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Characterization of profunda femoris vein thrombosis

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ABSTRACT

Objective: The incidence of and risk factors for profunda femoris vein (PFV) thrombosis are poorly characterized. We prospectively identified patients with PFV deep venous thrombosis (DVT) to characterize the demographics and anatomic distribution of proximal DVT in patients with PFV DVT.

Methods: A prospective study was conducted of patients at a tertiary care university hospital with DVT diagnosed by venous duplex ultrasound scanning between June 2014 and June 2015. DVT patients were categorized as having PFV involvement (yes or no), and the anatomic distribution of other sites of ipsilateral venous thrombi was further stratified to determine whether there was external iliac vein (EIV), common femoral vein (CFV), or femoropopliteal vein (FPV) DVT. Demographic characteristics of the patients were compared between groups, PFV DVT vs proximal DVT without PFV DVT.

Results: Of 4584 lower extremity venous duplex ultrasound studies performed, 398 (8.7%) scans were positive for proximal DVT from 260 patients; 23.1% of patients with DVT (60/260) had DVT involving the PFV. Of 112 patients who had CFV DVT, 55 (49.1%) also had ipsilateral involvement of the PFV. Of 60 patients with PFV DVT, 55 (91.7%) had involvement of the ipsilateral CFV. Patients in the PFV DVT group were more likely to have a history of a hypercoagulable disorder (26.7% vs 14.5%; $P = .029$) and a history of immobility (58.3% vs 42%; $P = .026$) compared with those with proximal DVT without PFV DVT. There were no differences in smoking, recent surgery, personal or family history of DVT, other medical comorbidities, inpatient status, or survival. There was no difference in laterality of DVT between the PFV DVT and proximal DVT without PFV DVT groups (35% vs 41.5% left, 35% vs 33.5% right, 30% vs 25% bilateral; $P = .619$). There was a higher proportion of PFV DVT with EIV involvement (21.7% vs 2.5%; $P < .00001$) and a higher proportion of PFV DVT with CFV + FPV involvement (65.0% vs 19%; $P < .00001$) compared with proximal DVT without PFV DVT. There was no difference in survival between the PFV DVT and proximal DVT without PFV DVT groups.

Conclusions: Patients with PFV thrombosis tend to have more thrombus burden with more frequent concurrent DVT in the EIV and FPV. Patients with PFV DVT are also more likely to have a history of hypercoagulable disorder and immobility. Ultrasound protocols for assessment of DVT should include routine examination of the PFV as a potential marker of a more virulent prothrombotic state. (J Vasc Surg: Venous and Lym Dis 2018;■:1-7.)

Keywords: Profunda femoris vein; Deep venous thrombosis; Venous duplex ultrasound

The profunda femoris vein (PFV) drains the inner thigh, traveling cephalad and medially to join the femoral vein. The incidence of PFV deep venous thrombosis (DVT) is poorly characterized; the duplex ultrasound-reported incidence of isolated PFV DVT ranges from 0.54% to 0.8%, whereas the reported incidence of PFV DVT found in conjunction with other DVT varies widely from 14.5% to 73.9% in three previous studies.[1-3] Only one study to date has investigated the laterality of PFV DVT or characteristics of this population of patients.[2]

Identification of PFV DVT may be important as the PFV plays a significant role in venous outflow of the lower extremities, and this role may be amplified in patients with previous venous thrombosis. Identification of PFV DVT may also have important consequences for predicting sequelae of DVT.

Given the limited data on PFV DVT and the likely vital role of the PFV in the venous drainage of the leg, we designed a prospective study to characterize PFV DVT. The objectives of our study were to characterize the incidence of PFV DVT and the distribution of other DVTs found in conjunction with PFV DVT. We also aimed to assess the laterality of PFV DVT, the demographics and comorbidities of patients with PFV DVT vs those with proximal DVT without PFV DVT, and the survival of patients with PFV DVT vs those with proximal DVT without PFV DVT.

METHODS

After approval by our Institutional Review Board, we conducted a prospective single-institution study that analyzed venous duplex ultrasound scans performed from June 2014 to June 2015 for the presence of lower

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extremity DVT. Informed consent of the patients was not obtained as it was not required for this study. Studies began with compression of the great saphenous vein in transverse from the saphenofemoral junction to the knee. Attention was then turned to the deep system, working from proximal to distal (groin to ankle) to image the following vein segments: common femoral, deep femoral, femoral, popliteal, anterior tibial, posterior tibial, and peroneal. All veins were imaged in transverse orientation with compressions recorded by cine loops. Color and Doppler ultrasound examinations were used to demonstrate phasic flow and augmentation with images obtained in each vessel. Philips iU22 and Philips CX50 machines (Philips Healthcare, Andover, Mass) were used in this study. There were seven registered vascular technologists performing studies during the time period of this study. There were three vascular surgeons interpreting studies, with >90% of studies being interpreted by one vascular surgeon.

