EVALUATION OF AVERAGE DIAMETER OF LOWER EXTREMITY VEINS IN ACUTE AND CHRONIC THROMBOSIS AND COMPARISON WITH NORMAL PERSONS BY DOPPLER SONOGRAPHY

H. Sharifian* and F. Gharekhanloo

Department of Radiology, Amir-Alam Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

Abstract- The goal of this study was to define the normal range of diameter in the deep vein of the lower limb and to compare this range with diameter of the veins with acute thrombosis and of veins with chronic thrombosis by using color doppler sonography. The study was cross sectional. The vein diameter and vein to artery ratio in different levels were measured and the following results were obtained. In patients with acute thrombosis the vein diameter and vein to artery ratio were more than normal range and this difference had statistical significance so we can reliably predict acute thrombosis if the vein diameter is upper than a suggested level. In chronic thrombosis, however, the vein diameter is not a good diagnostic factor and so we can not rely on it.

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Key Words: Lower extremity veins, thrombosis, doppler sonography

INTRODUCTION

Sonography is a sensitive and reliable tool for diagnosis of deep venous thrombosis (DVT) (2,3). Compressibility of veins was used as a criterion for differentiating acute thrombosis from chronic ones in the past, but recent studies showed that this criterion was not satisfactory (4). Some investigators believe that vein diameter and vein to artery ratio are more useful in differentiating these entities (6,8). There is controversy about it and some investigators believe that this difference has no statistical significance (1,4,5), so we decided to determine the normal range of lower limb vein diameter and then compare them in acute and chronic thrombosis and normal persons with statistical methods.

MATERIALS AND METHODS

All patients suspected of having thrombosis were examined with GE logic 500 color doppler sonography machine (7.5 MHz probe), by one radiology resident under supervision of the attending physician. Common femoral veins (CFV), superfacial femoral vein (in upper [high SFV] and lower [low SFV] parts of it) and popliteal veins (PV) were examined. After dertermining vein and artery diameter, the vein to artery ratio was calculated. These dimensions were measured anteroposteriorly in axial sections from vein and artery. Normal vein is defined as a vein with smooth walls and complete filling with color doppler study. The term acute DVT, when implied means partial compressibility, visualization of thrombosis in the vein and no flow in spectral imaging in a patient with compatible clinical settings. Signs in chronic thombosis are narrowing of the lumen of the vein, collateral veins and thickening of the wall of the veins in patients with known history of acute thrombosis or pulmonary emboli. After completing data collection, statistical significance of difference between these groups was tested by one way analysis of variance (ANOVA).

RESULTS

Sixty patients (20 in each group) were examined. The normal group, which were patients with no clinical and sonographic evidence of thrombosis and came to the ward for other reasons, were in age range of 20–70 years. This range in acute thrombosis was 15-85 and in chronic thrombosis was 18-65 years.

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*** Corresponding Author:**
H. Sharifian, Department of Radiology, Amir-Alam Hospital, School of Medicine, Tehran University of Medical, Tehran, Iran
Tel: + 98 21 6704998
Fax: +98 21 6704805
E-mail. hsharifi@sina.tums.ac.ir

Table 1. Average of vein diameter and vein to artery ratio in normal, acute DVT and chronic DVT groups

Groups / Vein level	Normal		Acute thrombosis		Chronic thrombosis	
	Diameter	Ratio	Diameter	Ratio	Diameter	Ratio
CFV	8.66 ± 1.24	1.17	11.62 ±2.51	1.45	8.18 ±1.14	1.05
High SFV	7.48 ±1.00	1.18	9.20 ±2.23	1.43	7.30 ±0.92	1.02
Low SFV	7.37 ±1.32	1.23	9.21 ±2.09	1.46	6.58 ±0.79	1.00
PV	6.61 ±0.84	1.2	9.55 ±1.64	1.66	5.84 ±0.64	1.03

