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Case Report

Transthoracic echocardiography as a diagnostic tool in the identification of saddle pulmonary thromboembolism

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ABSTRACT

Pulmonary thromboembolism (PTE) is a common and potentially fatal emergency that results from thrombi mostly originating from deep veins of lower limbs. It is the third most frequent cause of death after myocardial infarction and stroke, with wide clinical spectrum ranging from asymptomatic emboli to sudden death. A particularly severe variant is saddling pulmonary embolism, defined by large thrombus lodges at bifurcation of main pulmonary trunk. Computed tomography pulmonary angiography (CTPA) remains the gold standard for diagnosing PTE. However, its use may be limited by hemodynamic instability, contrast allergies, renal impairment, or unavailability in resource-limited settings. In such scenarios a reliable bedside diagnostic alternative becomes essential. Given the urgency of diagnosis in saddle PTE and limitations of CTPA in critical care settings, echocardiography may serve as an important adjunct in early detection and triage.

Keywords: Computed tomography pulmonary angiogram, Pulmonary thromboembolism, Transthoracic echocardiography, Point of care ultrasound, Saddle thrombus

INTRODUCTION

Pulmonary thromboembolism (PTE) is a common clinical condition with variable clinical presentations ranging from stable patients to rapidly progressing hemodynamic collapse.[1,2] Early identification and intervention are the key steps in any suspected case of PTE. Computed-tomography pulmonary angiogram (CTPA) is the diagnostic modality of choice, especially for saddle thrombus with haemodynamic instability, where early intervention with thrombolysis or mechanical thrombectomy plays a crucial role in the survival of patients.[3] However, obtaining a CTPA might be difficult in certain scenarios, such as haemodynamically unstable individuals, resource-limited settings, pregnant women, and patients with contrast allergies. In these patients, direct visualization of the saddle thrombus via transthoracic echocardiography (TTE) is critical for early detection and intervention.[4]

TTE as a reliable bedside diagnostic tool in the management of saddle pulmonary thromboembolism.

CASE REPORT

A 45 years old female presented with complaints of sudden onset shortness of breath which was progressively worsening and associated with tachycardia and hypotension. Her previous medical history included coronary artery bypass graft (CABG) surgery ten years ago and a total abdominal hysterectomy one month back for menorrhagia (due to fibroids). Post-surgery patient was given thrombopoietin receptor agonist (eltrombopag) i/v/o persistent thrombocytopenia due to immune thrombocytopenic purpura (ITP) which was confirmed by laboratory investigations.

On further evaluation, her vitals were, temperature – 98 F, blood pressure – 90/60 mmHg on nor-adrenaline 0.3 mcg/kg/min, hear rate – 120/min, respiratory rate – 30/min

and electrocardiography (ECG) showed S1Q3T3 pattern "s "waves in lead1, "q" waves in lead 3, t wave inversions in v1-v4 with left bundle branch block and her chest X-ray showed no consolidations or effusions. On physical examination lungs were clear and no murmurs were heard.

Bedside screening echocardiography revealed dilated right ventricle with tricuspid annular plane systolic excursion 1.1 (TAPSE) and direct visualization of saddle thrombus was noted in the right ventricular outflow tract (RVOT) view (Figure 1). Subsequent CTPA revealed saddle thrombus at the bifurcation of pulmonary artery (Figure 2).

Figure 1: Echocardiography view of saddle thrombus at pulmonary artery bifurcation.

Figure 2: CTPA showing saddle thrombus at pulmonary bifurcation.

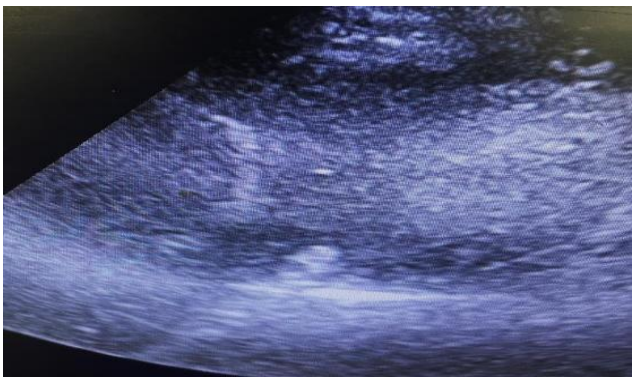

Figure 3: Echocardiography view of pulmonary trunk post mechanical thrombectomy.

