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CASE REPORT

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A decisive lifesaving tool in submassive pulmonary embolism: Bedside echocardiography

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Key Clinical Message

Immediate thrombolysis in submassive pulmonary embolism on the basis of bedside echocardiography can be a lifesaving decision in areas where computed tomography (CT) pulmonary angiogram is not readily available.

Abstract

Bedside echocardiography can be a rapid diagnostic and decision-making tool for immediate thrombolysis in submassive pulmonary embolism with evidence of progressively failing ventricles. We report a case of submassive pulmonary embolism in a 26-year-old male under testosterone replacement therapy, who was successfully thrombolyzed based on bedside echocardiography findings.

KEYWORDS

bedside echocardiography, submassive pulmonary embolism, testosterone replacement therapy, thrombolysis

1 | INTRODUCTION

Pulmonary embolism is a common masquerade in clinical settings ranging from asymptomatic incidental finding to massive life-threatening presentation, mostly arising from deep vein thrombosis of legs in 79% cases.[1] Dyspnea, hypoxemia, chest pain, cough, hemoptysis, and syncope are common clinical presentations of pulmonary embolism. The presence of risk factors like immobility, major surgery, infections, drugs, and inherited thrombophilia with compatible clinical presentations has higher likelihood of pulmonary embolism, which can be ascertained by Well's score.[2]

Despite unclear mechanism, testosterone replacement therapy has been linked to thrombotic presentation such as myocardial infarction and stroke. The predisposition of the testosterone replacement to pulmonary embolism cannot be denied.[3,4]

Thrombotic tendency in testosterone replacement therapy has been attributed to erythropoietic stimulation, secondary polycythemia, hyperviscosity, and high thromboxane A2 density on platelet receptor after use of testosterone. Such an event is mostly seen in first 6 months of its use.[3,5,6]

2 | CASE PRESENTATION

A 26-year-old male presented to the emergency department with history of sudden onset of breathlessness and epigastric pain of 2 h duration. There was no history of fever, cough and vomiting, leg swelling, recent

surgery, and immobilization. On taking detailed history, he revealed taking weekly doses of intramuscular testosterone, which was prescribed for hypogonadism, since last 6 months. He did not have significant family history of thrombophilia or any coagulation disorder.

On arrival at emergency room, he was anxious. His blood pressure was 120/70 mmHg with pulse rate of 180 bpm, regular. He had tachypnea with respiratory rate of 28/min. His saturation measured 70% in room air. He required flow of 10 liters of oxygen per minute to maintain saturation of 94%. He was cyanosed. There was no pallor, icterus clubbing, and lymphadenopathy. On auscultation, he had vesicular breath sounds with no added sounds. S1 and S2 were heard without any murmur. Rest of systemic examination was unremarkable.

On investigations, his electrocardiogram (ECG) revealed sinus tachycardia with heart rate of 166 bpm with S1Q3T3 pattern as shown in Figure 1. Bedside echocardiography showed dilated right chambers and right ventricular dysfunction with thrombus oscillating in right pulmonary artery at the level of bifurcation of main pulmonary artery as shown in Figure 2. His left ventricular ejection fraction was normal. Venous Doppler study of bilateral lower limbs did not reveal thrombus in deep venous system.

His complete blood count showed white blood cell count 18,460/cumm, hemoglobin 15.8 g/dL, and platelet count 168,000/cumm. Renal function test showed urea 1.78 mmol/L, serum creatinine 92.8 µmol/L, sodium 144 meq/L, and potassium 4.6 meq/L. Liver function test showed total bilirubin 15.3 µmol/L, direct bilirubin 1.7 µmol/L, aspartate transaminase 20 U/L, and alanine transaminase 42 U/L. His Covid 19 polymerase chain reaction (PCR) was negative. His troponin I was negative. We could not do intravenous contrast pulmonary angiogram at the time because he was in respiratory distress. Besides, it could not be done immediately in our setting. Considering the potential deterioration of vital signs in no time in the process of computed tomography pulmonary angiogram and evidence of thrombus in right pulmonary artery, we made prompt decision to proceed with thrombolysis on the basis of clinical background and echocardiography finding.

