



## Fatal Central Venous Catheterization Complication: Right Ventricular Rupture and Hemopericardium

Nizameddin KOCA<sup>1</sup>, Selçuk KANAT<sup>2</sup>

<sup>1</sup> University of Health Sciences, Bursa Yüksek İhtisas Training & Research Hospital, Department of Internal Medicine, Bursa, Turkey

<sup>2</sup> University of Health Sciences, Bursa Yüksek İhtisas Training & Research Hospital, Department of Cardiology, Bursa, Turkey

### Abstract

Central venous catheterization (CVC) is frequently used in urgent intervention needed cases, and in patients that require long-term vascular access. The catheter tip perforating the ventricular wall leading to a cardiac tamponade is a complication with high mortality. A 26-year-old female patient with IgA nephropathy was admitted to the emergency department with complaints of fainting at home. The echocardiographic evaluation revealed fibrin-rich, intense pericardial fluid located in front of the right ventricle and causing a collapse in the right structures. The patient was evaluated as pericardial tamponade and pericardiocentesis was performed through the sub-xiphoid region. A pigtail catheter inserted, and 650 mL of hemorrhagic pericardial fluid was evacuated. Clinically stabilized patient discharged from the hospital, and nephrology follow-up was suggested. This rare, mostly mortal complication had a dramatic response to the appropriate treatment if it is recognized earlier. Adequate training and following procedures for catheter placement will be the most effective prevention to reduce the risk of such complications.

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**Keywords:** Cardiac tamponade, central venous catheter, complication.

### Introduction

Central venous catheterization (CVC) is frequently used in cases of urgent intervention (acute hemodialysis, plasmapheresis, cardiopulmonary resuscitation). Long-term vascular access is needed particularly in intensive care units. The femoral vein is preferred in acute short-term hemodialysis and the internal jugular vein is preferred in case that needs long-term hemodialysis. Interventional procedures carry the complication risk even in the most experienced practitioners. The catheter tip

perforating the ventricular wall leading to a cardiac tamponade is a complication with high mortality.<sup>1</sup>

We present a 26-year-old woman with a diagnosis of IgA nephropathy who was admitted to the emergency department with the complaint of fainting at home due to right ventricular damage and hemopericardium, 2-months after starting 3/7 hemodialysis program with a jugular venous catheter.



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**Address for Correspondence:**

Nizameddin KOCA, MD.

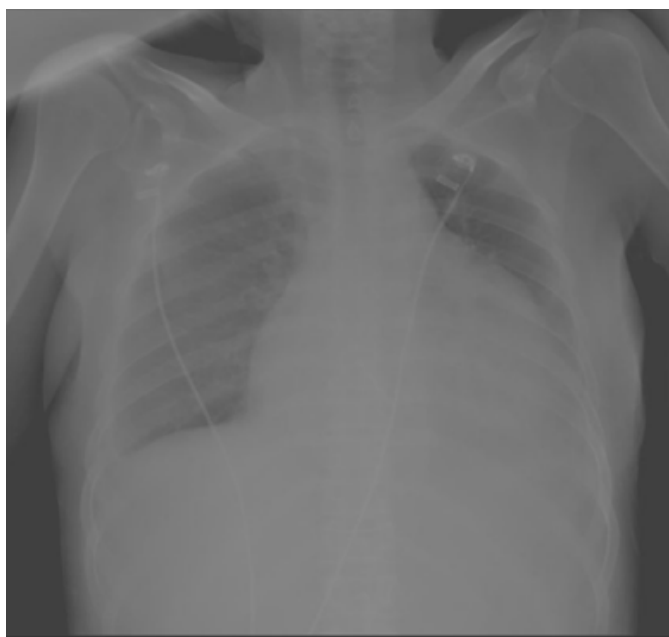
Bursa Yüksek İhtisas Training and Research Hospital, Department of Internal Medicine, Bursa, Turkey

E-mail: [nizameddin.koca@sbu.edu.tr](mailto:nizameddin.koca@sbu.edu.tr)

