SCIENTIFIC LETTER

RARE COMPLICATION OF INFERIOR VENA CAVA FILTER IMPLANTATION

ABSTRACT

Inferior vena cava filters are a valid option in treating patients with deep vein thrombosis of the lower limbs with contraindication or failure of anticoagulation or in cases of recurrent pulmonary embolism under adequate levels of anticoagulation. It should be recognized that, like any procedure, the implantation of these devices is not without complications, and migration is a rare but potentially severe late complication. The authors present the case of migration of a vena cava filter into the right ventricle in a 54-year-old female patient with a history of arterial hypertension and previous hospitalization for bilateral infrapatellar DVT.

Keywords: *inferior vena cava filters, implantation, deep vein thrombosis, lower limbs, pulmonary embolism.*

Authors

Geraldo Meza, Tomás Hudson, Carla Sconda, María Alejandra Morales, Santiago Granja, Pablo Sabbatiello, Alberto Fregoni, Andrés Molina, Hernán Del Percio.

Cardiovascular Surgery Service, Sanatorio Güemes, Buenos Aires, Argentina.

Corresponding author:

Dr. Geraldo Meza

smeza@fsg.edu.ar

Received: 06/29/2023 ***Accepted: 07/19/2023*** ***https://doi.org/10.55200/raccv.v21.n3.0047***

INTRODUCTION

Inferior vena cava filters (IVCF) are a valid option in the treatment of patients with lower limb deep vein thrombosis (DVT) with contraindication or failure of anticoagulation or in cases of recurrent pulmonary embolism under adequate levels of anticoagulation[1]. Currently, this strategy is an alternative to long-term oral anticoagulation, and these devices may be increasingly implanted in patients without contraindications for anticoagulation, thus reducing the impact that these drugs can have on the quality of life of patients. However, it should be recognized that, like any procedure, the implantation of these devices is not free of complications, and migration is a rare but potentially severe late complication[1,2]. The authors present the migration of a vena cava filter into the right ventricle in an adult female patient.

CASE REPORT

A 54-year-old female patient with a history of arterial hypertension and previous hospitalization for bilateral infrapatellar DVT, in whom onco-gynecological pathology was suspected at first instance, with an indication for ICVF implantation for eventual surgical resolution of the underlying pathology. During hospitalization, the oncological cause was ruled out, so the patient was discharged with anticoagulation and scheduled outpatient removal of the device.

After six months, the patient went to the hospital for phlebography, visualizing that the inferior vena cava and right iliac vein were permeable, free of thrombi with evidence of the device, which seems to be adhered to the inferior aspect of the right ventricle (*Image 1*). Upon physical examination, the patient was hemodynamically stable without angina dyspnea or pump failure signs. At that time, it was decided to hospitalize the patient. A transesophageal echocardiogram was performed, which revealed a hyperechogenic image at the level of the right ventricular inflow tract, which compromised the opening and closing of the tricuspid valve, generating moderate to severe tricuspid insufficiency with mild dilatation of the right chambers and mild deterioration of right ventricular systolic function due to apical hypokinesia (*Image 2*).

After interdisciplinary evaluation and given the impossibility of percutaneous removal, it was decided to remove the device by surgery. A median sternotomy was performed with arterial cannulation at the level of the ascending aorta and venous cannulation to the superior and inferior vena cava. Extracorporeal circulation (ECC) was used after systemic heparinization. Right atriotomy with evidence of vena cava filter adhered to subvalvular plane and perforation of posterior leaflet of tricuspid valve; the device was then removed for bacteriological study and subsequent tricuspid valve repair with 5.0 polypropylene stitch, confirming correct valvular sufficiency with hydraulic test; the point of impact on the ventricular wall was reinforced using 4.0 polypropylene stitches reinforced with pledget. Subsequently, the right atrium was closed, and rigorous hemostasis control was performed; ECC was performed, with aortic clamping time of 14 minutes and a total of 22 minutes (*Image 3*). This patient had an intraoperative requirement of 3 units of red blood cells and low doses of noradrenaline. After surgery, the patient underwent the postoperative period in the cardiovascular recovery unit with ventilatory weaning in the first 6 hours after the procedure and the start of motor and respiratory kinesic assistance 24 hours after removing the drains. During hospitalization, negative cultures were confirmed; the echocardiogram showed good tricuspid valve function, and one week after surgery, it was decided, due to promising clinical evolution, to discharge the patient with oral anticoagulation for six months, as indicated by the Department of Hematology. The patient is under annual follow-up by the specialty, well controlled and without over-aggregated complications.

