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Inferior Vena Cava Filters: Two Years Experience in King Abdulaziz University Hospital

Husain H. Jabbad, FRCSC
Division of Cardiac Surgery, Department of Surgery,
Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
hjabbad@gmail.com

Abstract. Pulmonary embolism remains a serious challenge for health care. Anticoagulation is considered the first line of treatment; however, in patients with anticoagulation failure or contraindication, inferior vena cava filter placement has been widely performed for the prevention of pulmonary embolism. This study is a retrospective review of King Abdulaziz University Hospital two years experience (2008-2009). Nineteen patients who had venous thromboembolic manifestations were subjected to inferior vena cava filter insertion. The main reasons for inferior vena cava filter insertion were the occurrence of venous thromboembolism on top of anticoagulants, and bleeding resulted from heparin induced thrombocytopenia. All of the patients were presented with one or more risk factors and co-morbidities among malignancies were the most common (52.6%). Insertion was successful for all cases, except one patient who had pre-existing massive inferior vena cava thrombosis. No complications were recorded during filter insertion or on the short term, after filter insertion. Medical indications for inferior vena cava filters in our hospital are not different from what was cited in the literature. Although, each individual patient had multiple risk factors and co-morbidities, nevertheless our patients had no complications related to inferior vena cava filter insertion, which denotes that inferior vena cava filters can be inserted properly and safely.

Keywords: Thromboembolism, Inferior vena cava filters.

Correspondence & reprint request to: Dr. Husain H. Jabbad
P.O. Box 80215, Jeddah 21589, Saudi Arabia
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Introduction

Venous thromboembolism (VTE) is common and often a fatal problem in postsurgical patients. These patients are usually treated with either therapeutic anticoagulation or the placement of inferior vena cava (IVC) filters[1]; which are an excellent therapeutic method for those patients of which anticoagulant therapy is contraindicate or ineffective[2].

Moreover, it had been advocated, that IVC filters can be placed in patients who cannot receive concomitant anticoagulation without placing them at a significantly higher risk of developing venous thromboembolism[3].

Thus, venous thromboembolism is the main indication for IVC filter insertion. In a study conducted in the USA, clinical data of 73 patients (46 men; age range, 22-89 years) who had IVC filter were implanted between August 2007 and June 2008 were reviewed. It was found that twenty-one (28.8%) presented with pulmonary embolism (PE), 15 (20.54%) with deep vein thrombosis (DVT), 12 (16.4%) with both, and the rest (34.26%) with other symptoms. Indications for filter placement were contraindication to anticoagulation (n = 38; 52%); prophylaxis/added protection (n = 22; 30%); failure of anticoagulation (n = 11; 15%), and complications of anticoagulation (n = 2; 3%). The filters were placed in the infra-renal (n = 71) or suprarenal (n = 2) IVC[4]. Almost similar findings were found in other studies[5,6].

Technological and practical pattern changes have led to an increase in filters inserted by vascular and trauma surgeons in the operating room, as well as in the intensive care units. Increased diagnosis of VTE disease and newer low profile delivery systems may also have contributed to the significant increase in filter placement. A shift of indications for placement from absolute toward relative indications and prophylaxis are evident over time and are across providers. These indicates the need for consensus development of an appropriate criteria[7]. Initially, it was done by open surgical procedure, but technological advancements have allowed filter placement to be done percutaneously. Bedside filter placement in the intensive care unit with ultra-sonographic imaging has been reported to be safe, effective, and reliable[8].

Deployment of the filter in the suprarenal position is advocated in certain clinical conditions, and some reports suggest a higher incidence

of renal complications in that position, especially among patients with malignancy. Therefore, it was ascertained that Suprarenal IVCF placement should be performed rarely, and then, only after careful evaluation of the underlying renal function, and most likely it should be avoided in patients with malignancy and known hypercoagulable state[10,11].

Other complications were reported in various settings which included; IVC occlusion by filter thrombus[12], penetration of the IVC[13], aortic lumen and vertebral body penetration[14]. Lumbar artery laceration with retroperitoneal hematoma[15], migration to the right ventricle resulting in ventricular tachycardia and elevated troponin[16]. Even rupture of the tricuspid valve[17], rupture of the free wall of the right ventricle[18], and cardiac tamponade[19], that might cause sudden death[20]. Also, migration to the pulmonary artery[21], fracture and embolization leading to cardiac tamponade had been documented[22]. Moreover, tilting of the filter was also reported[23].

The aim of this study is to present our data and compare it with the reported international data.

Patients and Methods

The study was designed with retrospective analysis of the data extracted from medical records of patients subjected to percutaneous insertion of IVC filters at King Abdulaziz University hospital over a period of 2 years (2008-2009), which included a total of 19 patients. This data includes demographic characteristics of the patients (age, gender and nationality), clinical data, VTE manifestations and IVF filter implantation (indication, approach, position, complications and postoperative anticoagulation therapy). In addition the follow up data and fate of the cases were also collected.

