



Revista Brasileira de Cirurgia
Cardiovascular/Brazilian Journal of
Cardiovascular Surgery

ISSN: 0102-7638

revista@sbccv.org.br

Sociedade Brasileira de Cirurgia
Cardiovascular

de Matos Soeiro, Alexandre; Fernandes, Felipe Lourenço; Plens Teixeira, Rafael; Gomez
Nicz, Pedro Felipe; Feres de Almeida Soeiro, Maria Carolina; Serrano Jr., Carlos V.;
Tavares de Oliveira Jr., Múcio

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Revista Brasileira de Cirurgia Cardiovascular/Brazilian Journal of Cardiovascular Surgery,
vol. 29, núm. 2, abril-junio, 2014, pp. 285-288
Sociedade Brasileira de Cirurgia Cardiovascular
São José do Rio Preto, Brasil

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Intracardiac embolization of inferior vena cava filter associated with right atrium perforation and cardiac tamponade

Embolização de filtro de veia cava associado à perfuração de átrio direito e tamponamento cardíaco

Alexandre de Matos Soeiro¹, MD; Felipe Lourenço Fernandes¹, MD; Rafael Plens Teixeira¹, MD, MsC, PhD; Pedro Felipe Gomez Nicz¹, MD, PhD; Maria Carolina Feres de Almeida Soeiro¹; Carlos V. Serrano Jr.¹, MD, PhD; Múcio Tavares de Oliveira Jr.¹, MD, PhD

DOI: 10.5935/1678-9741.20140060

RBCCV 44205-1552

Abstract

Insertion of inferior vena cava filters has been well established in literature, reducing occurrence of pulmonary embolism after an episode of deep venous thrombosis in patients with contraindication to anticoagulation. There are a small number of complications related to procedure and embolization is rare. In this context, we described a case of intracardiac embolization associated with cardiac tamponade.

Descriptors: Vena Cava Filters. Vena Cava, inferior. Cardiac Tamponade.

Resumo

A colocação percutânea de filtro de veia cava inferior é bem estabelecida em literatura, reduzindo a chance de ocorrência de tromboembolismo pulmonar após um episódio de trombose venosa profunda em pacientes com contraindicações à anticoagulação. O índice de complicações relacionadas ao procedimento é pequeno, sendo embolização evento extremamente raro. Nesse contexto, descrevemos um caso de embolização intracardíaca de filtro de veia cava inferior associada ao tamponamento cardíaco.

Descritores: Veia Cava Inferior. Tamponamento Cardíaco. Filtros de Veia Cava.

INTRODUCTION

The treatment of choice for prevention of pulmonary embolism (PE) secondary to deep vein thrombosis (DVT) is anticoagulation; however, some patients may have contraindications to it. Without treatment, the chance of developing PE after an episode of DVT is approximately 40%^[1]. Thus, for patients with contraindications to anticoagulation, there is the option of placing an Inferior Vena Cava Filter (ICVF) in an attempt to prevent PE^[2]. The idea of implementing a fil-

ter to prevent clots reaching the pulmonary arteries was first described in 1958 by Hunter and DeWeese^[3]. From this time until the present day, the models and placement techniques have evolved considerably, however the ICVF is not free of risks, and device-related complications can occur, e.g. in situ thrombosis (0-25%), occlusion of the ICVF (2-30%), recurrence of PE (0.5-6%), filter fracture (2-10%) and vena cava filter embolization (< 1%)^[4,5].

Embolization of the filter to the heart or pulmonary artery is an extremely rare complication that can lead to symptoms

¹Instituto do Coração do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (INCOR-HCFMUSP), São Paulo, SP, Brazil.

Work carried out at the Instituto do Coração do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (INCOR-HCFMUSP), São Paulo, SP, Brazil.

Correspondence address:

Alexandre de Matos Soeiro
Instituto do Coração do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo Unidade Clínica de Emergência
Av. Dr. Eneas de Carvalho Aguiar, 44 - Cerqueira César - São Paulo, SP, Brazil - Zip code: 05403-900
E-mail: alexandre.soeiro@bol.com.br

Article received on December 30th, 2013

Article accepted on March 24th, 2014

No financial support.

Abbreviations, acronyms & symbols

PE	Pulmonary embolism
DVT	Deep vein thrombosis
ICVF	Inferior vena cava filter

ranging from hypotension, syncope, dyspnea or even cardiac arrest as the first manifestation^[2,6]. The cause of embolization of the ICVF can vary greatly, and includes: placing the device in an unsuitable location, device failure and a vena cava with an enlarged diameter (>28 mm)^[6].

In case of intracardiac embolization, therapeutic options involve surgical or endovascular removal or even maintenance of the vena cava filter in the same place^[5], however the best treatment option is under discussion. Many authors suggested that the removal by open thoracotomy would be the best option^[2].

Below we report a case of embolization of a vena cava filter in a patient treated at the Heart Institute in Sao Paulo.

