Safety of Inferior Vena Cava Filter Retrieval in Anticoagulated Patients*

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Purpose: **To evaluate the safety of inferior vena cava (IVC) filter retrieval in therapeutically anticoagulated patients in comparison to prophylactically or not therapeutically anticoagulated patients with respect to retrieval-related hemorrhagic complications.**

Materials and methods: **This was a retrospective study of 115 consecutive attempted IVC filter retrievals in 110 patients. Filter retrievals were stratified as performed in patients who were therapeutically anticoagulated (group 1), prophylactically anticoagulated (group 2), or not therapeutically anticoagulated (group 3). The collected data included anticoagulant and antiplatelet medications (type, form and duration of administration, dosage) at the time of retrieval. Phone interviews and chart review was performed for the international normalized ratio (INR), activated partial thromboplastin time, platelet count, infusion of blood products, and retrieval-related hemorrhagic complications.**

Results: **Group 1 included 65 attempted filter retrievals in 61 therapeutically anticoagulated patients by measured INR or dosing when receiving low-molecular-weight heparin (LMWH). Four retrievals were not successful. In patients receiving oral anticoagulation, the median INR was 2.35 (range, 2 to 8). Group 2 comprised 23 successful filter retrievals in 22 patients receiving a prophylactic dose of LMWH. Group 3 included 27 attempted filter retrievals in 27 patients not receiving therapeutic anticoagulation. Six retrievals were not successful. Five patients were receiving oral anticoagulation with a subtherapeutic INR (median, 1.49; range, 1.16 to 1.69). No anticoagulation medication was administered in 22 patients. In none of the groups were hemorrhagic complications related to the retrieval procedures identified.**

Conclusions: **These results suggest that retrieval of vena cava filters in anticoagulated patients is safe. Interruption or reversal of anticoagulation for the retrieval of vena cava filters is not indicated.**

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Key words: pulmonary embolism; vena cava filters; venous thrombosis

Abbreviations: aPTT = activated partial thromboplastin time; DVT = deep venous thrombosis; FFP = fresh-frozen plasma; INR = international normalized ratio; IVC = inferior vena cava; LMWH = low-molecular-weight heparin; PE = pulmonary embolism; VTE = established venous thromboembolism

The optimal therapy for patients with established venous thromboembolism (VTE) is anticoagulation.[1] When anticoagulation is contraindicated or ineffective, inferior vena cava (IVC) filter placement is an accepted measure to reduce the risk of pulmonary embolism (PE).[2] Although data are limited, IVC filters are believed to have certain long-term risks

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such as IVC occlusion and recurrent deep venous thrombosis (DVT).[3–5] In some patients with VTE, the period of time during which a filter is necessary for protection against PE is limited.[6–8] In these patients, anticoagulant therapy should be resumed as soon as the risk of a complication from anticoagulation has abated because the filter has no impact on the treatment of existing PE or DVT.[1]

Optional IVC filters can be used as permanent devices but also allow percutaneous removal. In patients with documented VTE, the current recommendations are that filter removal should not occur until the patient is adequately treated with anticoagulant medication, based on expert consensus but no data, and the risk of PE is acceptably low.[8] Achievement of therapeutic anticoagulation, especially with warfarin, can take several weeks in some patients.[1] Interruption of anticoagulation in these patients in order to retrieve a filter may introduce added cost and risk. Although published clinical studies[6,9–12] have shown that IVC filter retrieval is safe, the specific question of the safety of filter retrieval in therapeutically anticoagulated patients has not been previously addressed. The anticoagulant-associated risks of filter retrieval are primarily hemorrhage at the filter implantation site in the IVC and at the percutaneous venous access site.[11]

Expert consensus recommends that patients with VTE remain fully anticoagulated, but objective data have not been reported. Based on expert consensus, we hypothesized that IVC filter retrieval can be safely performed in therapeutically anticoagulated patients. The purpose of this retrospective study was to evaluate the safety of IVC filter retrieval in therapeutically anticoagulated patients in comparison to prophylactically or not therapeutically anticoagulated patients in terms of retrieval-related immediate or long-term hemorrhagic complications.

