



# The Role of Inferior Vena Cava Filters in Pulmonary Embolism

Jonathan D. Steinberger, MD,<sup>\*</sup> and Scott J. Genshaft, MD<sup>†</sup>

Pulmonary embolism (PE) is a cause of significant morbidity and mortality, with an estimated 600,000 cases of clinically significant PE in the United States annually, and roughly 200,000 deaths per annum directly attributable to PE. By far the most frequent cause of PE is deep vein thrombosis originating in the lower extremities, which travels to the pulmonary vasculature. The mainstay of treatment is anticoagulation, but multiple additional treatments exist for patients in whom anticoagulation is inadequate or contraindicated. The absolute indications for inferior vena cava (IVC) filtration are narrow, but many filters are placed in patients with relative indications. There is growing concern for overuse of IVC filters, with a relatively low rate of retrieval. It is essential for interventional radiologists to understand the appropriate and correct use and retrieval of IVC filters. Familiarity with placement techniques, protocols and techniques for retrieval, current and emerging technologies, and the clinical model for management of venous thromboembolism, will ensure that interventional radiologists remain an integral member of the care team for these often complex patients.

Tech Vasc Interventional Rad 20:197-205 © 2017 Published by Elsevier Inc.

**KEYWORDS** IVC, filter, venous thromboembolism, DVT, PE

## Background

Pulmonary embolism (PE) is a cause of significant morbidity and mortality, with an estimated 600,000 cases of clinically significant PE in the United States annually, and roughly 200,000 deaths per annum directly attributable to PE.<sup>1,2</sup> Furthermore, it has been postulated that without treatment 40% of all proximal deep vein thrombosis (DVT) will cause PE.<sup>2</sup>

The most common cause of pulmonary embolus is lower extremity DVT, although other sites of clot origination do occur. Existing data that probably underestimate the true incidence of DVT suggest that about 80 cases per 100,000 population occur annually.<sup>2,3,4</sup> Approximately 1 person in 20 develops a DVT in the course of his or her lifetime.

It has long been known that thrombus that develops in the lower extremities can dislodge and travel to the pulmonary

vessels, and the idea of preventing lower extremity thrombus migration dates back as far as the 18th century.<sup>2</sup> In the mid-20th century several techniques for caval interruption were attempted, including open suture plication of the inferior vena cava (IVC), interruption of the IVC with plastic clips, and stapling devices to plicate the IVC from a surgical approach. The development of the Mobin-Uddin filter in 1967 enabled endovascular treatment of venous thromboembolism (VTE), and an improvement over surgical ligation of the IVC, in that caval blood flow was preserved while solid clot was prevented from traveling to the pulmonary circulation.

Over the ensuing years, IVC filter technology has drastically evolved, and there are currently many options available for endovascular implantation. The interventional radiologist must exercise appropriate judgment and technique in patient selection, venography, placement, and removal of filters. In so doing our specialty can play an important role in reducing the morbidity and mortality of VTE.

## Preprocedural Workup

As with nearly every procedure, appropriate care of a patient with VTE begins with a thorough history and physical examination. Symptoms of DVT may include

<sup>\*</sup>Dotter Interventional Institute, Oregon Health Sciences University, Portland, OR.

<sup>†</sup>Division of Interventional Radiology, Department of Radiological Sciences, David Geffen School of Medicine, University of California, Los Angeles, CA.

Address reprint requests to Jonathan D. Steinberger, MD, Dotter Interventional Institute, Oregon Health Sciences University, 3181 SW, Sam Jackson Park Rd, L-605, Portland, OR 97239. E-mail: steinbej@ohsu.edu

Indications/Contraindications for IVC Filter Placement	
<p><b>Absolute Indications</b></p> <p>Patients with acute proximal DVT and contraindication to anticoagulation:</p> <ul style="list-style-type: none"> <li>-impending major surgical procedure</li> <li>-intracranial hemorrhage</li> <li>-GI/Pelvic/Retroperitoneal bleed</li> <li>-solid organ injury</li> </ul> <p>Complication of anticoagulation in a patient with acute proximal DVT</p> <p>Failure of anticoagulation in a patient with acute proximal DVT</p> <p>Inability to achieve therapeutic anticoagulation</p> <p>Recurrent PE when therapeutically anti-coagulated</p>	<p><b>Relative/Controversial Indications</b></p> <p>Prophylactic filter placement</p> <ul style="list-style-type: none"> <li>-Preop Surgical Patients with multiple risk factors for VTE</li> <li>-severe trauma without VTE</li> <li>-high-risk patients, such as immobilized or intensive care patients</li> </ul> <p>Free-floating ilio caval thrombus</p> <p>Massive PE with residual DVT, risk for further PE</p> <p>Concurrent with thrombolysis</p> <p>Patients with severe cardiopulmonary disease and documented DVT</p> <p>High risk for complications on anticoagulation</p> <p>Cancer, burn, pregnant patients with documented VTE</p>
<p><b>Contraindications (Relative)</b></p> <p>Uncorrectable coagulopathy</p> <p>Bacteremia</p> <p>Chronically occluded cava (auto filtered)</p>	

