CLINICAL STUDY

Is a Venacavogram Necessary after Inferior Vena Cava Filter Retrieval?

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ABSTRACT

Purpose: To evaluate the utility of venacavography after optional inferior vena cava (IVC) filter retrieval using routine and complex techniques.

Materials and Methods: Patients (N = 224; 228 patient encounters) in whom venacavography was performed before and after IVC filter retrieval were reviewed from a 12-year period ending March 2014. Retrieval was considered complex if it required forceps or other adjuncts. Venacavograms were assessed for abnormalities including stenosis, filling defects, dissection, and extravasation of contrast material.

Results: Filling defects (n = 53; 23%) and stenosis (n = 137; 60%) were significantly more frequent after retrieval ($P < .05$), but they did not change patient management. The only major abnormality after retrieval was extravasation (n = 3), which occurred only in the complex group and was treated with balloon tamponade and observation. No dissection was observed. Dwell time was not correlated with the presence of abnormalities after retrieval ($r = 0.002$, $P = .977$).

Conclusions: The lack of abnormalities requiring treatment on venacavography after routine IVC filter retrieval may justify omitting venacavography after retrieval regardless of dwell time. Although uncommon, extravasation requiring treatment may be seen after complex retrieval; venacavography remains warranted in this setting.

ABBREVIATIONS

DSA = digital subtraction angiography, EMR = electronic medical record, IVC = inferior vena cava

Inferior vena cava (IVC) filtration is an established approach to prevent pulmonary embolism in patients who cannot receive systemic anticoagulation (1,2). The advent of optional filters has led to significantly increased use, but overall rates of retrieval have been low (1). Longer filter dwell times have been associated with complications such as filter tilt, tip embedding, IVC wall penetration, filter migration, and fracture, which can be seen on imaging before filter retrieval (3–10). Adjunctive techniques using endobronchial forceps, loop snares, and endovascular laser ablation have been developed to remove tilted and embedded filters that are not amenable to routine retrieval (11–15).

Imaging of the IVC traditionally has been performed before and after retrieval of IVC filters. Although venacavography before retrieval is generally accepted to be critically important (2), the value of venacavography after retrieval is less clear. Major complications that have been reported after retrieval include extravasation of contrast material, retroperitoneal hematoma, dissection, and caval stenosis, but their incidence varies in the literature (1,3–10). The purpose of this study was to determine the frequency of radiographic abnormalities of the IVC after routine and complex filter retrievals and determine the value of venacavography after retrieval.

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MATERIALS AND METHODS

This retrospective cohort study was compliant with the Health Insurance Portability and Accountability Act and approved by the local institutional review board. All patients who successfully underwent IVC filter retrieval and had venacavography performed after retrieval between April 2004 and March 2014 at the host institution were included (n = 245). Patients who did not have venacavography performed after retrieval (n = 71) were not considered for inclusion; venacavography was not performed in these patients because of a combination of clinician preference and a change in divisional practice; venacavography was not routinely performed after IVC filter retrieval at the host institution after June 2013. All of the complex retrievals were reported separately, but venacavography was not specifically studied in that report (16). Patients were excluded if their images were not available for review (n = 16), if their filter was removed immediately after suboptimal placement (ie, the filter dwell time was less than 1 day; n = 2), or if there was extensive caval thrombosis before retrieval (n = 4) (Fig 1). Patients who had more than one filter retrieved during the course of the study had each retrieval counted as a separate patient encounter (n = 4).

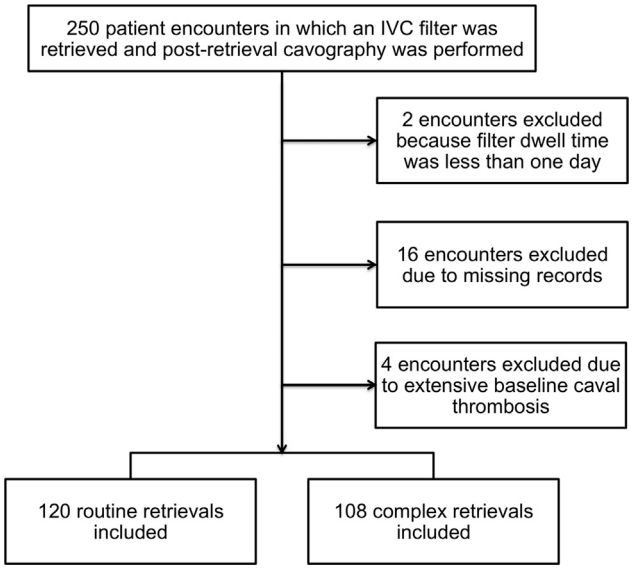

Figure 1. Flow chart showing patient selection.

Patient characteristics including sex, age, dwell time, filter type, and placement indication were obtained from the electronic medical record (EMR) and are shown in Table 1. History of prior retrieval attempt, retrieval approach, retrieval indication, retrieval device, filter position, fluoroscopy time, contrast type, contrast volume administered, and use of rotational venacavography were also obtained from the EMR. Although fluoroscopy time was available for nearly all patients, data regarding dose were unavailable during the study period because of a failure of transmission of these data to electronic archives. The indications for filter placement were categorized based on Society of Interventional Radiology (SIR) Quality Improvement Guidelines (17). Indications for most filters were venous thromboembolism despite anticoagulation (n = 107; 47%) and prophylaxis in the setting of high risk of thromboembolic disease and temporary contraindication to anticoagulation (n = 64; 28%). Filter types in the study are shown in Table 1 and included Recovery series (Recovery [n = 26], G2 [n = 85], G2X or Eclipse [n = 35], Meridian [n = 1], Denali [n = 4]; Bard Peripheral Vascular, Inc, Tempe, Arizona); Option (n = 9) (Argon Medical Devices, Plano, Texas), OPTEASE (n = 4) (Cordis Corp, Fremont, California), ALN (n = 1) (ALN International, Miami, Florida), Celect (n = 39) (Cook, Inc, Bloomington, Indiana), and Günther Tulip (n = 24) (Cook, Inc). When only the month of filter placement was noted in the medical record, the last day of the month was substituted for calculation of dwell time. Dwell time could not be determined for 15 patient

Table 1. Patient Characteristics

Characteristic	Routine	Complex	Significance
Sex, no. (%)			$P = .01$
Male	58 (48%)	34 (31%)	
Female	62 (52%)	74 (69%)	
Age (y), mean ± SD (range)	49 ± 16 (16–82)	45 ± 16 (18–79)	$P = .07$
Dwell time (d), mean ± SD (range)	214 ± 243 (3–2,178)	460 ± 611 (24–2,907)	$P < .001$
Filter type, no. (%)			$P < .001$
Günther Tulip	8 (7%)	16 (15%)	
Recovery series	99 (82%)	52 (48%)	
Celect	8 (7%)	31 (29%)	
Other (Option, OptEase, or ALN)	5 (4%)	9 (8%)	
Placement indication, no. (%)			$P = .93$
Therapeutic	86 (72%)	78 (72%)	
Prophylactic	34 (28%)	30 (28%)	

Note–See text for details regarding filter types.