th vertebral body overlying left iliac vein in computed tomography (CT) scan.

## METHODS

One hundred and sixty-six limbs in 113 patients with DVT diagnosed by duplex scan with serum d-dimer test in one institute were reviewed. CT scan was performed to detect presence of pulmonary embolism as well as to determine the exact location of the thrombus in the vein (Fig. 1). We used a uniform protocol for CT pulmonary arteriography and indirect venography [9]. We excluded twenty cases that received thrombolysis or other invasive treatments. Among the 146 cases, CTs for the diagnosis of pulmonary embolism were checked in 131 cases. We contacted 65 cases of the left side DVT over a year after the first diagnosis and ended up with forty one cases for analysis.

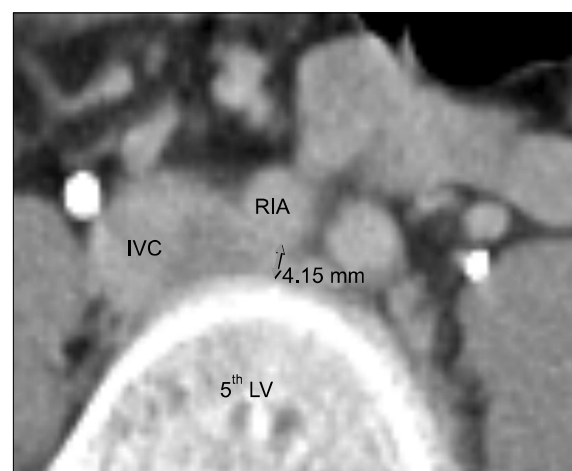


**Fig. 1.** Indirect computed tomogram (CT) venography. White arrows indicate the thrombus in the left iliac and femoral vein.

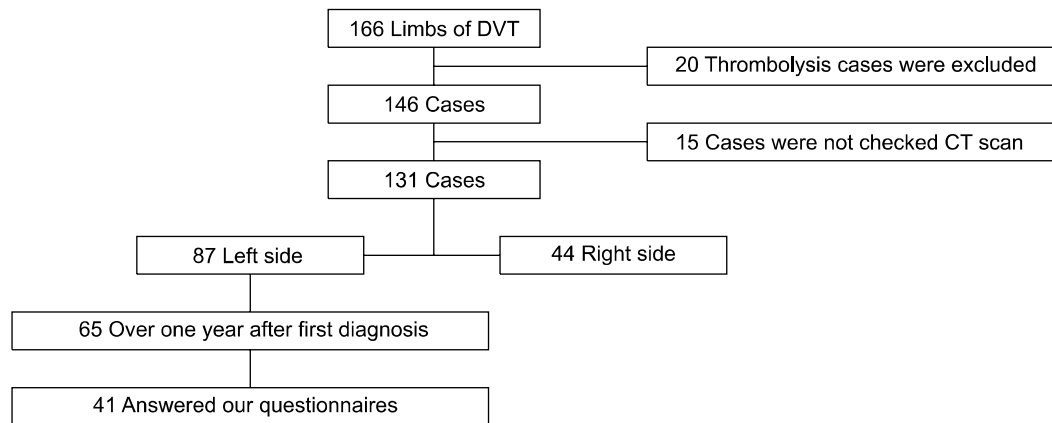
All the cases were recommended one year of oral anti-coagulation and anti-gravity stockings. Anticoagulation was performed by treatment with oral warfarin maintaining the prothrombin time between 2 to 2.5 international normalized ratio. CT scan and duplex scan were performed at a year follow-up of oral anticoagulation. We evaluated the recanalization of thrombosed vein by CT scan and duplex scan at a year follow-up. According to our definitions, recanalization was the partial or complete resolved thrombus while non-recanalization was complete occlusion of a whole venous lumen in any segment of thrombosed vein.

The shortest distance from right iliac artery to 5th vertebral body was measured in picture archiving and communicating system program using  $\pi$ -ViewSTAR (INFINITT Healthcare Co., Seoul, Korea). The distance was measured at the shortest distance between the right iliac artery and the 5th vertebral body overlying left iliac vein on cross sectional view (Fig. 2).

Diagnosis of PTS was checked by phone call with questionnaire. We used the Ginsberg measure of PTS diagnosis [10]. We asked the following questions: 1) Do you have newly onset chronic venous insufficiency signs, such as varicose veins, swelling of foot or calf, skin pigmentation or discoloration, and venous ulcers? 2) Is there any



**Fig. 2.** Distances are measured in cross-sectional views. The shortest distance is measured from right iliac artery to 5th vertebral body overlying left iliac vein by picture archive communication system software. RIA, right iliac artery; IVC, inferior vena cava; LV, lumbar vertebra.



