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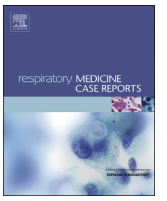

Case Report

Right heart thrombus in transit: Raising bar in the management of cardiac arrest

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ABSTRACT

Right heart thrombus represents medical emergency as it is associated with acute pulmonary embolism. Right heart thrombus can manifest acutely in a dramatic fashion as cardiac arrest. Bedside echocardiography is a key to rapid diagnosis and allow early intervention. We report a case of elderly female who was admitted to our hospital after a mechanical fall and found to have hip fracture. Despite an initial uncomplicated course, she experienced cardiopulmonary arrest with right heart clot in transit identified on transesophageal echocardiography (TEE). We highlight the utility of point-of-care ultrasound as well as use of TEE to establish cause of cardiopulmonary arrest.

1. Background

Right heart thrombus also known as clot-in-transit (CIT) is described as a mobile echogenic mass seen in the right side of the heart. Free floating right heart thrombi are rare phenomenon, generally diagnosed when echocardiography is performed in patients with suspected or proven pulmonary embolism. Focused transthoracic echocardiography (TTE) during cardiac arrest resuscitation can enable the characterization of myocardial activity, identify potentially treatable pathologies, assist with rhythm interpretation, and provide prognostic information. Over the last few years, focused transesophageal echocardiography (TEE) has been proposed as a tool that is ideally suited to image patients in cardiac arrest and peri-arrest states.

2. Case description

A 92-year-old female with past medical history of osteoarthritis presented to the emergency department after a fall at home. Patient was ambulating at home with the nursing staff when she had an assisted fall to the ground. On admission, vitals were stable. Physical exam revealed painful and limited mobility at the right hip joint with bruising of the right foot. Laboratory work up revealed normal complete blood count and comprehensive metabolic panel. Pelvic-X-ray was performed which showed acute comminuted fracture of the right femur and right acetabulum with superior displacement of right femur in relation to acetabulum. Otherwise, imaging was unremarkable. A right femur skeletal traction was placed emergently. The next day, patient was taken to operating room where an uncomplicated closed reduction percutaneous pinning was performed on right acetabular fracture and an open treatment for right femur fracture was completed.

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Post operatively, patient's clinical condition deteriorated progressively. She developed significant hypoxia requiring 15 L/minute of supplemental oxygen via non-rebreather mask. Subsequently, patient became hypotensive and went into pulseless electrical activity (PEA) arrest. Cardiopulmonary resuscitation (CPR) was initiated. Patient was emergently intubated due to worsening respiratory distress. A point-of-care transthoracic ultrasound was attempted, however given concurrent chest compressions, adequate images could not be obtained. This was followed by performance of transesophageal echocardiogram (TEE) during active CPR which demonstrated a large clot in transit in right atrium (as shown in video 1 and video 2). At this point of time, family was contacted. Given her high mortality and morbidity, they decided not to pursue further interventions and opted for termination of chest compressions.

Supplementary video related to this article can be found at https://doi.org/10.1016/j.rmcr.2022.101801

3. Discussion

Pulmonary thromboembolism is a well-known and reversible cause of cardiac arrest and accounts for up to 9% of all cases of cardiac arrest [1,2]. Other common reversible causes of cardiac arrest include hypoxemia, electrolyte disturbances, hypo- or hyperthermia, acidosis, circulatory shock, tension pneumothorax, cardiac tamponade, myocardial infarction, and various toxins [3].

Right heart thrombi (RHT) are uncommon, occurring in about 4% of patients with pulmonary embolism (PE) [4]. The association of RHT and PE carries a higher mortality rate when compared to pulmonary embolism alone [4]. The visualization of a thrombus in transit is a rare echocardiographic finding that carries a mortality rate up to 27% and goes up to 100% with the absence of treatment [5]. The prevalence of right heart thrombus in the setting of acute pulmonary embolism is 4%–18% [5]. Two major types of RHT have been described, each with distinct morphology and pathophysiology. Type A thrombi are mobile and snake-like in appearance, representing thrombus in transit after embolization from the lower extremity veins. Type B thrombi are immobile and flat in appearance, representing in situ formation from predisposing cardiac abnormalities such as cardiomyopathy [6]. Based on the TEE images, our patient likely had a Type A thrombus.

Transthoracic echocardiography (TTE) during cardiac arrest resuscitation can help identify patients with poor prognosis, accurately detect reversible pathology, and guide ongoing resuscitation efforts [7,8]. A focused TTE can be crucial for the identification of obstructive pathologies including tension pneumothorax, cardiac tamponade, deep vein thrombosis with RV dilation or akinesis suggesting pulmonary embolism [9]. Despite this strong rationale, an important restriction of the use of TTE during cardiac arrest is the technical difficulty in adequate image acquisition. Several factors, including the limited time available during chest compressions, may decrease the use and quality of TTE during resuscitation of cardiac arrest patients. Transesophageal echocardiography (TEE) has been recognized as an alternative to TTE that can overcome these limitations and has been proposed as a well-suited imaging modality to enhance cardiac arrest care [10,11]. TEE offers high resolution and clarity of images which allows for constant visualization of the heart, even during chest compressions. Moreover, TEE may allow direct diagnosis of pulmonary embolism when it displays a thrombus in the pulmonary arteries, and it may visualize a patent foramen ovale and sometimes a thrombus entrapped in it [12]. In all studies describing the utility of focused TEE in resuscitative settings, patients were intubated before TEE [13,14].

Previously published data described successful management of mobile RHT via anticoagulation with heparin [15], systemic thrombolysis [16], catheter-directed thrombolysis [17], surgical embolectomy under cardiopulmonary bypass [18], and percutaneous embolectomy [19]. Several studies have suggested a mortality benefit using a more aggressive approach with either thrombolysis or surgery [20]. Other studies have shown better outcomes with use of thrombolysis, specifically over anticoagulation alone or surgery [21]. Overall, the existing literature has shown conflicting evidence, with no clear consensus on management recommendations. Until there is more definitive evidence, management decisions should be made on a case-by-case basis, with careful consideration of complicating factors such as hemodynamic instability, right heart function, PFO, and malignancy.

4. Conclusion

Right heart thrombus (RHT) carries a high mortality, therefore rapid diagnosis and initiation of therapies are essential to improve outcomes. Individualization of the risks and benefits of each therapeutic option is necessary to choose the most appropriate management strategy. Increased training and use of resources such as Point-of-care ultrasound could aid in the early identification of potentially life-threatening features as a RHT for patients presenting with PE.

Author contributions

Conceptualization - A. Bajwa, S.M Farooqui, S. Hussain
Data curation – A. Bajwa
Formal analysis – A. Bajwa, S.M Farooqui
Funding acquisition – None
Investigation – A. Bajwa, S.M Farooqui, S. Hussain
Methodology – A. Bajwa, S. Hussain
Project administration – A. Bajwa, S.M Farooqui, S. Hussain
Resources – S.M Farooqui, S. Hussain
Software – None
Supervision – S.M Farooqui, K. Vandyk
Validation – S.M Farooqui, S. Hussain, K. Vandyk
Visualization – S.M Farooqui, S. Hussain

Writing - Original Draft – A. Bajwa
Writing – Review & Editing – S.M Farooqui, S. Hussain, K. Vandyk

Declaration of competing interest

All authors have no conflicts of interest relevant to this publication to disclose.

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Appendix A. Supplementary data

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