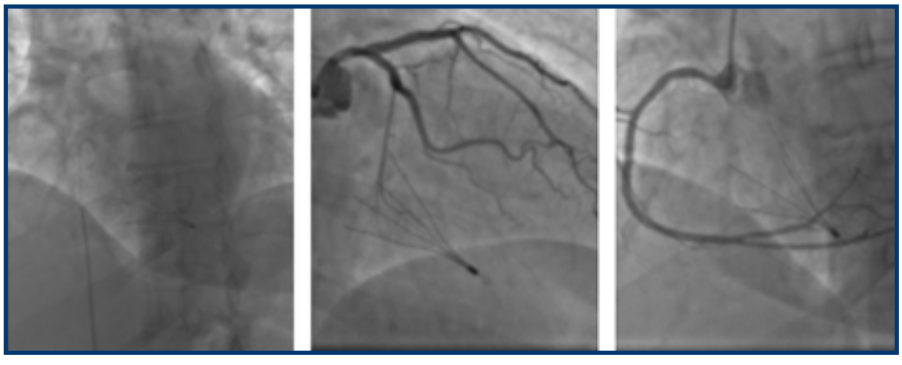

IMAGE 1. Phlebography showing free inferior vena cava without thrombosis with the device inside the right ventricle.

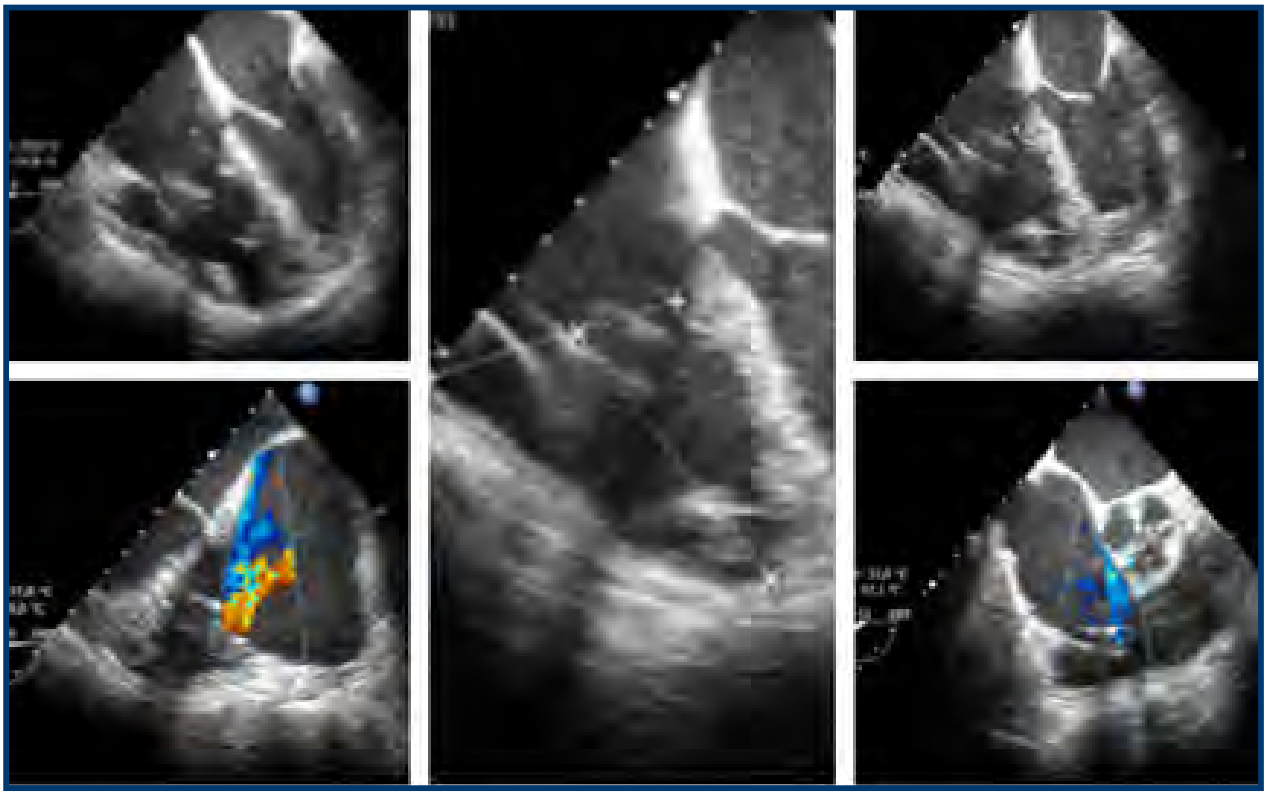

IMAGE 2. Transesophageal echocardiogram showing hyperechogenic image at the level of the tricuspid valvular plane, which generates moderate-severe insufficiency.