Materials and Methods

Study Population

This retrospective single institution study was approved by the Institutional Review Board and was performed according to the Health Insurance Portability and Accountability Act of 1996. One hundred fifteen consecutive attempted IVC filter retrievals in 110 consecutive patients (71 women, 39 men) between July 2001 and August 2006 were evaluated. The mean (± SD) patient age was 52 ± 16 years (range, 12 to 87 years).

Filter Placement

Informed consent was documented for all filter placements. Patients who were considered at short-term high risk for PE in whom a permanent IVC filter was not required received a retrievable vena cava filter. All patients with DVT had proven proximal DVT documented by an objective test such as duplex sonography, CT, contrast venography, or magnetic resonance venography. Similarly, all patients with PE had a positive objective test finding, including radionuclide ventilation/perfusion scans, pulmonary angiography, contrast-enhanced spiral CT, or gadolinium enhanced magnetic resonance angiography.

The indications for filter placement were recorded according to the recommended reporting standards (Table 1).[13,14] All filters were placed in an angiography suite by interventional radiologists using ultrasound-guided venous access to avoid inadvertent puncture of the carotid or femoral arteries. The filter choice was at the discretion of the interventional radiologist. A vena cavogram was obtained before and after filter placement with use of iodinated contrast material (iodixanol, 320 mgI/mL) [Visipaque; Amersham Health; Princeton, NJ].

Anticoagulation at the Time of Filter Retrieval

Three groups of patients were defined. Group 1 comprised therapeutically anticoagulated patients including those receiving warfarin with a therapeutic international normalized ratio (INR) ≥ 2, therapeutic doses of low-molecular-weight heparin (LMWH), and receiving a combination of warfarin and therapeutic LMWH. Group 2 included patients receiving prophylactic anticoagulation with LMWH. Group 3 included patients without anticoagulation and patients receiving warfarin with a subtherapeutic INR < 2.0.

Patient anticoagulation status at the time of attempted IVC filter retrieval was determined by recording hematologic coagulation parameters or dosing when receiving LMWH. Type, form, duration of administration, and dosage of anticoagulation medications were recorded. The results of hematologic studies (activated partial thromboplastin time [aPTT], INR, and platelet count) obtained within 24 h prior to IVC filter retrieval were collected. An aPTT between 70 s and 110 s was considered therapeutic. A platelet count of $< 50 \times 10^9$/L was defined as low.

Patients receiving subcutaneous LMWH were treated according to a standardized institutional dosing protocol. In VTE patients with normal renal function, the therapeutic dose was 1 mg/kg per dose per 12 h, or 1.5 mg/kg per dose per 24 h. In patients without VTE, the prophylactic dose was 0.5 mg/kg per dose per 24 h. For the purposes of this study, patients receiving LMWH were considered anticoagulated after a minimum of 5 days of treatment. The standard of care in the hospital was not to monitor anticoagulation with plasma tests in patients treated solely with LMWH.

In patients with VTE, warfarin was started as soon as possible with a therapeutic target INR ≥ 2.0. Warfarin was usually

Table 1—*Indications for 115 IVC Filter Placements*

Indications	% (No./Total)
Established VTE requiring interruption of anticoagulation for surgery	42.6 (49/115)
Established VTE with other contraindication to anticoagulation	22.6 (26/115)
Prophylaxis after trauma (no VTE)	21.7 (25/115)
Prophylaxis in high-risk patients undergoing surgery (no VTE)	10.4 (12/115)
Acute VTE with initial inability to achieve anticoagulation	0.9 (1/115)
Recurrent VTE during early anticoagulation	0.9 (1/115)
Patient with VTE initially refusing anticoagulation treatment	0.9 (1/115)