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CASE REPORT

Venous thrombus formation following percutaneous cardiopulmonary support

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Summary It is considered that percutaneous cardiopulmonary support (PCPS)-associated thrombosis is rare on antithrombotic coated PCPS if anticoagulation therapy is appropriately performed. We experienced two cases in which the association between antithrombotic coated PCPS and venous thrombus formation was highly suspected. These cases suggest that PCPS-associated venous thrombus formation should be checked frequently during and after PCPS even if anticoagulation was appropriately performed.

Percutaneous cardiopulmonary support (PCPS) system offers temporary but full cardiopulmonary support and oxygenation of venous blood. PCPS is sometimes considered the treatment of choice in severe conditions including fulminant myocarditis, pulmonary embolism, and severe acute myocardial infarction [1—7]. Even though PCPS has been shown to be extremely effective for temporary life support, several possible complications include thrombosis, hemorrhage, ischemia in lower extremities, infection, and hemolysis [8,9]. To reduce the risk of thrombosis associated with PCPS, an antithrombotic coating for PCPS had been developed with several observational studies supporting this innovation [10,11]. However, the association between antithrombotic coated PCPS and venous thrombus formation has not been fully investigated. We present two cases in which the association between PCPS and venous thrombus formation was highly suspected.

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Case report

Case 1

A 23-year-old man was diagnosed with fulminant myocarditis, and transferred to our medical center in August 2006. As his cardiac function deteriorated even with high-dose catecholamine and intra-aortic balloon pumping (IABP) support, PCPS (heparin-coated Capiox^{TM} system, Terumo Co., Ltd., Tokyo, Japan) was initiated to address circulatory collapse on the second day. An arterial cannula was inserted from the right femoral artery to the right common iliac artery. A venous cannula was inserted from the right femoral vein to the right atrium. Initial PCPS flow was maintained at more than 3.5 L/min. During PCPS, he received anticoagulation therapy of unfractionated heparin 20,000 unit/day. The activated partial thromboplastin time (APTT) was kept at twice the control value (from 62 to 85.5 s). As the cardiac function had begun to recover gradually, PCPS was removed without protamine on the sixth day. We did not detect any thrombus attached to the arterial and venous cannulas. Two hours after removing the PCPS without protamine, a large thrombus in the inferior vena cava (IVC) was found by ultrasonography (Fig. 1). The same anticoagulation by unfractionated heparin was continued all the time. We performed daily ultrasonography during PCPS management and routinely checked IVC by ultrasonography. While the venous thrombus was not visible before removing the PCPS, it was easily found 2 h after removing the PCPS.

We inserted a temporary IVC filter (New House Protect, Toray, Ltd., Tokyo, Japan) from the right internal jugular vein. The top of the filter was placed at the hepatic vein level. The anticoagulation by unfractionated heparin was continued with appropriate APTT control (from 62 to 85.5 s). After removing the PCPS, the thrombus disappeared with the anticoagulation therapy in 3 days. His cardiac function recovered gradually without pulmonary thromboembolism and he was discharged on the 34th day. He was administered warfarin for 2 months after discharge. After discontinuing warfarin, complete evaluation for hypercoagulability was performed. However, there were no abnormal values including cardiolipine antibody, anti CL-beta 2 GPI antibody, lupus anticoagulant, antithrombin III, Protein C, and Protein S. Now, he has been well and has not developed any thrombotic events for more than 1 year.

Case 2

A 39-year-old woman was diagnosed with fulminant myocarditis and transferred to our medical center in September 2008. Due to severe cardiac dysfunction, PCPS (heparin-coated Capiox^{TM} system) was initiated on the first day of admission. An arterial cannula was inserted from the right femoral artery to the right common iliac artery. A venous cannula was inserted from the right femoral vein to the right atrium. Initial PCPS flow was maintained at more than 3.5 L/min. When the patient was on PCPS, she received anticoagulation therapy with unfractionated heparin with the APTT kept at twice the control value. As the cardiac function began to recover gradually, PCPS was removed on the eighth day. We did not detect any thrombus attached to

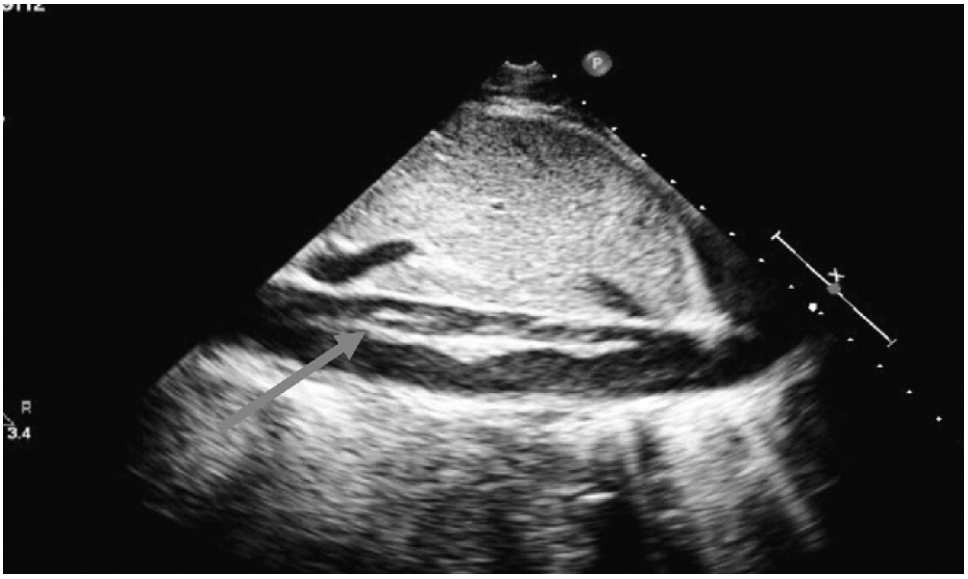

Figure 1 Ultrasonography showing the thrombus formed in inferior vena cava in Case 1. Arrow indicates thrombus.