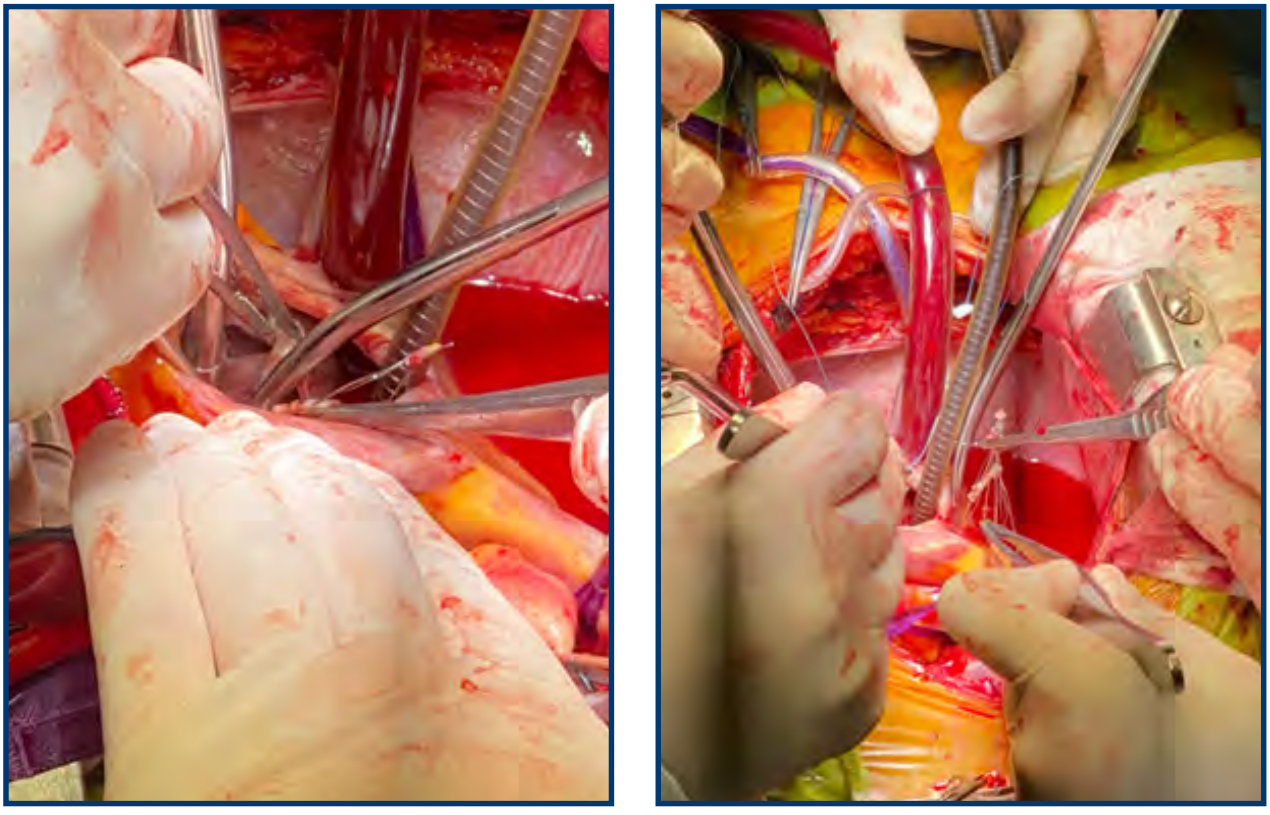

IMAGE 3. Right, atriotomy with evidence of vena cava filter adhered to the subvalvular plane and perforation of the posterior leaflet of the tricuspid valve (left side); removal of the device sent for bacteriological study (right side).

DISCUSSION

Complications that may arise during or after inferior vena cava filter implantation fall into two categories: early-onset and late-onset[1]. Early complications include bleeding, infection, malpositioning, incomplete deployment, or embolism of the filter or its components[1]. On the other hand, late complications include thrombosis of the inferior vena cava or any of its branches, perforation of the venous wall, filter fracture, retrograde embolization of filter fragments, and filter migration[1].