**Fig. 3.** Patient selection diagram for evaluation of left side post thrombotic syndrome after deep venous thrombosis (DVT).

**Table 1.** Clinical characteristics of left side DVT

Characteristic	PTS group (n = 11)	Non PTS group (n = 29)	P-value
Male/female	6/5	13/16	0.308
Mean age (yr)	63.9	53.7	0.625
Level of DVT			0.205
Iliac vein	5	13	
Femoral vein	4	8	
Popliteal & calf vein	2	3	
Recanalization rate (%) <sup>a)</sup>	81.8	82.8	0.736
DVT risk score (mean) <sup>b)</sup>	2.01	0.08	0.014

PTS, post-thrombotic syndrome; DVT, deep venous thrombosis.  
<sup>a)</sup>Complete or partial resolution of venous lumen/total number.  
<sup>b)</sup>DVT risk scores were followed by New York Heart Association protocols.

newly onset spontaneous calf pain when walking or standing? 3) Are you experiencing newly onset heaviness of leg? We sorted the cases to the PTS group if he or she answered ‘yes’ to least one of the above questions.

New York Heart Association DVT risk score system was used for DVT risk assessment [10].

The mean of the shortest distance from the right iliac artery to the 5th vertebral body was compared between PTS group and non PTS group by independent t-test. The statistical analysis was performed with SPSS ver. 11.0 (SPSS Inc., Chicago, IL, USA).

## RESULTS

Forty-one patients were finally enrolled in the study. Median follow-up period was 16 months (Fig. 3). Eleven of

**Table 2.** The mean of the shortest distance from right iliac artery to 5th vertebral body

	PTS group (n = 11)	Non-PTS group (n = 29)	P-value
Mean ± SD (mm)	5.56 ± 3.04	5.89 ± 4.23	0.882

PTS, post-thrombotic syndrome.

forty-one cases (26.8%) had PTS symptoms or signs. Male and female ratio of PTS group was 6:5 and 13:16 for non-PTS group. Mean ages were 63.9 for PTS group and 54.9 for non PTS group. The levels of thrombus were 5 iliac veins, 4 femoral veins and 2 popliteal veins in PTS group and 13 iliac veins, 8 femoral veins and 3 femoral veins in non-PTS group. The recanalization rate was achieved in 81.8% (9/11) of PTS group and 82.8% (24/29) of non-PTS group. Mean of DVT risk score for PTS group was 2.00 and 0.08 for non-PTS group. Most clinical features were similar except the DVT risk score by means of Fisher exact test or t-test (Table 1). Mean of the shortest distance from right iliac artery to 5th vertebral body of PTS group was 5.56 mm and 5.89 mm in non-PTS group (Table 2).

## DISCUSSION

About twenty-five percent of all the patients with DVT in their lower extremities developed PTS within a year, and PTS is one of the most important complications of DVT [11]. In our study, a figure of 26.8% incidence of PTS is similar to that of other study that reported on patients

who used elastic stockings [12]. However, there was a variation in the incidence of PTS because of a difference of diagnostic criteria and follow-up duration.

While several studies reported that invasive treatment such as catheter directed thrombolysis could reduce the risk of PTS in short-term results [6], long-term results were not established and the complication of invasive treatment was not possible to overcome.

We reported that the shortest distance between the right iliac artery and the 5th vertebral body overlying the left iliac vein could be a risk factor for developing DVT in the left proximal vein [9]. The main mechanism in the development of DVT might be similar to that of iliac compression syndrome or May-Thurner syndrome. According to our hypothesis, this short distance representing the narrowness of the iliac vein would be also related to the incidence of PTS after left-side DVT. If this method could predict PTS development, we could easily select patients who are in need of invasive treatment. However, no result could be found to show any relationship between them. Rather, the result concluded that the higher the risk factor scores are, the higher the PTS incidence is (Table 1). It is acknowledged that DVT risk factors such as the previous documented DVT are shared with PTS risk factors [3]. There are some other risk factors such as development of PTS after DVT. The recanalization rate of thrombosed vein is considered one of the risk factors for PTS [13]. It is found in this study that the recanalization rates were similarly achieved in both groups.

There were some limitations in this study: small number of cases, short follow-up period, and inexactitude of diagnostic criteria for PTS. The thrombolysis cases were excluded in that they were suspected as severe iliac vein compression.

We aimed for a non-invasive and simple method to predict the necessity of invasive intervention for DVT. However, it doesn't seem that this study provides strong effects on external iliac vein compression in the development of PTS after left-side DVT or less effect than DVT risk factor scores.

## CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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