Table 2. Suggestive values for the diagnosis of acute venous thrombosis

Vein level	Suspicious level for acute DVT		Highly suggestive for acute DVT
	Absolute diameter	Ratio	Absolute diameter
CFV	≥ 10-11	>1.5	>11
High SFV	≥ 9-9.5	>1.5	>9.5
Low SFV	≥ 10-10.5	>1.5	>10.5
PV	≥ 8-8.5	>1.5	>8.5

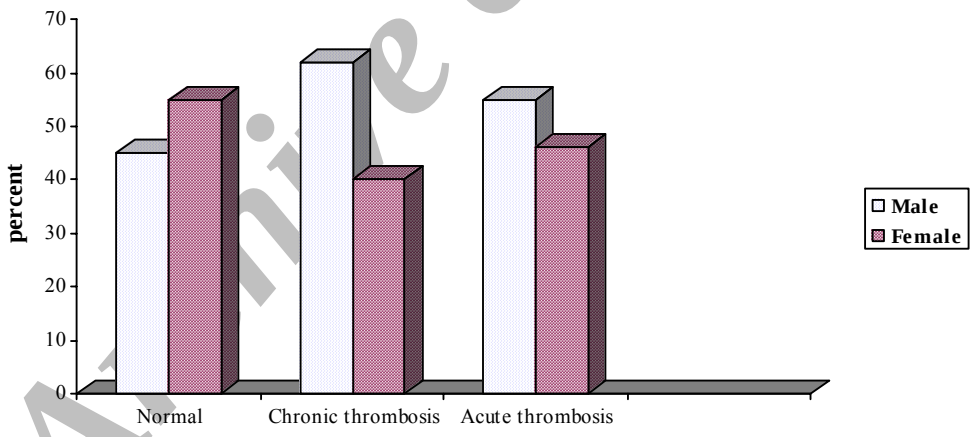

Fig. 1. Sex distribution in study groups

Male patients frequency were 45% in normal group, 55% in acute thrombosis group and 60% in chronic thrombosis group, so frequencies in female patients were 55%, 45% and 40%, respectively (Fig.1). The average of vein diameter in these groups are shown in table 1. According to this table following results are note worthy:

In these three groups, the vein to artery ratio was maximum in common femoral vein and is decreased to the popliteal level. In acute thrombosis, the vein diameter is significantly increased in comparison with normal range and this difference is statistically significant (P= 0.003). In chronic thrombosis the diameter is decreased and this difference has no statistical meaning (P= 0.37), however if follow up time is sufficiently prolonged, then decreasing of vein diameter in chronic thrombosis can have significant difference with normal range.

DISCUSSION

In this study the normal range of vein diameter was determined and compared with measurements in patients with acute and chronic thrombosis. The

diameter of veins in lower extremity was largest at the level of the common femoral vein which was 8.66 mm in normal group,11.62 mm in acute thrombosis and 8.18 mm in chronic thrombosis. This study showed that vein diameter and vein to artery ratio in acute thrombosis was more than normal range and also in patient with chronic thrombosis but according to table 1 the range in each group was wide and there was overlap between them. In past studies, investigators believed that in acute thrombosis the vein to artery ratio was 2 (7,8), but in our study only in a few of patients with acute thrombosis the vein to artery ratio was 2 or greater. In patients with chronic thrombosis the vein diameter and vein to artery ratio was less in comparision with normal people and patients with acute thrombosis, however this difference had no statistical significance. In conclusion we can suggest that increase in diameters in acute thrombosis is more significant than decreased diameter of veins in chronic thrombosis. So we can use this measurement in the diagnosis of acute thrombosis. In conclusion, we can say that although the range of vein diameter and vein to artery ratio is wide but if the vein diameter or vein to artery ratio is more than the suggested values of the table 2, the diagnosis of acute thrombosis is very likely. However it is necessary to use other studies for the evaluation of positive predictive value (PPV) and negative predictive value (NPV) for the suggested values.

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