Editorial

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An Evasive Case of Right Atrial Thrombus: A Need For Evidence-Based Guidelines

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Editorial

A 56 year old male presented with the chief complaint of progressive dyspnea on exertion over several weeks prior to his admission. The CT scan of the chest revealed a sub-massive pulmonary embolus with radiological evidence of right-sided heart strain. Echocardiogram revealed a right atrial thrombus. The patient was started on intravenous anticoagulation with unfractionated heparin. During an attempt to extract the left atrial thrombus, the patient was found to have a patent foramen ovale (PFO), and the procedure was aborted. The patient was continued on intravenous unfractionated heparin. Repeat echocardiogram at 48 hours confirmed the resolution of the right atrial thrombus.

The incidence of mobile right heart thrombi are less than 4% of unselected patients with pulmonary emboli [1-3] but their prevalence may reach 18% in the intensive care setting [3]. Mobile right heart thrombi essentially confirm the diagnosis of PE and their presence is associated with RV dysfunction and early mortality [2, 4, 5] as high as 21% in the first 24 h and an overall 45% in hospital mortality as reported in some studies [6]. Right heart mobile thrombi can be easily identified by 2-dimensional transthoracic or trans-esophageal echocardiography. The increase in utility of echocardiography has led to an increase in the early diagnosis of right ventricular thrombi and evidence of right ventricular strain and pulmonary hypertension.

Recent publication of the Right Heart Thrombi European Registry (RiTHER) reported the outcomes of patients with right heart thrombi (RiHT), their characteristics, and prognostic factors. In RiHT patients, pulmonary embolism mortality was associated with systolic blood pressure <90 mm Hg (42% *vs.* 12%, p=0.0002), and right ventricular dysfunction (16% *vs*. 0%, p=0.038). The study concluded that 30 day mortality in patients with RiHT was related to the hemodynamic effect of pulmonary embolism rather than RiHT characteristics. Presence of right ventricular dysfunction was associated with worse prognosis [7].

Despite the association with high mortality, treatment approaches towards intra-cardiac thrombus is controversial and not standardized. Recent guidelines by Chest did not address treatment guidelines for intra-cardiac thrombus [8]. Conventional therapy with intravenous anticoagulation versus catheter-directed extraction of intra-cardiac thrombus or surgical embolectomy remains to be an unsettled concept that needs to be addressed.

The recent guidelines published by Chest in 2016 for the treatment of pulmonary emboli with hypotension (e.g., systolic BP<90 mm Hg) in patients who do not have a high bleeding risk, were in favor of systemic thrombolytic therapy over catheter-directed thrombolysis (Grade 2C) [8]. If appropriate expertise and resources are available, catheter-directed thrombus removal was suggested as the mode of intervention in patients with acute PE associated with hypotension and who have either high bleeding risk, failed systemic thrombolysis, or shock that is likely to cause death before systemic thrombolysis can take effect (e.g., within hours) (Grade 2C) [8]. In patients with mobile right heart thrombi, the therapeutic benefits of thrombolysis remain controversial. Good results were reported in some series, [9, 10] but in other reports short-term mortality exceeded 20% despite thrombolysis [2, 6, 11].

Ferarri et al. [9] demonstrated in their series of 18 patients with PE and a mobile RiHT (all located in the right atrium), complete disappearance of RiHT within 24 h after thrombolytic therapy (TT), suggesting that even the persistence of the clot during the first hours following TT should not result in a hasty decision to embark on a new strategy such as TT or clot extraction. However, when reviewing the literature, it is unclear whether the disappearance of RiHT following TT is due to dissolution by the thrombolytic agent or migration to the pulmonary arteries facilitated by the now improved hemodynamics allowing forward flow of the thrombus [12-14], which might argue in favor of early extraction of the clot.

Maron reported successful resolution of intra-cardiac adherent right atrial thrombus with tissue plasminogen activator administrated by continuous infusion (2 mg/h) over 24 h via

a 4F, 11 cm catheter placed fluoroscopically into the mid-superior vena cava, without major bleeding complications [15]." When facing an impending paradoxical embolism - a bi-atrial thromboembolus caught in transit across a patent foramen ovale -there is no data to support one approach over the other. Most authors recommend surgical thromboembolectomy and foramen ovale closure, because the risk of systemic embolization during thrombolysis or anticoagulation is considered too high; however, there is no data to support this assertion [16].

The idea of catheter-directed thrombus removal of intra-cardiac thrombus is attractive but lacks evidence-based guidelines. The role of catheter-directed mechanical thrombectomy (CDMT) for the treatment of massive pulmonary embolism (MPE) and sub-massive pulmonary embolism (SMPE) is not clearly defined. Nassiri [17] reported that CDMT as a primary treatment of MPE and SMPE had a high rate of technical and clinical success in a high-risk patient population. Clinical outcomes are influenced by limited experience and strict patient selection criteria. Bereji [18] reported successful percutaneous mechanical thrombectomy in two patients with right atrial thrombus. The author concluded that endovascular extraction of right atrial thrombi may represent a potential therapeutic alternative, particularly in patients with contraindications to thrombolysis and surgery [18].

The lack of incorporation of an algorithmic approach toward right heart thrombus, especially in high risk patients, both by Chest and the European Society of Cardiology are due to the lack of evidence-based guidelines and randomized control studies. At the current state, a multidisciplinary approach toward treatment options for right heart thrombus with pulmonary embolism is recommended and should be based upon clinical experience, availability of resources such as cardiac catheterization, and proper patient selection. Further research efforts should be conducted to compare the efficacy and outcomes of catheter directed mechanical thrombectomy vesrus thrombolysis in patients with right heart thrombus.

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