CLINICAL STUDY

Significance of Echocardiographically Detected Central Venous Catheter Tip–Associated Thrombi

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ABSTRACT

Purpose: To explore significance, management, and outcomes of central venous catheter (CVC) tip–associated thrombi incidentally detected on echocardiography.

Materials and Methods: Echocardiogram data from all patients with CVCs from October 2009 to June 2011 were reviewed (N = 170). Patients with CVC tip–associated thrombi were selected (n = 49). Echocardiograms were reviewed for ejection fraction, presence of patent foramen ovale (PFO), presence of other intracardiac shunts, and mean thrombus size. Management decisions, thrombus extension, pulmonary embolism, paradoxical emboli, and stroke within 3 months were recorded.

Results: Mean thrombus size was 2.1 cm (range, 0.5–5.7 cm). Of patients with thrombi, 11 (22%) were already on anticoagulation, and there was no change in management. Anticoagulation was started without complications in 17 (35%) patients, the catheter was removed in 4 (8%) patients, and no new treatment was initiated in 17 (35%) patients. Of these 17 patients, 16 (94%) developed no complications. One (6%) patient with a PFO and right-to-left shunt experienced a stroke before PFO closure. After surgical closure of the PFO, the same patient developed catheter tip–associated thrombus without complication. There were no pulmonary emboli, strokes, or other detected embolic phenomena.

Conclusions: In this sample with CVC tip–associated thrombi but without PFO or other intracardiac shunts, no embolic or other complications were detected, regardless of anticoagulation status. These data suggest a benign course for such thrombi and that anticoagulation, catheter removal, thrombectomy, and thrombolysis may be unnecessary when catheter tip–associated thrombi are incidentally detected on echocardiography.

ABBREVIATIONS

CVC = central venous catheter, PFO = patent foramen ovale, SVC = superior vena cava, TEE = transesophageal echocardiography, TTE = transthoracic echocardiography

Central venous catheters (CVCs) are frequently employed in clinical care and used in up to 8.1% of hospitalized patients. They provide intravenous access, hemodynamic monitoring, medication administration, and extracorporeal therapies including dialysis and plasmapheresis (1–3). Although CVCs are lifesaving medical devices, they are not without complications, which include malposition, infection, occlusion, and catheter-associated venous thrombosis (4–7). Although superficial thrombophlebitis typically resolves with

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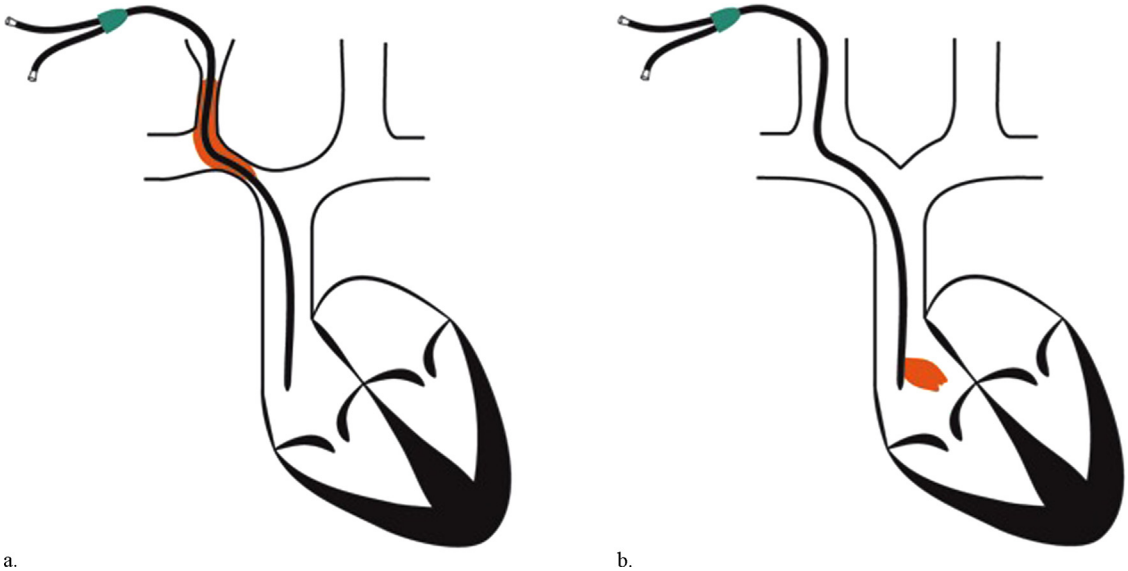
catheter removal, deep venous thrombosis and right atrial thrombus may lead to pulmonary embolism, paradoxical emboli, and stroke (8–11). Because of the potential embolic risk, with associated high morbidity and mortality, the American College of Chest Physicians and the International Clinical Practice Guidelines recommend anticoagulation, without or with catheter removal, for CVC-associated deep venous thrombosis (12–14).

