Peripherally inserted central catheters (PICCs) have become a mainstay for inpatient and outpatient medicine treatments with over 5 million placed annually in the United States. There are various complications associated with PICCs, one being deep-vein thrombosis involving the upper extremities. PICCs have a thrombosis incidence between 10% and 38%. Risk factors for this include catheter diameter, with larger catheters having a higher risk, catheter malpositioning, malignancy, hereditary or acquired thrombophilia, multiple insertion attempts, prior deep vein thrombosis, recent surgery, and left-sided catheters. Complications of upper-extremity deep vein thrombosis (UEDVT) include pulmonary embolism (6% for upper extremities vs 15% to 32% for lower extremities), recurrent UEDVT at 12 months (2% to 5% for upper extremities vs 10% for lower extremities), and post-thrombotic syndrome (5% for upper extremities vs up to 56% for lower extremities). The following case highlights the importance of maintaining a high index of suspicion of PICC-associated complications in the appropriate population.

**CASE PRESENTATION**

A 32-year-old man with a history of right hand osteomyelitis and tobacco use presented with 3 weeks of significant fatigue and worsening dyspnea on exertion. Previously active in sports, he could now only walk 10 feet without severe dyspnea and associated symptoms of pre-syncope. He also reported that he was recently told he had a new diagnosis of heart murmur, but no further investigation had been undertaken. Osteomyelitis due to orthopedic hardware complications was diagnosed 9 months prior to this presentation, and he was treated with intravenous antibiotics via PICC for a total of 4 weeks. He reported entry site complications and leaking around the catheter, requiring removal and replacement for a total of 3 catheter insertions. At the end of his 4-week antibiotic regimen, he developed shortness of breath and was subsequently diagnosed with a pulmonary embolism at another facility. The PICC was removed at the time of diagnosis, and no echocardiogram was performed. He was treated with rivaroxaban 15 mg twice daily for 21 days, followed by 20 mg daily for a total treatment duration of 90 days. After completing treatment with rivaroxaban, he was asymptomatic and reported returning to his prior level of functioning for approximately 3 months. He then began to develop worsening fatigue and dyspnea on exertion that prompted his presentation at our facility, at which time he was referred for an outpatient pulmonology and cardiology assessment.

**Abstract:** We report the case of a male patient with a history of recent pulmonary embolism and peripherally inserted central catheter who presented with severe dyspnea. He was found to have a large mass on the tricuspid valve, and definitive diagnosis remained elusive until surgical intervention. The thrombotic potential of central venous catheterization should not be overlooked in patients presenting with dyspnea and appropriate history of central access.

**Key words:** peripherally inserted central catheter, dyspnea, tricuspid valve thrombus

**Figure 1.** Computed tomography of the chest, coronal view, demonstrating a large right-sided cardiac mass (arrow). RA, right atrium; RV = right ventricle; LA = left atrium; LV = left ventricle.
Underlying pulmonary pathology was quickly ruled out. He underwent transthoracic echocardiogram at the cardiologist’s office and was immediately referred to the hospital for admission.

Computed tomography of the chest revealed a large right-sided cardiac mass (Figure 1). Transesophageal and repeat transthoracic echocardiograms confirmed this finding, as well as revealing mild tricuspid regurgitation and severe tricuspid stenosis secondary to the mass (Figures 2 and 3). The mass measured approximately 4.9 cm × 2.3 cm with a stalk coming from the right anterior wall and a ball-valve effect appreciated during the examination. No other significant valvular abnormalities were seen. No structural abnormalities were visualized. Based on this study, it was felt that the diagnosis was most consistent with a right atrial myxoma. Left heart catheterization revealed no significant obstructive coronary artery disease.

The patient was taken to the operating room the next day for median sternotomy. The mass was adherent to the posterior and septal leaflets of the tricuspid valve (Figure 4). Successful removal was achieved by peeling the mass from the leaflets without causing visible injury (Figure 5). Grossly, the mass was firm and rigid. Histopathologic findings revealed a large organizing clot and adhering granulation tissue (Figure 6). Blood and tissue cultures were negative, and hypercoagulable studies revealed no abnormalities. The patient was discharged home 5 days postoperatively in stable condition.

**DISCUSSION**

Native tricuspid valve thrombus is quite uncommon, particularly in an individual without structural heart disease or antiphospholipid syndrome (APLS). It is frequently mistaken for infective endocarditis or tumor. The majority of case reports involve individuals with structural heart disease such as ventricular septal defect and coagulative disorders, especially APLS.7–9 Our patient presented with a structurally normal heart and no evidence of hypercoagulable disorder or malignancy.

The patient described a history of likely catheter malposition, requiring 3 separate devices to complete his antibiotic course. Intravenous catheters can cause endothelial disruption and trauma, leading to thrombosis.7–9 Catheter malposition is also associated with increased incidence of thrombosis and right heart thromboemboli (RHTE).10

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**Figure 2.** Transthoracic echocardiogram apical 4-chamber view revealing right-sided cardiac mass. RV = right ventricle; RA = right atrium; LA = left atrium; LV = left ventricle.

**Figure 3.** Transesophageal echocardiogram measured the mass at 4.9 cm x 2.3 cm, and a ball-valve effect was appreciated. RA = right atrium; RV = right ventricle.

**Figure 4.** Intraoperative right atrium exposure revealing the mass was adherent to the posterior and septal tricuspid leaflets. RA = right atrium.
RHTEs are associated with pulmonary embolism in approximately 4% to 6% of cases.10,11

In this case, we suspect that the thrombus originated from a PICC-induced thrombus of the upper extremity. Thrombi became entrapped on the tricuspid valve. For unknown reasons, the natural fibrinolytic system failed and a massive organized thrombus developed.

Management strategy of right heart thrombus remains controversial. Treatment options include systemic and catheter-directed thrombolysis, anticoagulants, and surgical removal.7,10,12,13 Definitive treatment is often surgical, as attempts to thrombolyse can lead to embolization of the clot. Novel techniques utilizing large catheter aspiration (ie, Angiovac, Angiodynamics, Latham, NY) can also be potentially useful. Davies et al also reported a case of percutaneous retrieval and sequestration using an inferior vena cava filter.13

In this case of a large, organized thrombus adherent to the tricuspid leaflets, percutaneous approaches would likely not be successful and pose too great a risk of embolization given the size and location of the thrombus. Surgical excision should remain the definitive treatment for thrombi of this nature.

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Address for correspondence: S. Jay Mathews, MD, MS, Manatee Memorial Hospital, Bradenton, Florida. Email: sjaymathewsmd@gmail.com

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