CASE REPORTS

DUPLICITY OF THE FEMORAL VEIN AS A RISK FACTOR FOR DEEP VENOUS THROMBOSIS - DIAGNOSIS BY ULTRASONOGRAPHY

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Abstract

Femoral vein duplication is an anatomical abnormality with high prevalence in general population. Its diagnosis is through imaging exams, with greater emphasis on Doppler ultrasonography. The identification is crucial because it masks the clinical symptoms of deep vein thrombosis. Besides being an important anatomical pathway and, while in duplicity, it can be used as a possible vascular substitute, therefore making the knowledge of the anatomical path and its variants essential. Ultrasonography has attractive advantages over other methods, collecting data from patients in physiological conditions without the need of contrast, or exposure to ionizing radiation, providing anatomical details of the venous system and anatomical variations. When thrombus is suspected in a duplicated segment, examination of the lower limb with anatomical variation should not be used to justify the presence of duplication in the contralateral limb.

Keywords: *Ultrasonography, Doppler, Color; Ultrasonography; Femoral Vein; Thrombosis.*

INTRODUCTION

The femoral vein follows the femoral artery, rising at the opening of the adductor magnus as the continuation of the popliteal vein.[1] In the lower part of the adductor canal, it is posterolateral to the femoral artery; the top of the canal and at the bottom of the femoral triangle, it is behind the artery.[1]

The complex embryological development of the vascular system generally results in a myriad of clinically relevant variants[1]. The duplication of the femoral vein is an anatomical variant of high prevalence in the general population, occurring in 20-55% of people - the rates can be higher if considering partial duplication.[2,3,4,5] It occurs bilaterally in about 60% of cases.[4]

Duplication of the femoral vein with full extension and similar diameters, according to Casella et al, is observed in less than 10% of members.[2] Its identification is commonly made with color Doppler ultrasonography, which accuracy is comparable to venography.[2,3,5]

The femoral vein has several purposes, such as a replacement for infected aortoiliac and axillofemoral prosthetic grafts. Also, the use of femoral vein as an interposition of arteriovenous fistulas for hemodialysis can be an option.[2]

CASE REPORT

A 30 year-old man presented with a history of syncope, that occurred when he was at work and lasted 15 minutes. He had a sedentary lifestyle and denied smoking, alcohol intake, comorbidities, trauma and previous surgeries. On examination, he had left leg edema, mainly in the calf.

Neurological assessment was normal.

The patient underwent cranial tomography that detected hypoattenuation of the capsular nucleus on the left side. Transesophageal echocardiography, with a microbubble test, showed a patent foramen ovale of about 2.0 mm. Doppler ultrasound of the lower limbs showed distal duplication of the left femoral vein in the region of the adductor canal (Hunter's canal) with thrombus in the middle / distal third of the homolateral popliteal vein, partially obliterating its diameter in about 37%, with the present flow, suggesting probable unstable thromboembolic lesion (Figures 1 and 2) or thrombosis in the process of spontaneous recanalization. Cerebral angiotomography, performed 12 days after the syncope episode, was normal.

The patient underwent treatment with rivaroxaban 20 mg/day for 6 months showing resolution of the thrombosis.

DISCUSSION

Deep venous thrombosis (DVT) is estimated to have an incidence of approximately 1 in 1000 and lead to more than 50,000 deaths annually in the USA.6 The Doppler ultrasound examination for vascular evaluation is therefore extremely important and essential in a DVT investigation protocol, the diagnosis is crucial and tends to be asymptomatic when duplication is present.[1,2,4] The symptoms are related to the creation of a pathway through which the blood can reflow, reducing the signs of obstruction.[6]

Ultrasonography has interesting advantages over other methods of investigation, collecting information from patients in physiological conditions without the need for administration of contrast, or exposure to ionizing radiation, providing anatomical details of the venous system and anatomical variations.[2] Venous diameters can be measured accurately and any reflux can be easily confirmed.[2]

Screaton et al. observed that in patients with duplication of the femoral vein, the diagnosis for DVT was higher than in individuals with a single femoral vein.[7] Screaton et al also demonstrated that of 410 contrast venographies, where the femoropopliteal veins were previously considered to be free of thrombus, showed that 43% of the patients had duplication of the femoral vein and in the 20 patients who had a false negative ultrasound, six (30 %) cases presented thrombus in the duplicated femoral vein.[4,7]

Liu et al. observed a higher prevalence of DVT in individuals with multiple femoral veins - multiple femoral veins occur in 31% of the population, of which 40% had DVT.[1,8] There was also a higher proportion of asymptomatic patients with DVT and with duplicate veins, which can be explained by the collateral pathways provided by the accessory veins and their natural relief by blood congestion.[8]

The incorrect diagnosis can be related to several factors.[3] Vein compressibility is an important criterion in the ultrasound diagnosis of DVT.[3] The collapse of the vein when