He had good clinical improvement evident by decreased oxygen requirement, tachypnoea, and tachycardia. The thrombus seen in pulmonary trunk in echocardiography also disappeared after thrombolysis. We did computed tomography (CT) pulmonary angiogram next day, and it revealed occluding thrombus in bilateral pulmonary vessels as shown in Figure 3.He was started on low-molecular-weight heparin following thrombolysis and was discharged on Tab Dabigatran 150 mg twice a day. He was advised for tab dabigatran for at least 6 months

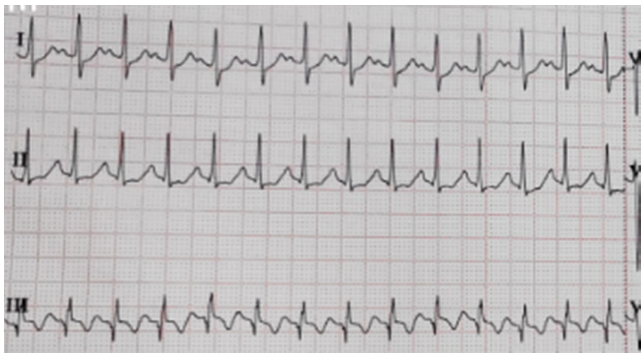

FIGURE 1 Electrocardiogram showing sinus tachycardia with heart rate 166 bpm and S1Q3T3 pattern.

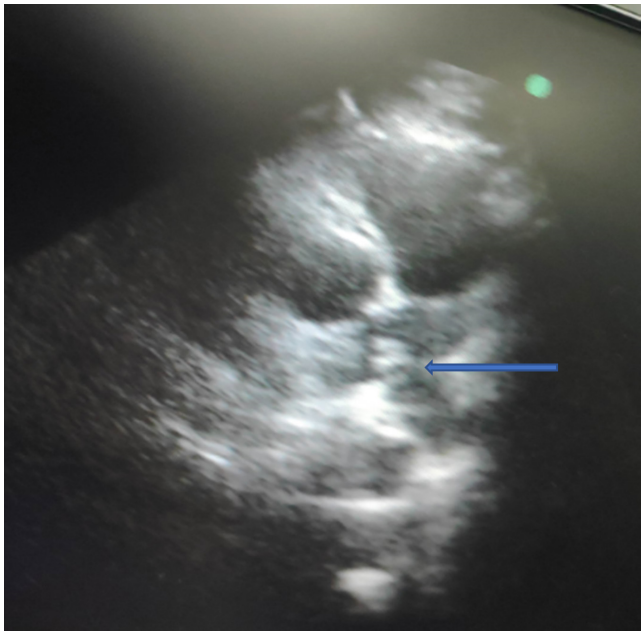

FIGURE 2 Parasternal short axis view in transthoracic echocardiography showing a large thrombus at the level of bifurcation of main pulmonary artery in right pulmonary artery (blue arrow).

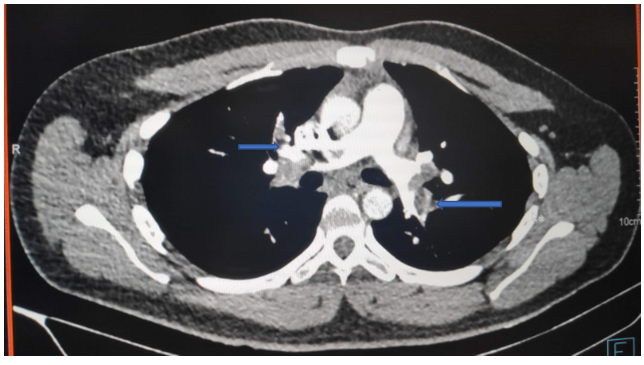

FIGURE 3 Coronal view of computed tomography pulmonary angiogram showing occluding thrombus in bilateral pulmonary vessels (blue arrows).

owing to provoked thromboembolism. We could not send the thrombotic profile for screening any coexisting thrombophilia because of financial reason and unavailability in local settings. In addition, he was treated with anticoagulation, which interfere with the results.