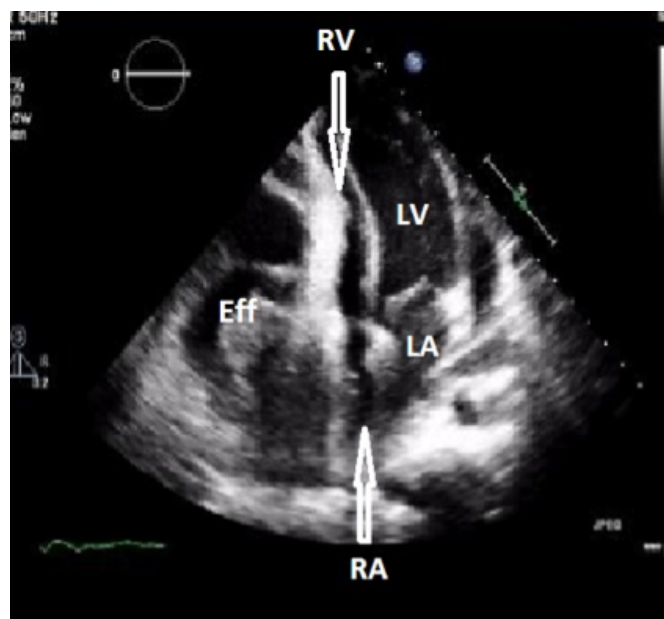


## Case Report

A 26-year-old female patient who was under nephrology follow-up with IgA nephropathy diagnosis was included into a hemodialysis program due to the progressive decrease in renal function by using a temporary jugular venous catheter 2 months ago. Her general condition and physical capacity have worsened day-by-day. She was admitted to the emergency department with the complaint of fainting at home. She had a general impairment, hypotension, tachycardia, dyspnea, cough and phlegm complaints, and transferred to internal medicine inpatient clinic for further examination. Chest-x-ray shows cardiomegaly (Figure 1) and echocardiographic evaluation revealed a fibrin-rich, dense pericardial fluid located in front of the right ventricle and causing a collapse in the right structures (Figure 2). Pericardial tamponade diagnosis was made with the addition of clinical parameter such as hypotension (70/40 mmHg) and tachycardia (140 beats/min) (Figure 3). Temporary dialysis catheter was removed and pericardiocentesis was performed through the sub-xiphoid region. About 650 mL of hemorrhagic pericardial fluid was evacuated with a pigtail catheter inserted under ultrasound guidance.



**Figure 1.** Chest-x-ray represents cardiomegaly



**Figure 2.** Pericardial effusion caused compression in both the right atrium and ventricle. 4-cavity transesophageal echocardiographic image. LV= Left Ventricle, LA= Left Atrium, RA= Right Atrium, RV= Right Ventricle, Eff= pericardial effusion

Pericardial fluid analysis showed hemoglobin: 11.7 g/dL, total protein: 6.2 g/dL, albumin: 3.1 g/dL, LDH: 953 U/L in synchronous blood biochemistry total protein: 6.5 g/dL, Albumin: 3.3 g/dL, LDH: 348 U/L. Cytologic evaluation of the effusion revealed no malignancy and no reproduction in the bacterial cultures.

In the follow-up of the patient, a dramatic improvement was observed in her clinical condition and a pigtail catheter was removed when the volume of the incoming fluid fell below 25 cc/day. Patients whose hemogram levels were stabilized, blood pressure and heart rate returned to normal was discharged from the hospital. The kidney function was re-evaluated, and she was removed from the hemodialysis program due to sufficient renal parameters, and nephrology outpatient clinic follow-up was suggested.

## Discussion

CVC is a commonly applied intervention in case of an acute need for hemodialysis. It is often the preferred vascular access point in routine hemodialysis patients during the fistula opening period or fistula-related complications. Since there is a high risk of stenosis in the subclavian vein after



**Figure 3.** Sinus tachycardia and QRS alternans is present in the ECG

hemodialysis, internal jugular vein is preferred in acute hemodialysis. The femoral vein may also be preferred in acute short-term hemodialysis and non-mobilized patients. Interventional procedures carry-out the risk of complications even in the most experienced practitioners. Catheter-related complications that may be encountered at each stage of catheter placement and after the catheter insertion cause catheters to be considered as prone to complication tools.<sup>2</sup> The frequency of complications related to central venous catheter placement varies between 5-19%, depending on the used anatomic site, the use of ultrasonography and the experience and ability of the practitioner.<sup>3,4</sup> The frequency of cardiac tamponade is not clearly known, but it is a complication that can be avoided by the practitioner taking into account the guidelines.<sup>1</sup>

In a retrospective review of 23 patients by Collier et al.<sup>1</sup>, it is reported that patients had shortness of breath (12 patients), palpitation sensation (8 patients) and air hunger (15 patients) up to 6 hours before the change was observed in vital signs. In the same study, tachycardia, and bradycardia developed in 56% and 46% of the patients, respectively. There was unexplained hypotension in all of the patients.<sup>1</sup> In our case, it was determined that the patient had shortness of breath before she had fainted, and tachycardia and

hypotension were observed in the hospital.

The most suitable site for the catheter tip is 3-5 cm proximal of the junction of the vena cava superior with the atrium. The perforation may depend on the displacement of the catheter tip at the beating heart as well as the neck movements of the patient. In the left-sided interventions, the distance between the puncture site and the Caval-atrial junction is 19-21 cm while it is 16-18 cm at the right-side interventions. This distance is not depending on the gender or body structure of the patient. Catheter site should be verified with a direct radiographic examination after catheter insertion and it must be demonstrated that the catheter is not in the heart cavity by echocardiography in selected patients. On direct radiography, it should be demonstrated that the catheter is in the 2 cm of the proximal of the pericardial shadow into the vena cava.<sup>5</sup>

## Conclusion

This rare, mostly mortal complication had a dramatic response to the appropriate treatment if it is recognized earlier. Adequate training and following procedures for catheter placement will be the most effective prevention to reduce the risk of such complications.

***Informed consent***

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

***Conflict of interest***

The authors declared that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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