**Figure 1** Appropriate utilization of IVC filters is maximized when the interventionalist is aware of indications and contraindications to the procedure and can therefore provide guidance to referring physicians. **Figure 1** lays out the absolute and relative indications and contraindications for IVC filter placement and can be helpful in establishing appropriateness of filter placement.

lower extremity edema, pain, tenderness, warmth or erythema, and symptoms of PE such as dyspnea, chest pain, or palpitations. A thorough history may give some clue as to the acuity of the clot and its distribution (lower extremity, upper extremity, caval, and PE), as well as any predisposing factors such as hypercoagulability disorders, prior injury, pregnancy, oral contraceptive use, and smoking. A prior history of VTE may favor more aggressive therapy, and the patient's history may reveal a contraindication to anticoagulation such as recent surgery or bleeding events.

The challenge of obtaining a history and physical exam in patients with VTE is that symptomatology and diagnostic testing do not correlate well—as many as 46% with patients with classic symptoms have negative venograms, and as many as 50% of those with image-documented venous thrombosis lack specific symptoms.<sup>5</sup> No single physical finding or combination of symptoms and signs is sufficiently accurate to establish the diagnosis of DVT, although physical exam may be helpful. Physical findings in DVT may include calf pain on dorsiflexion of the foot (Homans sign), a palpable, indurated, cordlike, tender subcutaneous venous segment, variable discoloration of the lower extremity, and blanched appearance of the leg because of edema (relatively rare).

Using validated clinical prediction rules to estimate pretest probability of VTE (eg, Wells criteria) will help determine the most appropriate workup for patients with suspected DVT or PE. Per recommendations from the American Academy of Family Physicians or American College of Physicians, in patients with low pretest probability, a normal high sensitivity D-dimer is sufficient to rule out VTE.<sup>5</sup> Patients with intermediate to high pretest probability of DVT or PE, a duplex ultrasound is appropriate. Patients with intermediate to high pretest probability of PE should also undergo diagnostic pulmonary

imaging (multidetector helical computed tomography, ventilation-perfusion scan, and invasive pulmonary angiography). Laboratory testing may also include coagulation studies (activated partial thromboplastin time and international normalized ratio) as part of the hypercoagulability workup.

## Treatment of DVT or PE, Indications

The mainstay of management of DVT or PE remains anticoagulation. Additional treatment options include elastic compression stockings, ambulation, IVC filtration, pharmacologic thrombolysis, and endovascular and surgical thrombolysis or thrombectomy in order to reduce clot burden. These advanced therapies may reduce the severity and duration of symptoms, prevent PE, diminish the risk of recurrence, and prevent post thrombotic syndrome.

The indications for placement of an IVC filter are actually rather narrow. In patients for whom anticoagulation is contraindicated (**Fig. 1**) or who fail treatment with anticoagulation alone (recurrent thromboembolism while on anticoagulation), guidelines from multiple societies including the American College of Chest Physicians (ACCP), American Heart Association(AHA), the Society of Interventional Radiology (SIR), and the United Kingdom National Institute for Health and Clinical Excellence (NICE), suggest the use of inferior vena cava (IVC) filters.<sup>5-7</sup> These societies also support use of filters in patients with proven VTE who suffer complications of anticoagulation and therefore must be taken off anticoagulation.

Several factors have led to increased use of IVC filters. In fact, an estimated 50% of all IVC filters are placed outside of Food and Drug Association (FDA) indications.<sup>8</sup> The “extended” and controversial indications for IVC filtration,

Download English Version:

<https://daneshyari.com/en/article/5728378>

Download Persian Version:

<https://daneshyari.com/article/5728378>

[Daneshyari.com](https://daneshyari.com)