The patient was promptly taken in for mechanical thrombectomy, and angiography revealed a significant thrombus at the bifurcation, which extended to the left pulmonary artery branch. Given our patient's risk factors, including thrombocytopenia, mechanical thrombectomy was selected over intravenous thrombolysis. Post-procedure, the patient showed symptomatic improvement with shrinkage of the clot as seen in the repeat echocardiogram and CTPA (Figures 1-4).

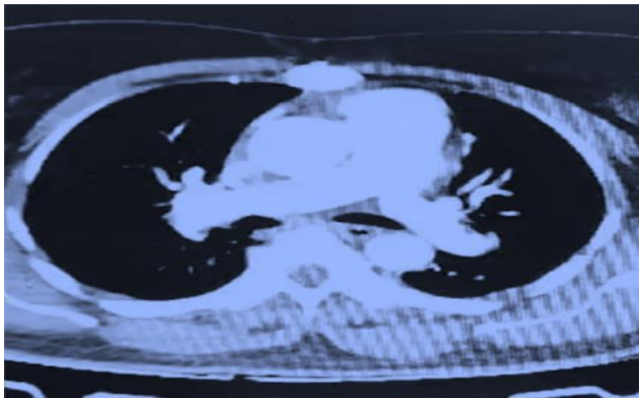

Figure 4: CTPA post mechanical thrombectomy.

DISCUSSION

The incidence of acute PTE is 39 to 115 per 100,000 population annually.[5] It is a common clinical condition with a variable clinical presentation, making the diagnosis challenging. PTE occurs when a thrombus originates elsewhere and disrupts blood flow in the pulmonary artery or its branches. Most PTE originate as lower extremity DVTs and they are typically multiple, with the lower lobes being involved more frequently than the upper. Large emboli tend to obstruct the main pulmonary artery, causing saddle embolus with deleterious cardiovascular consequences.

Saddle thrombus is a somewhat unusual finding with a very few case reports on it.[6-9] Patients with massive pulmonary thromboembolism usually presents with hypotension and tachycardia secondary to both left and right ventricular pressure overload. Thrombus detection becomes a major step in the rapid diagnosis and early intervention in PTE. In our patient, we were able to identify the thrombus at the bifurcation of pulmonary artery using echocardiography in parasternal short axis view with probe fanned in cephalic direction focusing on the Right ventricular outflow tract (Figure 1).[10] Echocardiographic identification becomes very crucial especially in situations where CTPA cannot be performed or risky to perform i.e., haemodynamically unstable patients, pregnant females, patients with contrast allergy, resource limited settings and with acute kidney injury.

The main trunk of pulmonary artery and its bifurcation can be wonderfully visualized with transthoracic echocardiography whereas the left pulmonary artery branch may be

difficult to visualize both by transthoracic and transesophageal echocardiography as it is shielded by left main bronchus.[11]

Though the important signs of PTE i.e., McConnell sign of right ventricular mid segment hypokinesia with normal apical contractility, tricuspid and pulmonic regurgitations with elevated right ventricular systolic pressure (RVSP) and RV pressure overload, pulmonary hypertension, D shaped left ventricle cavity with a flattened inter-ventricular septum indirectly indicate the increased RV strain due to a possible obstruction distally in the pulmonary artery, saddle thrombus identification is the only direct sign showing direct visualization PTE at the bifurcation of pulmonary artery ruling out all the other possible causes for right ventricular dilatation.[12]

Echocardiographic signs are specific while lacking sensitivity, in large meta-analysis "right heart strain" (defined as RV dysfunction, RV strain or cor-pulmonale) was 83% specific and 53% sensitive.[12,13] McConnell's sign is commonly associated with acute pulmonary thromboembolism and is 97% specific and 22% sensitive for diagnosis, Casazza et have reported that Mcconnell sign have only 33% specificity for pulmonary embolism "60/60 sign" defined as a tricuspid regurgitation jet gradient of <60 mmHg and a pulmonary acceleration time of <60 msec, carries a pooled specificity of 84%.[12-14]

Patients with large thrombus are prone for rapid haemodynamic instability and need early thrombolysis or mechanical thrombectomy. Along with identification of thrombus, the effectiveness of intervention can also be assessed by regularly screening for the clot burden in the pulmonary artery. In our case, eltrombopag and post-surgery immobilization are the possible risk factors for PTE leading to haemodynamic instability which was identified swiftly as saddle thrombus with the use of echocardiography and proceeded for CTPA confirmation. Mechanical thrombectomy was done and later patient was switched to oral anticoagulants and discharged successfully.

CONCLUSION

Bedside visualization of PTE using transthoracic echocardiography by critical care physicians can help in early identification and intervention saving time and lives.

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