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Complications Related to Inferior Vena Cava Filters: A Single-Center Experience

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We reviewed our experience with the different types of inferior vena cava (IVC) filters used over 4 years for the incidence of complications and correlated this with the type of filter used. This is a retrospective study involving chart reviews of all the patients who received IVC filters placed between January 2002 and January 2006. Data related to indications for filter insertion and the incidence of early (30 days) and late complications related to the filter insertion were collected. Complications were correlated to the type of filter and the indication for insertion. Statistical analysis was done using Fisher's exact test, and $p<0.05$ was considered significant. During this period 400 filters were inserted. There were 199 males (49.7%) and 201 females (50.25%). The mean patient age was 61 years (range 17–86). Filters used included TrapEase in 224 (56%), Greenfield filter in 95 (23.8%), Gunther-Tulip in 42 (10.5%), Bard recovery nitinol (all first-generation) in 34 (8.5%), and Simon Nitinol filter in five (1.2%). The indications for IVC filter insertion included acute venous thromboembolism (VTE) event in 273 patients (68.25%) and pulmonary embolism (PE) prophylaxis in 127 (31.75%) patients. In the group with VTE, 59 (21.6%) had contraindication for anticoagulation and 34 (12.5%) had hypercoagulable/malignant conditions. In the 127 patients who received the filter for PE prophylaxis in the absence of VTE, 107 (84.3%) had fractures, 43 (33.9%) had head injury, 32 (25.2%) had multiple trauma, and 15 (11.8%) had paralysis. Sixteen (12.6%) of the prophylaxis patients had IVC filter insertion prior to an elective surgical procedure. Complications in the form of hematoma at the site of filter insertion occurred in four (1%) patients, ipsilateral limb deep vein thrombosis in 15 (3.8%) patients, migration/tilt of filter in six (1.5%) patients, PE in six (1.5%) patients, and IVC thrombosis in 19 (4.75%) patients. Migration/tilt was higher in Bard filters compared to other filters, individually ($p<0.004$) and as a group (11.8% vs. 0.55%, $p<0.0005$). All other complication had a comparable incidence in all filters. However, in the group of patients ($n=34$) who had hypercoagulable/malignant conditions, the incidence of IVC thrombosis was higher with TrapEase filters compared to all other filters as a group (25% vs. 0%, $p<0.05$). In conclusion, IVC filters are frequently used for prophylaxis in the absence of VTE conditions. Complications are relatively low. All types of filters used in this study had comparable complications with the exception of the Bard filter, which had a higher incidence of tilt, and the TrapEase filter, which had a higher incidence of IVC thrombosis, in patients with hypercoagulable/malignant conditions.

INTRODUCTION

Traditionally, the indications for inferior vena cava (IVC) filter placements included patients with venous thromboembolism (VTE) who had contraindications to anticoagulation, those with recurrent pulmonary embolism (PE) while adequately anticoagulated, those who develop complications for anticoagulation, and, for some authors, those with large free-floating iliofemoral venous thrombi.[1-3] More recently, these indications were expanded to include patients at risk of developing VTE who cannot be prophylactically anticoagulated, patients with a low pulmonary reserve in whom PE otherwise tolerated by healthier individuals would prove fatal, and patients requiring venous thrombectomy.[4,5] The role of IVC filters in the prevention of PE in hospitalized patients with multiple trauma is

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controversial in spite of the high incidence of lower extremity deep vein thrombosis (DVT, up to 58%).[6] In such patients significant PE can be prevented by the insertion of IVC filters.

Various filters with different designs are now available for clinical use, presumably each having its advantages over the others. In this study we analyzed our experience with IVC filters during a 4-year period with a focus on complications and the elucidation of differences in complication rates among the different filter types.

MATERIALS AND METHODS

This study presents a retrospective review of data collected from charts, follow-up outpatient clinic visits, and X-ray reports of all patients who received IVC filters between January 2002 and January 2006. The recorded data include the patient's age, gender, indication for filter insertion, type of filter inserted, and any immediate or delayed complications resulting from the filter placement. The locations of the procedure for filter insertion were noted.

Computerized tomographic (CT) scans of the abdomen and pelvis were obtained in patients showing extension of venous thrombi above the common femoral veins, patients presenting with bilateral DVT involving the common femoral veins, patients with unexplained swelling of one or both lower extremities who did not show distal DVT or any other pathology to account for the swelling, patients with unexplained backache in the presence of an IVC filter, and trauma patients who were followed up with a CT scan for other reasons related to their hospital course. The CT scans were evaluated for IVC thrombosis or the presence of clots entrapped within the filter and for IVC filter penetration, tilt, fracture, and migration.

Data were collected and recorded on a spreadsheet. They were arranged according to the type of filter inserted, the indication for insertion, and any complications that followed the insertion. The complications included IVC thrombosis, ipsilateral DVT, PE, and migration and tilting of the filters. Comparison of the data was done using Fisher's exact test for discrete data. $p \leq 0.05$ was considered significant. The VassarStats Web site was used for statistical computation (http://faculty.vassar.edu/lowry/vassarStats.html.

RESULTS

A total of 400 IVC filters were inserted in 199 (49.75%) male and 201 (50.25%) female patients between January 2002 and January 2006. The mean age was 61 years (range 17–98). Past history of DVT was present in 27 (9.3%) and of PE in 13 (3%) patients. Filters were inserted via the femoral approach in 388 (97%) cases and via the internal jugular approach in 12 (3%) cases, with a technical success rate of 100%. The procedure was done in the angiography suite in 318 (79.5%) cases, and 72 (18%) were performed in the intensive care unit at the bedside under fluoroscopy and contrast except for one case done under ultrasound guidance. The remaining 10 cases (2.5%) were performed in the operating room in association with other procedures.

Table I. Indications for IVC filter insertions

Indication	*n*	%
VTE	273	
68.25%		
DVT	197	
PE	31	
DVT/PE	45	
Prophylaxis[a]	127	
31.75%		
Paralysis	15	
Head injury	43	
Multitrauma	32	
Surgery	16	
Fractures	107	
Total	400	100%

[a]Patient can belong to more than one category.

The indications for filter insertion are summarized in Table I. IVC filters were inserted in 273 (69%) patients with a diagnosis of VTE. Out of these, 197 (72.2%) had DVT only, 31 (11.3%) had PE only, and 45 (16.5%) had both DVT and PE at the time of filter insertion. Thirty-four (12.5%) of the patients had a diagnosis of hypercoagulability secondary to hypercoagulable conditions or malignancy contributing to the indication for filter insertion. Of all patients with VTE, 59 (21.6%) had a contraindication for anticoagulation as the reason for filter insertion. In 127 (31%) cases the filter was inserted prophylactically in trauma patients or prior to surgery for other conditions. The most frequent injuries encountered were fractures in 107 (84.3%), head injury in 43 (33.9%), multiple trauma in 32 (25.2%), and paralysis in 15 (11.8%). Some patients might have had more than one of the previously mentioned conditions.

The TrapEase filter (Cordis Endovascular, Miami Lakes, FL) was used in 224 (56%) patients, the Greenfield filter (GFF; Boston Scientific/Meditech, Natick, MA) in 95 (23.8%) patients, the R-Tulip

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