

Factors Associated with Contralateral Deep Venous Thrombosis after Iliocaval Venous Stenting

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WHAT THIS PAPER ADDS

This study suggests that placement of iliac venous stents across the iliocaval confluence is a safe procedure. It is associated with a low incidence of contralateral iliac DVT, and if this occurs, early clot removal may be performed with good results. Acute DVT, pre-operative contralateral IIV thrombosis, pre-existing IVC filters, anticoagulation non-compliance, and malignant compression are significant factors that may increase the risk of subsequent contralateral DVT.

Background: The majority of iliac venous obstructions occur on the left side, and endovascular therapy has become the first line treatment for this condition. A left common iliac venous stent will protrude into the inferior vena cava (IVC) to some extent, thereby covering the contralateral common iliac vein (CIV) outflow. This may increase the risk of thrombosis of the contralateral iliac vein. The aim of this paper was to determine the rate of, and factors associated with, contralateral lower limb venous thrombosis after stenting, and to evaluate the results of salvage revascularisation.

Methods: A total of 376 patients (102 from UCH, Galway, Ireland, 2008–16, and 274 from, CHU Nord, Marseille, France, 2000–15) with symptomatic acute or chronic left iliocaval venous obstruction were retrospectively evaluated. Either duplex ultrasound scanning (DUS) or computed tomographic venography (CTV) was used for pre- and post-operative imaging. Data were collected from the PACS system (IMPAX, Agfa, BE) of the Radiology Department, UCH, Galway, and from the electronic medical records of Vascular Surgery department, CHU Nord, Marseille.

Results: The median age of stented patients was 46 (range 15–86 years), 80% were female (301/376). Following left CIV stent placement, 2.7% (10/376) later presented with a right (contralateral) iliac deep venous thrombosis (DVT). Acute DVT ($p = .001$), non-compliance with the prescribed 6 months anticoagulation ($p = 0.05$), pre-operative contralateral internal iliac vein (IIV) thrombosis ($p = 0.001$), and pre-existing IVC filter placement ($p = 0.003$) were all statistically significantly associated with contralateral DVT. All patients with symptomatic contralateral iliac DVT underwent clot removal in the acute phase. The primary patency of these limbs was 100% at 3 years.

Conclusion: Stent placement across the iliocaval confluence from the left CIV is associated with a low but definite rate of contralateral iliac vein thrombosis. Acute DVT, pre-operative contralateral IIV thrombosis, pre-existing IVC filters, and anticoagulation non-compliance are significant risk factors.

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INTRODUCTION

Percutaneous endovenous stenting has emerged during the last two decades as the method of choice to treat

venous outflow obstruction (VOO) revealed after acute or chronic obstruction¹ with excellent long-term clinical outcome and low complication rates.² Precise stenting of the proximal common iliac vein (CIV) can be challenging due to the difficulty in accurately locating the iliac vein confluence on venography and the limitations of current stent design, which may lead to proximal end stent collapse with caudal stent migration when stents are positioned exactly at the confluence with a high risk of recurrent thrombosis.^{2,3}

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To overcome the difficulties of stent placement close to the ilio caval confluence, the cranial end of the venous stent will by necessity project into the inferior vena cava (IVC) to a variable extent; which may result in partial or complete coverage of the contralateral CIV outflow.⁴ This may increase the risk of thrombosis of the patient's normal contralateral iliofemoral vein. The aim of this study was to determine the rate and factors associated with contralateral limb thrombosis after ilio caval venous stenting in two different groups and to evaluate the results of the treatment.

METHODS

Data of patients treated for symptomatic left ilio caval venous obstruction were retrospectively collected from two different hospitals: PACS system (IMPAX, Agfa, Mortsels, BE) and Philips client programs in the Radiology Department of Galway University Hospital, and the electronic medical records of the Vascular Surgery Department, CHU Nord, Marseille. An SPSS 23.0 spreadsheet was prepared and included demographics, details of the pre-operative work-up, the extent of thrombosis, disease type and extent, and procedural details, including the type and size of stent, degree of stent projection into the IVC lumen, post-operative outcome, incidence of contralateral deep vein thrombosis (DVT), and the time elapsed prior to its development. All cases of initial right lower limb DVT, initial IVC involvement and loss of follow-up were excluded. Patency was assessed by combining clinical observation, duplex ultrasound scanning (DUS), computed tomographic venography, venography, and/or IVUS (intravascular ultrasound).