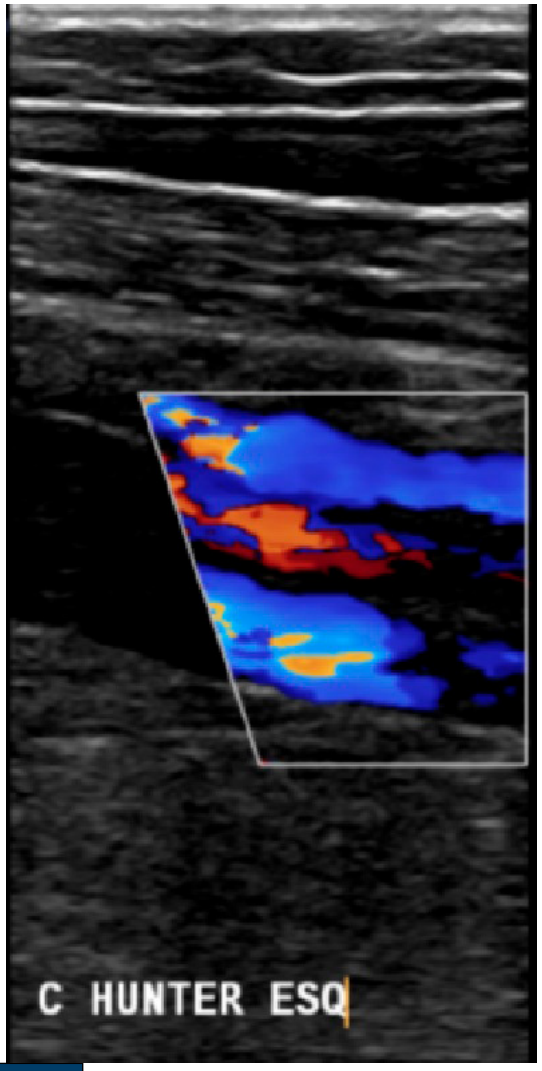

Figure 1

Examination performed on admission. Ultrasonography demonstrating longitudinal image in Hunter's canal - distal duplication of the femoral vein - showing flow to the Doppler study, without signs of thrombosis. Also observed is the femoral artery involved by the distal duplicity.

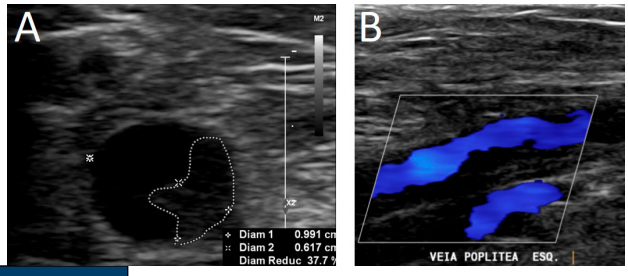

Figure 2

Examination performed on admission.
Ultrasonography showing a popliteal vein with a thombus inside the cross-section in A.
In the longitudinal section in B, showed flow to the study with Doppler, over the mural thrombus, indicating possible spontaneous recanalization.

pressure is applied with the transducer is prevented by the intraluminal thrombus, but it is also difficult to perform in the path of the patent femoral vein inside the adductor canal.[3] In certain anatomical sites, compressibility can be seen in the absence of a thrombus - this occurs when the femoral vein crosses the adductor hiatus and at the level of the saphenous opening.[3] If the evaluator is aware of these possible variations and if the compressibility of a segment is in question, other criteria can be used to better evaluate these areas.[3] This includes the absence of any visualized thrombus and the evaluation of the filling of the vessel lumen in the study with color Doppler.[3]

When thrombus is suspected in a duplicated segment, examination of the lower limb with anatomical variation should not be used to justify the presence of duplication in the contralateral limb.[3] Unfortunately, in our searches, no articles were found regarding the condition of duplicated veins after treatment.

REFERENCES

1. Sharma P, Salwan. Duplication of femoral vein and its significant clinical implications. IJAV. 2011;4:188–91.
2. Casella IB, Presti C, Yamazaki Y, Vassoler AA, Furuya LA, Sabbag CD. A duplex scan-based morphologic study of the femoral vein: incidence and patterns of duplication. Vasc Med. 2010 Jun;15(3):197-203.
3. Gordon AC, Wright I, Pugh ND. Duplication of the superficial femoral vein: recognition with duplex ultrasonography. Clin Radiol. 1996 Sep;51(9):622-4.
4. Paraskevas P. Femoral vein duplication: incidence and potential significance. Phlebology. 2011 Mar;26(2):52-5.
5. Zamboni P, Gianesini S. Surgical Technique for Deep Venous Reflux Suppression in Femoral Vein Duplication. EJVES Short Rep. 2016 Feb 19;30:10-12.
6. Zhang Y, Xia H, Wang Y, Chen L, Li S, Hussein IA, Wu Y, Shang Y, Yao S, Du R. The rate of missed diagnosis of lower-limb DVT by ultrasound amounts to 50% or so in patients without symptoms of DVT: A meta-analysis. Medicine (Baltimore). 2019 Sep;98(37):e17103.
7. Screaton NJ, Gillard JH, Berman LH, Kemp PM. Duplicated superficial femoral veins: a source of error in the sonographic investigation of deep vein thrombosis. Radiology 1998; 206: 397–401.
8. Liu GC, Ferris EJ, Reifsteck JR, Baker ME. Effect of anatomic variations on deep venous thrombosis of the lower extremity. AJR Am J Roentgenol 1986; 146: 845–848.