CASE REPORT

A 47-years-old male who had a history of epilepsy was admitted to our service due to dyspnea and chest pain, that was worse during inspiration. Forty-five days prior to this admission he had been submitted to a subdural hematoma surgical drainage secondary to a same height fall. Following the procedure the patient developed DVT. Since he had clinical contraindication to anticoagulation, insertion of an ICVF was performed.

At entrance physical examination he was prostrated, pale and disoriented. Had a heart rate of 114 bpm, blood pressure of 108/80mmHg, weak pulse and capillary refill of less than 3 seconds. Cardiac examination showed hypophonic and rhythmic heart sounds without murmurs. Pulmonary examination had diminished breath sounds at lung bases, a respiratory rate of 16 breaths per minute and an oxygen saturation of 94%. Extremities examination demonstrated an asymmetrical bilateral edema, that was larger in the left limb.

Electrocardiogram was normal. At initial laboratory studies he had hemoglobin of 9.7 g/dL, hematocrit of 31%, leukocytes 10.360/mm³, 351.000 platelets, CK-MB 1.12 ng/mL, troponin I 0.288 ng/ mL, urea 19mg/dL, creatinine 0.86 mg/dL, C-reactive protein (CRP) 272.22 mg/dL.

As the initial hypothesis was PE, the patient underwent CT angiography of the pulmonary arteries. Instead of showing signs of PE, CT showed an ICVF dislocation. It had moved to the right atrium. There was also right-sided pleural effusion and pericardial effusion (Figure 1).

Transthoracic echocardiogram showed signs of cardiac tamponade. In such way, emergent surgical pleural and pericardial drainage was performed.

After the procedure, CT and echocardiogram still showed moderate pericardial effusion, now with no signs of cardiac tamponade and a foreign body into the right atrium. In this moment the patient developed an early nosocomial infection thereby delaying the withdrawal of ICVF performed by open thoracotomy. During the procedure we observed that the ICVF had perforated the free wall of the right atrium (Figure 2).

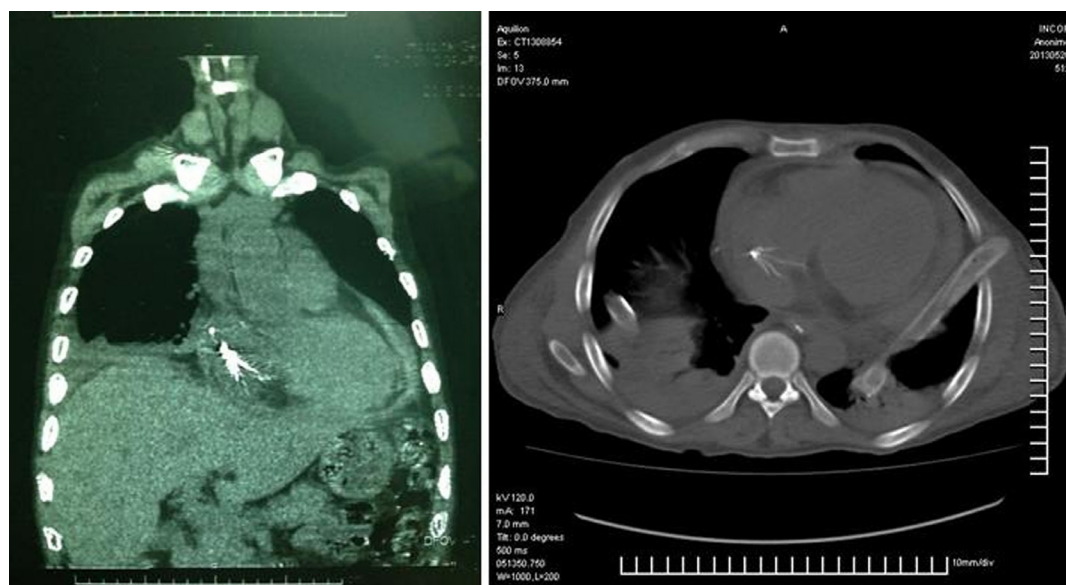


Fig. 1 - Tomography with the image of a vena cava filter located in transition of right atrium and right ventricle, before (A) and after (B) pericardial drainage