IVCF migration is defined as cephalic or caudal displacement greater than 1 cm from the original position of the device. Although this complication is rare, it can be potentially serious. Most registries are single case studies with very few data that, unfortunately, do not allow us to determine the factors responsible for their etiopathogenesis[1]. Migrations of the filter or device fragments into the right atrium, pulmonary artery, right gonadal vein, lumbar veins, and even into the aorta have been reported[2].

In a comprehensive review of the medical literature, Owens et al. described 98 cases of intracardiac filters, of which almost half were located at the level of the right atrium. The other locations, such as the tricuspid valvular plane, the right ventricle, and the pulmonary vascular tree, accounted for the other half1.

The mechanism of device migration has yet to be well understood and is often multifactorial[1,3]. The placement of an inadequately sized filter or the lack of device opening are causes that can generate early migration[3]. On the other hand, filter obstruction by thrombus with the consequent "sail phenomenon" is a cause associated with late migration.

In terms of diagnosis, this complication is usually an unexpected radiological finding with a wide range of symptoms that can simulate pathologies such as MI, pericarditis, or arrhythmias. Transesophageal echocardiography (TEE) is a valuable tool for detecting vena cava filter migration[3]. In our case, TEE not only provided us with essential data (such as the location of the device and its relationship with intracardiac structures) but also allowed us to establish the degree of valve compromise and prepare for different intraoperative scenarios.

All studies agree that the treatment of IVCF migration is its immediate removal through surgery or image-guided percutaneous removal whenever possible and safely. Although information on the migration and removal of these devices is currently minimal, the procedure of choice, it is clear, should be chosen on the basis of the patient's characteristics, the operator's experience, and the location of the filter[3]. Percutaneous removal has a high success rate and a low complication rate, provided it is performed in experienced centers with a multidisciplinary team[4-6]. Surgical removal is a less frequent and more invasive option, which is reserved for cases in which percutaneous removal is not feasible or has failed. In our case, the decision to remove the device by conventional surgery was based on the good health status of the patient, the intracardiac location of the device that could not be removed percutaneously, and the degree of valvular compromise defined in the TEE.

CONCLUSIONS

IVCF migration is an uncommon and little-studied pathological entity. The repercussions of device migration are related to its location, and although this complication is not the most frequent, once diagnosed, the device should be removed whenever possible and safely. Finally, the choice of the approach route will depend on certain factors, such as the patient's general condition, the experience of the medical team, and the location of the vena cava filter.

Consent

Written informed consent was obtained from the patient to publish this case report.

Declarations

The authors declare no conflict of interest.

REFERENCES

1. Owens CA, Bui JT, Knuttinen MG, Gaba RC, Carrillo TC, Hoefling N, Layden-Almer JE. Intracardiac migration of inferior vena cava filters: review of published data. Chest. 2009 Sep;136(3):877-887. Doi: 10.1378/chest.09-0153. Epub 2009 Apr 6. PMID: 19349385.

2. Sánchez-Carpintero Abad M, García-Medina V, García-García A, et al. Migration of an inferior vena cava filter to the abdominal aorta: an infrequent but potentially serious complication [Migration of an inferior vena cava filter to the abdominal aorta: an infrequent but potentially serious complication]. Arch Bronchopneumol. 2014;50(11):517-518.

3. Maskin LP, Rodriguez PO, Attie S, Bonelli I, Grecco M, Valentini R. Pulmonary thromboembolism secondary to intrapulmonary inferior vena cava filter migration [Pulmonary thromboembolism secondary to intrapulmonary inferior vena cava filter migration]. Med Intensiva. 2012 Dec;36(9):660-1. Spanish. Doi: 10.1016/j.medin.2012.03.015. Epub 2012 May 17. PMID: 22608300.

4. Nguyen NT, Barshes NR, Bechara CF, Pisimisis GT. Natural history of an intra-aortic permanent inferior vena cava filter. J Vasc Surg. 2014 Sep;60(3):784. Doi: 10.1016/j.jvs.2013.12.029. PMID: 25154964.

5. Bochenek KM, Aruny JE, Tal MG. Right atrial migration and percutaneous retrieval of a Günther Tulip inferior vena cava filter. J Vasc Interv Radiol. 2003 Sep;14(9 Pt 1):1207-9. Doi: 10.1097/01.rvi.0000085774.71254.48. PMID: 14514816.

6. Arjomand H, Surabhi S, Wolf NM. Right ventricular foreign body: percutaneous transvenous retrieval of a Greenfield filter from the right ventricle--a case report. Angiology. 2003 Jan;54(1):109-13. Doi: 10.1177/000331970305400114. PMID: 12593503.