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STATE-OF-THE-ART REVIEW

Inferior Vena Cava Thrombosis

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CME Objective for This Article: 1) Identify the clinical context in which inferior vena cava thrombosis should be suspected. 2) Describe the diagnostic tests for inferior vena cava thrombosis. 3) Differentiate the various treatment modalities of inferior vena cava thrombosis with respect to the indications, risks versus benefits, technical aspects and patient selection.

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Inferior Vena Cava Thrombosis

ABSTRACT

Thrombosis of the inferior vena cava (IVC) is an under-recognized entity that is associated with significant short- and long-term morbidity and mortality. In absence of a congenital anomaly, the most common cause of IVC thrombosis is the presence of an unretrieved IVC filter. Due to the substantial increase in the number of IVC filters placed in the United States and the very low filter retrieval rates, clinicians are faced with a very large population of patients at risk for developing IVC thrombosis. Nevertheless, there is a paucity of data and societal guidelines with regards to the diagnosis and management of IVC thrombosis. This paper aims to enhance the awareness of this uncommon, but morbid, condition by providing a concise, yet comprehensive, review of the etiology, diagnostic approaches, and treatment strategies in patients with IVC thrombosis. (J Am Coll Cardiol Intv 2016;9:629–43) © 2016 by the American College of Cardiology Foundation.

Inferior vena cava (IVC) thrombosis is an under-recognized entity that is associated with significant morbidity and mortality (1). It is estimated that 2.6% to 4.0% of patients with lower extremity deep vein thrombosis (DVT) have IVC thrombosis (2-5). However, the true incidence of IVC thrombosis may be underestimated due to the lack of standardized methods of its detection and reporting, as well as the exponential increase in the number of unretrieved IVC filters in the United States, a major predisposing factor to IVC thrombosis (5,6). The mortality rate of IVC thrombosis is twice as high as that of DVT confined to the lower extremities (2). If untreated, patients with IVC thrombosis will also suffer from significant morbidities: post-thrombotic syndrome (PTS) in up to 90%, disabling venous claudication in 45%, pulmonary embolism (PE) in 30%, and venous ulceration in 15% (1,3,4). Phlegmasia cerulea dolens and renal vein thrombosis are rare, but well-described, limb and life-threatening complications of IVC thrombosis (7).

In this review, we aim to enhance the awareness of this uncommon, but morbid, condition, and provide readers with a guide detailing the diagnosis and management of IVC thrombosis with special emphasis on contemporary endovascular treatment modalities.

ETIOLOGY

CONGENITALLY ABNORMAL IVC. IVC thrombosis is prevalent (60% to 80%) among patients with congenital IVC anomalies (8-10). These anomalies occur in 0.5% to 1% of the general population, and in 2% to 3% of patients with congenital cardiac defects (9,11). Congenital IVC anomalies can be classified into 3 anatomic categories (12) (**Figure 1**):

1. Infrarenal: duplicate IVC, persistent left-sided IVC, pre-aortic IVC, and absence of the infrarenal IVC
2. Renal: accessory left renal vein, retroaortic and circumaortic left renal vein
3. Suprarenal: absence of the hepatic IVC with azygos continuation, congenital caval stenosis or atresia, and IVC membranes

Most IVC anomalies are subclinical for many years due to well-developed collaterals. They are often discovered incidentally on abdominal imaging (10). However, thrombosis of the collateral channels or of their feeding vessel (often the common iliac vein) can lead to acute or subacute proximal DVT or findings of chronic venous insufficiency.

CONGENITALLY NORMAL IVC. Thrombosis of the IVC in the absence of congenital abnormalities is rare, and is usually a result of a predisposing hypercoagulable state along with an acquired pathology in the IVC or one of its adjacent structures (1,7,13,14).

1. Prothrombotic factors: thrombophilia, malignancy, oral contraceptives, smoking, obesity, pregnancy, hormonal replacement therapy, and nephrotic syndrome.
2. Abdominal pathology: renal cell tumor, abdominal masses producing extrinsic compression such as a very large uterine fibroid, Budd-Chiari syndrome, abdominal trauma/surgery, May-Thurner syndrome, and thrombotic occlusion of an IVC filter.

Thrombotic occlusion of IVC filters is of particular importance in the United States, where presumed overutilization of IVC filters and low retrieval rates have drawn recent attention. It is estimated that IVC filter placement rates in the United States in 2012 were 25 times that of an equivalent population in Europe (224,700 vs. 9,070) (6). Although the majority