The analyzed venous duplex ultrasound scans included a mix of scans performed in the outpatient and inpatient settings as well as scans obtained for suspected DVT in symptomatic patients and examinations of asymptomatic patients thought to be at high risk for DVT. Scans from trauma patients were included in the study and were not separated out in our analysis. Of the venous duplex ultrasound scans performed, only those positive for proximal DVT (DVT involving the external iliac vein [EIV], common femoral vein [CFV], PFV, or femoropopliteal vein [FPV]) were included in our analysis. Examinations positive only for isolated axial or muscular calf vein DVT were excluded from analysis. The analysis included both acute and chronic DVTs, and we did not stratify according to chronicity of DVT. Examinations were divided into two groups based on involvement of the PFV (proximal DVT with PFV involvement vs proximal DVT without PFV involvement). Duplicate scans from the same patient were eliminated, and the scan showing the largest clot burden was selected for inclusion in the analysis.

The PFV DVT and proximal DVT without PFV DVT groups were then compared in terms of laterality of DVT (left, right, or bilateral) and distribution of DVT. To characterize the distribution of DVT, each group was further subdivided. The proximal DVT without PFV DVT group was subdivided into the following four categories: proximal DVT with involvement of the EIV (with or without more distal involvement), isolated CFV involvement, CFV + FPV involvement, and isolated FPV involvement (Fig 1). The PFV DVT group was subdivided into the following five categories: isolated PFV DVT, PFV DVT with involvement of the EIV (with or without more distal involvement), PFV + CFV involvement, PFV + CFV + FPV involvement, and PFV + FPV involvement (Fig 2).

Age, body mass index (BMI), gender, and comorbidities were recorded from the institutional electronic medical record and compared for the PFV DVT vs proximal DVT without PFV DVT groups. Recorded demographics included sex, smoking history (never vs current or prior smoker), history of immobility (nonambulatory status for ≥72 hours within 30 days of ultrasound examination), and history of recent surgery (inpatient procedures in the following areas: cardiac, vascular, orthopedic, gynecology, urology, neurosurgery, spine, or abdominal). The presence of the following comorbidities was also recorded: hypertension, hypercholesterolemia (known diagnosis or patient receiving statin therapy), diabetes (known diagnosis or patient taking oral hyperglycemic or insulin therapy), dialysis dependence, coronary artery disease (known diagnosis or prior myocardial infarction), hypercoagulable disorder (factor V, protein C or S deficiency, antithrombin III, homocysteinemia, lupus anticoagulant, anticardiolipin, antiphospholipid, heparin-induced thrombocytopenia, prothrombin), cancer (active and prior cancers excluding skin cancer unless metastatic), and arrhythmia. Personal history of DVT (history of DVT or pulmonary embolism [PE]) and family history of DVT (family history of hypercoagulable state as defined before or history of PE or DVT in first-degree relative [parents and siblings]) were also recorded. Not all patients were screened for PE, and the incidence of PE was obtained by chart review. Survival data were recorded through both the institutional electronic medical record and the Social Security Death Index.

To assess the overall comorbidity burden, the Charlson Comorbidity Index[4] was calculated for each patient. Points were assigned according to the following scale: 1 point for myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease or transient ischemic attack, pulmonary disease/asthma, diabetes, gastric or peptic ulcer, dementia or Alzheimer disease, rheumatic or connective tissue disease, hypertension, depression, or warfarin use; 2 points for hemiplegia, diabetes with end-organ damage, renal disease, mild liver disease, cancer (lymphoma, leukemia, solid tumor), or skin ulcers/cellulitis; 3 points for severe liver disease;

ARTICLE HIGHLIGHTS

- **Type of Research:** Prospective cohort study
- **Take Home Message:** In 260 patients with proximal deep venous thrombosis (DVT), those with profunda femoris vein thrombosis had more thrombus burden, had more frequent concurrent DVT in the external iliac and femoropopliteal veins, and were more likely to have hypercoagulable disorder and immobility.
- **Recommendation:** These data suggest that ultrasound protocols for assessment of DVT should include routine examination of the profunda femoris vein as a potential marker of a more virulent prothrombotic state.