

Inferior Vena Cava Filters

Types, Indications, and Removal

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KEYWORDS

- IVC filter • Inferior vena cava filter • Pulmonary embolism
- Venous thromboembolism • Retrievable IVC filter • Permanent IVC filter

HOSPITAL MEDICINE CLINICS CHECKLIST

1. Inferior vena cava (IVC) filters are used to prevent acute pulmonary embolism (PE), a common and preventable entity with significant clinical consequences.
2. IVC filter placement is generally considered a second-line intervention to anti-coagulant therapy, whether in the acute setting of a venous thromboembolism or as primary prophylaxis in surgical or trauma patients.
3. Although placing an IVC filter may decrease the incidence of PE in patients with proximal lower extremity deep vein thrombosis (DVT) compared with anticoagulation alone, doing so does not offer any long-term mortality benefit, and may increase the risk of developing a new or recurrent DVT within 2 years.
4. The development of retrievable IVC filters has contributed to an increase in usage over the past 10 to 20 years, although actual retrieval rates remain low.
5. Several types of permanent and retrievable filters are available for implantation in the United States. Filter choice is often dependent on market availability and physician preference.
6. Because the risk of PE is often time limited, retrieval after a certain period post-placement is believed to ameliorate the risks and complications associated with an indwelling vena cava filter. This period is not well defined, and patients are frequently lost to follow-up before retrieval can occur.

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DEFINITIONS

1. *What is an IVC filter and what is it used for?*

An inferior vena cava (IVC) filter is a device that is deployed into the IVC with the intention of disrupting the flow of embolic material from a distal venous site in the lower extremities to the central cardiopulmonary venous system. IVC filters are placed to prevent the acute onset of pulmonary embolism.

2. *What is the definition of a pulmonary embolism and how dangerous is it?*

Acute pulmonary embolism (PE) is a fairly common condition, which, if left untreated, is associated with a 30% mortality rate¹ and is 1 of the leading causes of preventable hospital deaths.² Any free-floating foreign material contained in the venous circulation may travel to the pulmonary vascular bed and become trapped in a vessel, impeding blood flow distally. The affected lung parenchyma becomes physiologic dead space (ventilated but not perfused), leading to hypoxemia. Although substances such as air or fat may cause a PE, thromboembolism arising from the proximal lower extremity deep veins or pelvis is by far the most common source of clinically significant PEs. Deep venous thrombosis (DVT) and PE are often collectively referenced under the umbrella term venous thromboembolism (VTE).

EPIDEMIOLOGY

1. *How frequently are IVC filters used?*

The number of IVC filters placed per year in the United States increased nearly 25-fold between 1979 and 1999, from 2000 to 49,000.³ The trend has continued with approximately 167,000 filters placed in the United States in 2007, and annual use is expected to top 259,000 in 2012.⁴ This increase is attributable to advancing technology with the development of optional filters⁵ and improved ease of placement,⁶ as well as the broadening of indications to include VTE prophylaxis in surgical patients.⁷

2. *How effective are IVC filters at preventing PE?*

Compared with anticoagulation alone, permanent IVC filters have been found to provide additional protection against symptomatic and asymptomatic PE for up to 8 years after placement. However, this benefit is countermanded by an increased risk of recurrent DVT among patients with filters; having an IVC filter offers no improvement in mortality.⁸ VTE recurrence is not well studied in patients with filters who are not receiving anticoagulation.

IVC filters have also been used increasingly as primary prevention against PE among surgical patients. The incidence of PE is significantly reduced in comparison with controls, as demonstrated in several studies of trauma patients, but it is notable that none of these are class I studies. Prophylactic vena cava filters are believed to provide good protection against fatal PE, and they are associated with a low incidence for adverse outcomes.⁹

CLINICAL GUIDELINES

Evidence-based guidelines have been developed by the American College of Chest Physicians (ACCP),¹⁰ the Society of Interventional Radiology (SIR),¹¹ and the Eastern

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