Technique

Using pre-operative imaging, possible access sites were chosen in advance. The prone ipsilateral popliteal approach under ultrasound guidance was used to gain access in most patients with acute iliofemoral deep venous thrombosis (IFDVT) (70%). In patients with post-thrombotic disease, access was obtained mainly through the common femoral vein (76%), ipsilateral femoral vein (6%), and/or right internal jugular vein (18%). A permanent retrievable IVC filter was applied in 15% (55/376), mainly through the right jugular vein approach ($n = 40$), right common femoral vein (CFV) ($n = 12$) and ipsilateral popliteal vein prone approach ($n = 3$).

All patients with acute IFDVT underwent pharmacomechanical thrombolysis alone or in combination with catheter directed thrombolysis before stent placement, and then the underlying obstructing lesion was addressed.⁵ A variety of stents, which changed over time as "dedicated" venous stents emerged, were employed and extended across the iliac confluence to support all diseased segments. Stents were dilated to nominal size to ensure adequate apposition to the vessel wall and to avoid possible stent migration. Over the later period of the study, IVUS was employed to assess stent placement and stent expansion. Success was obtained once completion venography

revealed perfect in line flow with no holdup of contrast and abolition of collaterals.

Post-operative care and follow-up

All patients had intermittent pneumatic compression (Tyco, Covidien, Galway, Ireland) overnight until they mobilised. Patients were discharged with fitted thigh length stockings (20–25 mmHg) for 6 months. All patients with acute DVT or post-thrombotic lesions were prescribed anticoagulation: low molecular weight heparin (LMWH) followed by coumarin anticoagulation with a target INR (2–3) for 6 months and 1 year of clopidogrel. In underlying malignant disease, LMWH was continued alone according to guidelines.⁶ Those with recurrent DVT or known thrombophilia were recommended lifelong anticoagulation. All patients underwent post-operative DUS before discharge to assess venous patency and to exclude acute re-thrombosis.⁷ Follow-up was clinical and by repeat DUS at 1, 3, 6, and 12 month intervals and annually thereafter. If symptoms occurred during surveillance, computed tomography venography (CTV) was performed. CT scans obtained through oncology follow-up were used to assess the stent in patients with underlying malignancy.⁸

Statistical analysis

Retrospectively collected data were analysed using SPSS (23.0). Cumulative primary, primary assisted, and secondary patency rates as defined by common standards were registered¹; the freedom from contralateral iliac DVT and intention to treat, were performed by survival analysis using the Kaplan–Meier method. The predictors and incidence of contralateral iliac DVT after ilio caval vein stenting and the results of salvage revascularisation were studied using the log-rank test. Continuous variables were analysed with the Student *t* test, and the Fisher exact test was used for categorical data. In all cases, $p < .05$ was considered significant.

RESULTS

A total of 376 patients in two groups from UCHG ($n = 102$; 2008–16) and CHU, Nord ($n = 274$; 2000–15), median age 46 (15–86 years), presenting with left lower limb VOO and undergoing left ilio caval venous stenting, were included in the study. Demographics, past medical history, and aetiology of treatment of the two patient groups are presented (Tables 1 and 2). The clinical presentation was acute with IFDVT ($n = 80$) or gradual development of symptoms for chronic venous disease ($n = 296$). Fifty-three of 170 (31%) patients tested positive for thrombophilia: factor V Leiden ($n = 24$) and factor VIII deficiencies ($n = 11$), anti-thrombin III ($n = 8$), Protein C and S deficiency ($n = 10$). Anatomical and operative details from the initial stenting procedure are given in Table 2. A total of 620 venous stents of different brands and diameters were placed. The majority of stents used in this study were Wallstents (BSCI, Galway, IE) (84%) (Table 3). In 2% (12/376) of patients, anticoagulation was contraindicated, and 98% of patients were maintained on

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