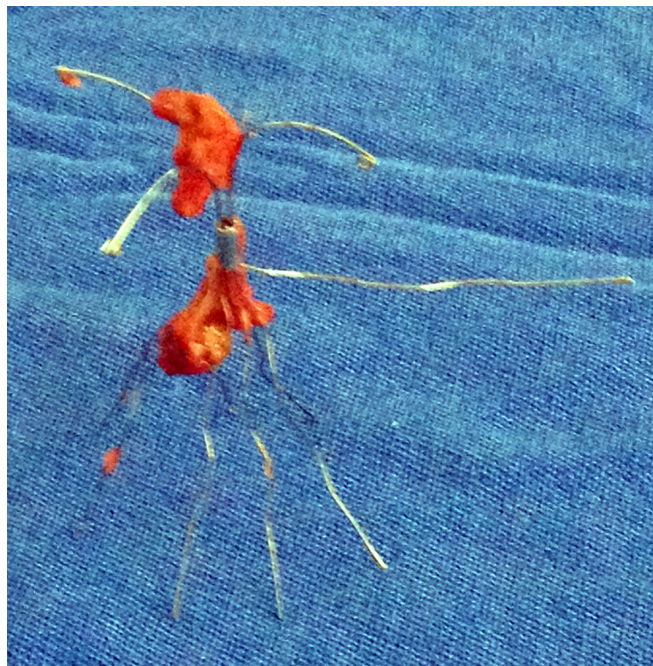


Fig. 2 - Inferior vena cava filter perforating the free wall of the right atrium

Postoperatively, the patient developed septic shock, resolved after 33 days of antibiotics (Meropenem, Colistimethate, Linezolid, Fluconazole and amikacin at different times). He was discharged in good general condition, without anticoagulation due to the poor patient compliance and because the risk factor for DVT and PE, that was immobilization, had been resolved. After two months, he presented a new episode of DVT in the left medial gastrocnemius vein, at this time the anticoagulation therapy with warfarin was introduced.

DISCUSSION

Embolization of the IVCF to the heart or pulmonary artery is an extremely rare complication that can lead to symptoms ranging from hypotension, syncope, dyspnea or even cardiac arrest as the first manifestation^[2,6]. The cause of embolization of the IVCF can vary greatly, and includes: placing the device in an unsuitable location, device failure and a vena cava with an enlarged diameter (>28 mm)^[4-14].

In a series published by Ferris et al.^[5], in which 324 patients had undergone to IVCF implantation, there were no cases of distal embolization. Similarly, another published case series with respect to 26 years of IVCF implants in 1731 patients at a center in the United States showed a complication rate of 0.3%, a rate of PE after the procedure of only 5.6% and no heart embolization.

The first description of cardiac tamponade associated

with IVCF embolization was performed by Lahey et al.^[13] in 1991. In this first published report, the authors associate the displacement of IVCF to its improper placement, with no evidence of fracture. As in our case, the patient had the IVCF removed by open surgery.

Differently to this first description and our case, the majority of reports in the literature with cardiac tamponade described the presence of fractured IVCF and intracardiac embolization of only parts of the filter^[7-10]. Chandra et al.^[8] reported there was no any well-defined correlation or factor associated with increased likelihood of intracardiac device embolization. Furthermore, the IVCF brands are variable and not necessarily associated with this complication^[8,14].

Nicholson et al.^[14] performed a single-center study in 2004, in which they published a series of 80 cases of patients who had IVCF placed. There were 5 cases of intracardiac embolization after filter fracture, and they were associated to two brands: BARD RECOVERY and BARD G2. Three of those patients had cardiac tamponade and one resulted in death. In all cases, the extraction was performed by open surgery^[14].

Regarding the observed time between the IVCF placement and embolization, the literature is also inconclusive. Hussain et al.^[11] described a case of embolization and cardiac tamponade after only four hours of filter implantation. However, the placement was performed in the subclavian vein, unlike our case. In another hand, most of the published series showed cases where embolization occurred months after the filter placement, usually associated with device fracture^[7-10].

The therapeutic options in cases of cardiac embolization involve surgical removal, endovascular treatment or even conservative approach^[3,7-14]. Many authors suggest that the withdrawal by open thoracotomy would be the best option^[1,7,8,10-14]. Controversially, Vergara et al.^[9] described a case of embolization associated with cardiac tamponade, in which the IVCF was removed percutaneously, suggesting that in selected patients, this is a plausible alternative to open surgery.

In our case, we opted for open surgical removal due to association with perforation and cardiac tamponade. However, the best treatment option is still uncertain due to the rarity of cases and it should be individualized^[1].

We could not find in Brazilian literature descriptions of cases of IVCF embolization associated with cardiac tamponade. This makes this case unique nationwide, inferring the clinician to consider this adverse outcome in the indication of the procedure and as a complication of its placement^[2,3].

CONCLUSION

Although embolization of the IVCF to the heart or pulmonary artery is an extremely rare complication (0.1-1.2%), clinicians should be aware of IVCF complications, in order to optimize the time-to-diagnosis and prevent further device-related complications^[7,8].

Authors' roles & responsibilities	
AMS	Analysis and interpretation of data; final approval of the manuscript; conception and design of the study; writing of the manuscript or revising it critically for its content
FLF	Analysis and interpretation of data; final approval of the manuscript; writing of the manuscript or revising it critically for its content
RPT	Final approval of the manuscript; writing of the manuscript or revising it critically for its content
PFGN	Final approval of the manuscript; conception and design of the study; writing of the manuscript or revising it critically for its content
MCFAS	Final approval of the manuscript; conception and design of the study; writing of the manuscript or revising it critically for its content
CVSJ	Final approval of the manuscript; conception and design of the study; writing of the manuscript or revising it critically for its content
MTOJ	Final approval of the manuscript; conception and design of the study; writing of the manuscript or revising it critically for its content

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