CVC tip–associated thrombi, such as CVC-associated deep venous thrombosis, are frequently encountered in clinical practice and often discovered incidentally on surveillance studies including echocardiography and cross-sectional imaging (**Fig 1a, b**) (15–17). However, throughout both clinical practice and the current literature, there is little consensus or evidence on the appropriate management or outcomes regarding CVC tip–associated thrombi. The aim of this study was to describe the significance, management, and outcomes of incidentally detected CVC tip–associated thrombi at a single institution.

MATERIALS AND METHODS

This study received institutional review board approval and complied with the Health Insurance Portability and Accountability Act. Patients were identified using retrospective review of a departmental database of echocardiograms (ProSolv CardioVascular Solutions, Inc, Indianapolis, Indiana) from October 2009 to June 2011. All consecutive echocardiograms (N = 481 patients) obtained within the study period were searched for key words "catheter" or "thrombus" Medical records were used to cross-reference patients obtained through this search to identify only patients with indwelling CVCs at the time of the echocardiogram (n = 170). Echocardiograms from these patients were then individually reviewed to identify all patients with CVCs and incidentally detected catheter tip thrombus (n = 49; 10%). Echocardiograms in these 49 patients were evaluated for ejection fraction, presence of patent foramen ovale (PFO) or other intracardiac shunts, and mean thrombus size. Medical and imaging records in conjunction with the division's main quality improvement database (HI-IQ; ConexSys, Lincoln, Rhode Island) were used to obtain additional information, including management decisions, thrombus extension, pulmonary embolism, paradoxical emboli, and stroke over a 3-month period.

The group consisted of 25 (51%) women and 24 (49%) men with mean and median ages of 58 and 61 years, respectively (range, 22–92 y). CVC types and catheter tip locations are summarized in **Table 1**. Swan-Ganz catheters were present in 15 (31%) patients, nontunneled CVCs were present in 14 (29%), tunneled CVCs were present in 9 (18%), peripherally inserted central catheters were present in 6 (12%), and ports were present in 4 (8%). One (2%) patient had a tunneled translumbar Hickman catheter. CVC tip position was determined by echocardiogram (59%), chest radiograph (27%), or both echocardiogram and chest radiograph (14%). Of catheters, 19 (39%) terminated in the right atrium, 10 (26%) at the cavoatrial junction, 6 (12%) in the main pulmonary artery, 5 (10%) in the distal superior vena cava (SVC), 3 (6%) in the right main pulmonary artery, 1 (2%) in the proximal SVC, 1 (2%) in the mid–SVC, 1 (2%) in the inferior vena cava, and 1 (2%) in the left main pulmonary artery. Of the Swan-Ganz catheters, 3 terminated at the cavoatrial junction, 1 in the right atrium, 2 in the right ventricle, 5 in the main pulmonary artery, 3 in the right main pulmonary artery, and 1 in the left main



a. b.

Figure 1. **(a)** CVC-associated deep venous thrombosis with thrombus throughout the internal jugular and brachiocephalic veins (orange material). **(b)** CVC tip-associated thrombus with thrombus on the tip of the CVC (orange).