Descriptive statistical analysis was used in the form of frequencies and percentages. Owing to lack of normal distribution of the continuous variable for age, median and range were used to present it.

Results

Nineteen patients were subjected to IVC filter implantation during the study time period (2008-2009). Their median age accounted for 50 years with a range between 23-70 years, they included ten males (52.6%) and

nine females (47.4%); the Saudis constituted almost one quarter of cases (26.3%) and the rest were a mix of different nationalities.

As shown in Table 1, all patients had VTE manifestations, and the great majority of them (78.9%) had lower limb DVT, which are mainly (80%) proximal, and two thirds of them (66.7%) were experiencing it for the first time. VTE was found to be provoked in slightly more than one half of the cases (53.3%). In addition, there were three patients who had bilateral pulmonary embolism and one patient who had renal thrombi extending to IVC.

Table 1. Venous thromboembolic manifestations among the patients(n=19).

VTE Manifestations	No.	%
Lower limb deep venous thrombosis	15	78.9
Anatomically		
Left lower limb DVT	9	60.0
Right lower limb DVT	6	40.0
Site of the thrombi		
Proximal	12	80.0
Distal	3	20.0
Frequency		
First attack	10	66.7
Recurrent	5	33.3
Provoke		
Provoked	8	53.3
Unprovoked	7	47.7
Bilateral pulmonary embolism	3	15.9
Left renal tumor thrombus	1	5.2

Anticoagulation therapy was indicated for almost all the patients (18/19); however, there were medical reasons to discontinue its prescription; Fig. 1 displays the reasons for discontinuation. It shows that almost two-thirds (61.1%) of them had VTE manifestation, despite they were on anticoagulants, and the rest had heparin induced thrombocytopenia with severe hemorrhage. The bleeding was hematuria (3 cases) and upper GIT bleeding (2 cases). Therefore, IVC filter was indicated for all these patients.

Moreover, there was one patient who had renal cell cancer with invasion of the left renal vein extending into the IVC; the patient was not a candidate for major surgical intervention. Hence, IVC filter was recommended to protect the patient against migration detached cancer thrombi.

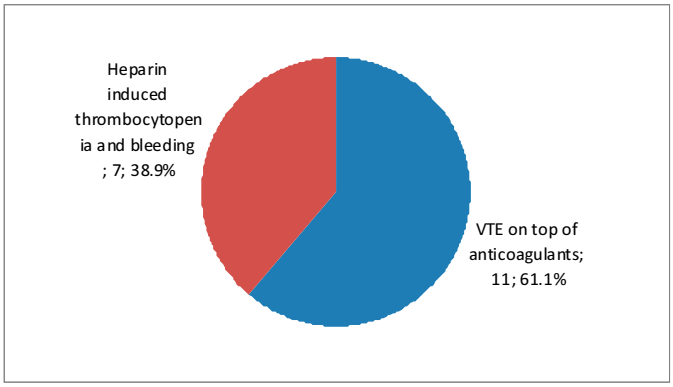

Fig. 1. Reasons for discontinuation of anticoagulation therapy.

All patients had more than one risk factor or co-morbidities associated with VTE manifestations. Table 2 demonstrates that malignancy was the most common risk factor followed by hypertension and immobilization.

Table 2. Risk factors and co-morbidities associated with venous thromboembolic manifestations.

Risk Factors	No.	%
Malignancy	10	52.6
Hypertension	9	47.7
Immobilization	8	42.1
Smoking	6	31.8
Diabetes mellitus	5	26.3
Obesity	4	21.1
Hyperlipidemia	2	10.5
Ischemic heart disease	2	10.5
Nephrotic syndrome	1	5.5
Bronchiectasis	1	5.5

Out of the nineteen patients, eighteen (49.7%) responded successfully to implantation of IVC filter; the application failed for only one patient who had advanced cancer pancreas with liver/lung metastasis and IVC thrombosis. Table 3 describes the approach and position of the inserted IVC filters. It shows that one-third (33.3%) of the IVC filters were inserted through the internal jugular vein and the rest were inserted through the femoral vein. Sixteen filters (88.8%) were inserted at infra-renal. One filter was inserted in the intra-hepatic portion of IVC as the patient had a renal cell carcinoma with invasion of the tumor thrombi through the left renal vein, and inserted into the intra-hepatic portion of

IVC. Another patient had amyloidosis with IVC thrombosis necessitated the insertion at the Proximal 1/3 of IVC.

Table 3. Approach and position of the inserted IVC filters (n=18).

Risk Factors	No.	%
Approach		
Right common femoral vein	9	50.0
Right internal jugular vein	6	33.3
Right femoral vein	2	11.1
Left femoral vein	1	5.6
Position		
Infra-renal	16	88.8
Supra-renal	2	11.2

There were no complications associated with the application of the IVC filters, or in the short term following the procedure. Six patients were lost to follow-up, four of them were non Saudis of which two had advanced cancer and probably died or went back to their countries. For those who were followed up, no complications directly related to the IVC filter were reported. Six patients died, mainly due to deterioration of their health as consequences of their primary diseases; it was found that four of them had cancer, and one case had multiple illnesses mainly nephritic syndrome and bronchiectasis; and the other one had subarachnoid hemorrhage with multiorgan failure and septic shock.

