An unusual cause of cardiogenic shock: tricuspid regurgitation and right ventricular perforation due to vena cava filter migration

P.E. Mocavero[1], A. Staglianò[1], M. Coppola[1], S. Langella[1], A. Conte[1], F. Pappalardo[2], A.R. Martiniello[3], M. Pieri[2], A. Mattei[1]

[1]U.O.S.D. "Rianimazione" A.O.R.N. "V. Monaldi", Naples, Italy; [2]Department of Anesthesia and Intensive Care, Università Vita-Salute San Raffaele, Milan, Italy; [3]U.O.S.D. "Cardiologia" A.O.R.N. "V. Monaldi", Naples, Italy

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ABSTRACT

Dislocation and migration of the inferior vena cava filter to the right heart is an uncommon but serious complication, requiring prompt diagnosis and appropriate therapy. We report the case of a seventy-year old man, who had previously undergone vena cava filter implantation and who was admitted to the Intensive Care Unit due to acute respiratory distress with the suspect of pneumonia-related sepsis. Due to the worsening of hemodynamics and the development of cardiogenic shock, the patient underwent bedside echocardiography, which on the contrary revealed dislocation of the filter and the entrapment of the device within the tricuspid valve and chordae tendineae. This evidence was confirmed also by the chest-abdominal X-ray. The patient underwent tricuspid valve surgical replacement and successfully recovered. The transthoracic and transesophageal echocardiographies performed in the intensive care unit were able to first orient the diagnostic efforts toward the correct cause.

Keywords: *vena cava filter, cardiogenic shock, echocardiography, intensive care unit.*

INTRODUCTION

The inferior vena cava (IVC) filter is an established therapeutic option for the prevention of pulmonary embolism in individuals with deep venous thromboembolism in whom conventional anticoagulation is contraindicated or deemed ineffective.
Although clinically efficacious, filters are not exempt from complications. The major complications associated with IVC filters include intravascular and extravascular migration, filter and venous thrombosis, recurrent pulmonary emboli and inferior vena caval obstruction.
We report a case of transvenous migration of an IVC filter to the right atrium, which lead to a very unusual scenario of acute cardiogenic shock.

CASE REPORT

A seventy-year old man with acute respiratory distress and fever was admitted to the Intensive Care Unit (ICU) coming from a Rehabilitation Center. The patient had suffered from a cerebrovascular accident

Corresponding author:
Federico Pappalardo, MD
Department of Anesthesia and Intensive Care,
Università Vita-Salute San Raffaele
Via Olgettina, 60 - 20132 Milan, Italy
e-mail: pappalardo.federico@hsr.it

