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Survival Effects of Inferior Vena Cava Filter in Patients With Acute Symptomatic Venous Thromboembolism and a Significant Bleeding Risk

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Objectives The purpose of this study was to investigate the survival effects of inferior vena cava filters in patients with venous thromboembolism (VTE) who had a significant bleeding risk.

Background The effectiveness of inferior vena cava filter use among patients with acute symptomatic VTE and known significant bleeding risk remains unclear.

Methods In this prospective cohort study of patients with acute VTE identified from the RIETE (Computerized Registry of Patients With Venous Thromboembolism), we assessed the association between inferior vena cava filter insertion for known significant bleeding risk and the outcomes of all-cause mortality, pulmonary embolism (PE)-related mortality, and VTE rates through 30 days after the initiation of VTE treatment. Propensity score matching was used to adjust for the likelihood of receiving a filter.

Results Of the 40,142 eligible patients who had acute symptomatic VTE, 371 underwent filter placement because of known significant bleeding risk. A total of 344 patients treated with a filter were matched with 344 patients treated without a filter. Propensity score–matched pairs showed a nonsignificant trend toward lower risk of all-cause death for filter insertion compared with no insertion (6.6% vs. 10.2%; $p = 0.12$). The risk-adjusted PE-related mortality rate was lower for filter insertion than no insertion (1.7% vs. 4.9%; $p = 0.03$). Risk-adjusted recurrent VTE rates were higher for filter insertion than for no insertion (6.1% vs. 0.6%; $p < 0.001$).

Conclusions In patients presenting with VTE and with a significant bleeding risk, inferior vena cava filter insertion compared with anticoagulant therapy was associated with a lower risk of PE-related death and a higher risk of recurrent VTE. However, study design limitations do not imply a causal relationship between filter insertion and outcome. (J Am Coll Cardiol 2014;63:1675–83) © 2014 by the American College of Cardiology Foundation

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Abbreviations and Acronyms

AD = absolute difference
AUC = area under the curve
CI = confidence interval
CT = computed tomography
DVT = deep vein thrombosis
Hb = hemoglobin
IVC = inferior vena cava
LMWH = low-molecular-weight heparin
PE = pulmonary embolism
UFH = unfractionated heparin
VTE = venous thromboembolism

Despite the advances in the diagnosis and management of venous thromboembolism (VTE), deep vein thrombosis (DVT) and pulmonary embolism (PE) remain major causes of morbidity and mortality (1). Conventional treatment for VTE consists of the use of parenteral agents (i.e., unfractionated heparin [UFH], low-molecular-weight heparin [LMWH], fondaparinux) as a "bridge" for oral anticoagulation therapy (2). Guidelines do not recommend insertion of a filter in the inferior vena cava (IVC) as the primary treatment of VTE. A large population-based retrospective analysis, which assessed for recurrent VTE in patients treated with an IVC filter for acute VTE, found that the use of a filter was associated with a higher incidence of rehospitalization for venous thrombosis among patients who initially manifested PE (3). Stein et al. (4) showed that the all-cause in-hospital case fatality rate was lower among patients with unstable PE who received thrombolytic therapy and had a vena cava filter. In the only clinical trial that evaluated the efficacy of vena cava filters (in addition to standard anticoagulant therapy), this treatment reduced the risk of PE but increased that of DVT and had no effect on survival (5). An 8-year follow-up of the patients enrolled in the PREPIC (Prevention of Recurrent Pulmonary Embolism by Vena Cava Interruption) trial showed similar results (6).

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In the absence of randomized clinical trials that demonstrate a mortality benefit of IVC filter treatment of VTE, the American College of Chest Physicians guidelines mainly limit their recommendation for IVC filter insertion to patients with acute symptomatic VTE and a contraindication to anticoagulation (grade 1B) (2). Unfortunately, studies have not clearly determined which patients with VTE would benefit from vena cava filter therapy.

Given the lack of data supporting a survival benefit of IVC filter therapy in patients with acute VTE, we conducted the present study using data collected for an international multicenter (Online Appendix) (7,8). The study assessed the association between the insertion of an IVC filter and mortality and other outcomes during the first month after treatment for acute symptomatic VTE in patients who had known significant bleeding risk.

Methods

Study design. This retrospective study used prospectively collected data from patients enrolled in the RIETE (Computerized Registry of Patients With Venous Thromboembolism) (Online Appendix) (7,8). All patients provided written or oral informed consent for participation in the registry in accordance with local ethics committee requirements.

Study cohort and definition of treatment groups. At each participating site, RIETE investigators aimed to enroll consecutive patients who had acute symptomatic or asymptomatic VTE confirmed by using objective testing that consisted of: high-probability ventilation/perfusion scintigraphy (9); positive contrast-enhanced PE protocol; helical chest computed tomography (CT) (single or multidetector CT) for PE (10); or lower limb venous compression ultrasonography positive for proximal DVT (11). This study excluded those who had asymptomatic VTE. Of the patients treated with an IVC filter, this study only included those patients who had an IVC filter inserted during the first 30 days after VTE diagnosis because of known significant bleeding risk (i.e., absolute or relative contraindication to anticoagulation therapy) as determined by the local investigator (i.e., not independently adjudicated).

Treated patients were defined as those who received an IVC filter (with or without concomitant anticoagulation) because of known significant bleeding risk. Control patients were defined as those with distributions of observed baselines covariates (i.e., similar baseline risk of bleeding) comparable to treated patients (see the Statistical analysis section) who did not receive a filter but underwent anticoagulant therapy.

Baseline variables. Patients enrolled in the RIETE registry had data collected from around the time of VTE diagnosis that included but was not limited to: age; sex; weight; presence of coexisting conditions such as chronic heart or lung disease; recent (<30 days before VTE) major bleeding; presence of risk factors for PE, including active cancer (defined as newly-diagnosed cancer or cancer being treated [i.e., surgery, chemotherapy, radiotherapy, hormonal or support therapy]); recent immobility (defined as nonsurgical patients assigned to bed rest with bathroom privileges for ≥4 days in the 2 months before VTE diagnosis); surgery (defined as those who had undergone major surgery in the 2 months before VTE); clinical signs and symptoms on admission, including heart rate and systolic blood pressure; and laboratory results at hospital admission that included hemoglobin (Hb), platelet count, and serum creatinine.

Study outcomes. This study used all-cause mortality through 30 days after initiation of anticoagulant treatment or filter insertion as the primary endpoint, and 30-day PE-related mortality, recurrent VTE, and major bleeding as secondary endpoints. The RIETE investigators assessed mortality presence, cause, and date by using medical record review and proxy interviews when necessary. Clinicians at RIETE-enrolling sites managed patients with suspected recurrences according to their local practice. Typically, the RIETE investigators defined recurrent DVT as a new noncompressible vein segment or an increase of the vein diameter by at least 4 mm compared with the last available