Anticoagulation therapy was continued after the IVC filter insertion in 9/18 (50%) patients. Out of them, six patients had Warfarin and three patients were given low molecular weight heparin.

Discussion

The use of IVC filters has increased dramatically over the last two decades[11]. Although, it had been reported that the filters stand as a crucial and fundamental measure for protection against pulmonary embolism among susceptible patients, especially when anticoagulation therapy either contraindicates, was not adequate to prevent recurrent VTE or when anticoagulation itself has lead to complications.

It was reported that IVC filter placement was associated with a high rate of serious complications (> 30%), with death occurring in 3.7% of patients[9], and that IVC thrombosis was a complication that occurs in 1-32% of patients inserted with IVC filters. The risk of complications

could be either during its insertion, *e.g*. penetration of the IVC)[13], penetration to the aortic lumen or vertebral body[14], or occlusion after insertion by filter thrombus[12], migration of the filter in a whole[15-21] or in part in the form an embolus of fractured part[22].

From the review of the published researches, it was evident that the practice of the IVC filter insertion in our hospital in terms of indications, approach and position was consistent with the accepted recommendations and standard of care. Where it was reported that the general indications for filter placement included history of thromboembolic disease and high risk for PE; specific indications included contraindication to anticoagulation, and the failure of anticoagulation[4,5,24]. The majority of the filters applied in our patients were placed at the infra-renal IVC, which accord with what was cited in Massachusetts General Hospital, USA[4].

Patients who had multiple risk factors and morbidities, almost one half of them had cancer, nevertheless, all inserted IVC filters were applied successfully, except in one patient who had massive IVC thrombosis which precluded progress of the filter to its place. Moreover, no complications during insertion were reported among our patients in contrast to what was reported in other studies[13,14]. Also, no short or long term complications related to the filters were reported in our study.

The med-term mortalities observed among our patients were attributed to the primary disorders and co-morbidities rather than the inserted filters. This notion was supported by the in depth analysis of the causes of death, where it was found that that four out of a total of six deaths had cancer, and one case had multiple illnesses, mainly nephritic syndrome and bronchiectasis; and the other patient who had subarachnoid hemorrhage with multi-organ failure and septic shock.

Conclusion

Medical indications for IVC filters in our hospital are not different from what was cited in the literature. Although each individual patient had multiple risk factors and co-morbidities nevertheless our patients had no complications related to IVC filter insertion, which denotes that IVC filters can be inserted properly and safely.

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زراعة/ إدراج مصافي الوريد الأجوف السفلي: دراسة نتائج عامين من الخبرة في مستشفى جامعة الملك عبد العزيز بجدة

حسين حمزة جباد

قسم الجراحة ، كلية الطب، جامعة الملك عبد العزيز

جدة - المملكة العربية السعودية

المستخلص. لا تزال الجلطة الدموية الوريدية التي تؤدى إلى انسداد تجلطي وريدى رئوي تمثل تحديا خطيراً للرعاية الصحية، ويعتبر منع تخثر الدم الخط الأول للعلاج، ولكن في المرضى الذين يعانون من فشل منع تخثر الدم، أو أصيبوا بمضاعفات، أو لديهم موانع لاستخدام تلك الأدوية، فإن مصافي الوريد الأجوف السفلي تكون هي البديل. تم جمع هذه الدراسة بأثر رجعي للبيانات من الملفات الطبية لمستشفى جامعة الملك عبدالعزيز خلال العامين (٢٠٠٨ – ٢٠٠٩م). شملت الدراسة تسعة عشر مريضًا أجري لهم إدراج مصافي الوريد الأجوف السفلي، وكانت الأسباب هي حدوث جلطة أدت إلى الانسداد الوريدي، وحدوث انسداد رئوي ناتج عن خثرات، بالرغم من استعمال جرعات مناسبة من مضادات التخثر، أو حدوث نزيف بعد استعمال عقار الهيبارين بسبب نقص الصفائح الدموية. كل المرضى كانوا يعانون من واحد أو أكثر من عوامل الخطر لحدوث الخثرات، ومنها الأورام الخبيثة التي كانت الأكثر شيوعا (٥٢,٦٪). تمت زراعة المصافي بنجاح لجميع الحالات باستثناء مريض واحد. ولم تسجل أية مضاعفات أثناء زراعة المصافي أو بعدها .

ونستخلص من ذلك أن دواعي إدراج مصافي الوريد الأجوف السفلي لدينا لا تختلف عن ما ورد في الأبحاث المنشورة، مرضانا لم تحدث لديهم مضاعفات تتعلق بإدراج المصافي، ويدل ذلك على أن هذه المصافي يمكن إدراجها بشكل صحيح وآمن.