Figure 1 - *Cardiogenic shock: bedside echocardiographic evaluation.*

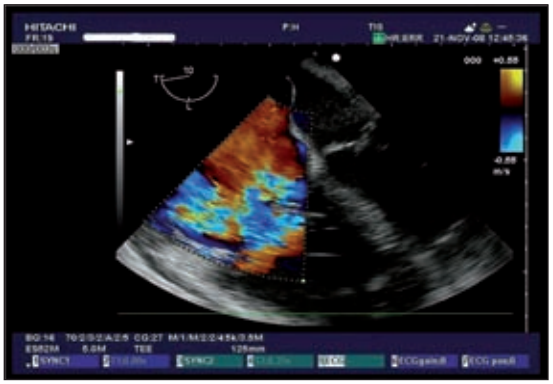

Figure 2 - *Cardiogenic shock: bedside doppler echocardiographic assessment.*

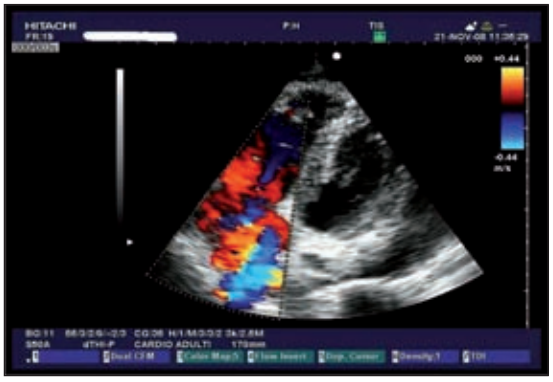

Figure 3 - *Cardiogenic shock: bedside doppler echocardiographic assessment.*

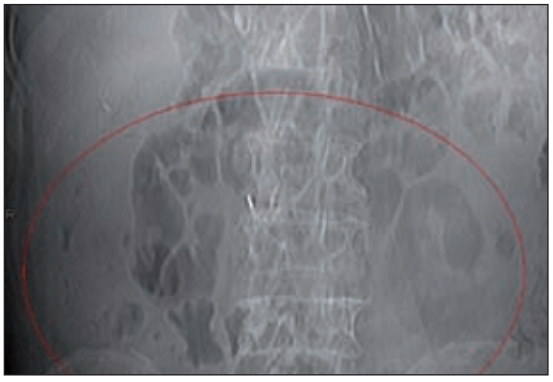

Figure 4 - *Chest-abdominal X-ray confirming the appropriate diagnosis.*

(hemorrhagic stroke) subsequent to anticoagulation therapy for acute pulmonary embolism three months before. Since hemorrhagic stroke is a well established contraindication to oral anticoagulant therapy, the patient had undergone implantation of a vena cava filter to prevent new episodes of pulmonary embolism (1-3).

On admission in the ICU, the presence of hospital-acquired pneumonia with severe sepsis was strongly suspected, but patient's clinical conditions rapidly evolved into hemodynamic collapse with hypotension, cold sweating and hypoxia, in the absence of any evidence of lung infiltration at chest X-ray. A transthoracic echocardiography with both morphologic and functional evaluation was performed, showing massive tricuspid insufficiency with papillary muscle rupture and a suspected endocardial vegetation. Immediately after, a transaesophageal echocardiography highlighted massive tricuspid insufficiency with leaflet rupture and lacked systolic closure due to reflective metallic structures trapping in valvular leaflets. A pericardial effusion without tamponade was also noticed (*Figure 1, Figure 2,* and *Figure 3*).

The suspected diagnosis of cava filter migration into cardiac cavity was confirmed by a chest-abdominal X-ray (*Figure 4*) which showed the presence of metallic elements in the right- heart and the concomitant absence of the cava filter in the cava district.

Following this evidence, the patient underwent open heart surgery.
During surgery the tricuspid valve insufficiency with metallic fragments between leaflets was confirmed, along with the presence of 800 ml of blood in the pericardium due to the migration of the cava filter fragments through the interventricular septum and the right ventricular apex.
The tricuspid valve and vena cava filter fragments were removed and a prosthetic tricuspid valve was implanted. The patient recovered successfully.

DISCUSSION

We reported an insidious case of vena cava filter migration, clinically manifesting with signs and symptoms of cardiogenic shock. After dislocation, the filter was "entrapped" within the tricuspid valve and chordae tendineae, and surgical valve replacement became mandatory.
Intracardiac or intrapulmonary IVC filters migration is uncommon, and a total of nearly a hundred of episodes have been reported in literature (4).
Although unusual, vena cava filters migration is a potentially life-threatening event which requires a reliable and prompt diagnosis. For this reason, some instrumental tools are of crucial importance, starting from the hemodynamic monitoring.
The type of hemodynamic monitoring performed in the ICU depends on two elements: patient's clinical status and physician's experience.
Historically, hemodynamic monitoring has been focused mainly on preload assessment. Preload is the " myocites stretching" before systolic period, that's to say the ventricular volume after atrial contraction, in telediastolic phase. Preload guides the treatment of hemodynamic impairment, the choice of fluids or inotropic drugs. Unfortunately, "myocites stretching cannot be monitored "in vivo", and other methods have been developed for preload evaluation.
Among these, the Swan- Ganz catheter (PAC) is invasive, and requires a high learning curve. Moreover, it lacks of a grade A evidence about reliability of the data and their impact on patient's outcome. Other cardiac output monitoring systems have been developed during last years based on continuous and real-time analysis of systemic arterial pressure wave, stroke volume and stroke volume variation.
In recent years, diagnosis-oriented treatment has supported the widespread use of echocardiography for the management of the hemodynamically unstable patients in the ICU.
Indeed, transthoracic and transesophageal echocardiography allow bedside examination in the ICU. Current applications of echocardiography in critical care are represented by emergent diagnosis (i.e. cardiac tamponade, papillary muscle rupture, massive pulmonary embolism) and therapy, but it should not been underestimated also its role in the hemodynamic assessment (5, 6). Indeed, bedside echocardiography is able to provide crucial information to decide on the following diagnostic steps and treatment (7). Cholley and colleagues also suggested that every critical care physician should at least be able to perform a basic ultrasound examination of the heart when the aetiology of shock is not 100 % clear, as echocardiography can be considered as a lifesaving tool (8).
This case report showed how the echocardiographic assessment can be a life saving tool when an unusual cause of shock prompting quick and appropriate treatment is present. Bedside echocardiography indeed allowed the intensivists to re-direct their diagnostic efforts toward the right cause of the shock sooner than the other monitoring strategies and with a valuable diagnostic accuracy.

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