3 | DISCUSSION AND CONCLUSIONS

Pulmonary embolism is obstruction in pulmonary artery, which can be foreign body, fat, air, or thrombus traveling from elsewhere in body. The clinical presentation is often misleading and nonspecific that requires high clinical suspicion. One out of four clinical suspicion only will have pulmonary embolism. Surprisingly, 50% cases of deep vein thrombosis have clinical pulmonary embolism.[7,8]

The presence of hemodynamic instability in form of hypotension, dyspnea, and right ventricular dysfunction suggests massive pulmonary embolism, which occurs in 5–10 percent of cases. It is associated with the occlusion of at least 60 percent of area of pulmonary trunk, which results in acute rise in right ventricular pressure and right ventricular dysfunction. While submassive pulmonary embolism, which occurs in 20–25% cases, compensate the pulmonary arterial obstruction, and systemic blood pressure is maintained.[9]

Dyspnea at rest or exertion followed by pleuritic chest pain, cough, orthopnea, calf pain, wheezing and hemoptysis are the common clinical features of symptomatic pulmonary embolism.[8]

About 79% cases of pulmonary embolism have the origin of thrombus in leg veins. If such evidence is not found in leg veins, the whole of thrombus might have dislodged and embolized to lungs.[1] We did not find evidence of deep vein thrombosis in leg veins in our case. In current scenario, the rate of pulmonary embolism in covid 19 cases has been higher than non-covid cases approaching incidence as high as 30%.[10] Our case did not have usual symptoms of covid 19, and covid 19 PCR test was negative. The only obvious risk factor that could be attributed in our case was the testosterone replacement therapy.

Although the mechanism of the thrombosis is not clear in testosterone therapy, it has been attributed to testosterone-induced erythropoietic stimulation, consecutive polycythemia and hyperviscosity, and increase in thromboxane A2 receptor density on platelets. The thrombotic event especially venous thromboembolism was seen higher in first 6 months of treatment. So, use of testosterone replacement needs shared decision-making with patient in view of risk of thromboembolism.[4–6,11]

The diagnosis of pulmonary embolism depends on compatible clinical history and evidence of thrombus on imaging. The role of D-dimer is on excluding diagnosis rather than ruling in the diagnosis. The low clinical pretest probability and D-dimer value less than 1000 ng/mL can safely exclude pulmonary embolism. Ruling out pulmonary embolism in moderate clinical test probability and D-dimer less than 500 ng/mL is also appropriate.[12]

Electrocardiogram shows sinus tachycardia, most common finding. Incomplete or complete right bundle branch block, T wave inversion in right precordial leads, right axis deviation, and S1Q3T3 are some ECG findings that may suggest RV strain in pulmonary embolism in clinically compatible cases. Our case had sinus tachycardia with S1Q3T3 pattern. Although S1Q3T3 pattern is considered classic pattern in ECG, its reported incidence is variable ranging from 10% to 50%. These ECG findings have low sensitivity and are less useful in clinical use for diagnostic purpose.[13]

Well's score has been found an effective and better scoring system than Geneva scoring to categorize into clinical pretest probability—low, intermediate, and high probability.[14] Our case had intermediate pretest probability of pulmonary embolism based on heart rate of more than 100 bpm and likely clinical diagnosis of pulmonary embolism (PE). The cases with moderate and high pretest probability should be investigated with contrast-enhanced pulmonary angiogram, which may not be easily and readily available everywhere. As in our case, we could do CT pulmonary angiogram next day because it wasn't available at the time. Spiral CT pulmonary angiogram has sensitivity of 87% compared to 65% sensitivity of V-Q scan, which is even more rarely available.[15]

The crux of problem lies on the availability and feasibility of the imaging in resource-limited settings. Bedside transthoracic echocardiography may detect the right ventricular hypokinesis in 92% cases if 30 percent or more area of lung is not perfused. In addition, Mc Connel sign, right ventricular hypokinesia with sparing of right ventricular apex, has sensitivity of 77%, specificity of 94%, positive predictive value of 71%, and negative predictive value of 96%.[16] High specificity and negative predictive value of this finding can be useful to differentiate RV hypokinesia of pulmonary embolism from other causes of pulmonary hypertension. Despite lower sensitivity of the echocardiography findings, the bedside echocardiography finding of right ventricular dilatation can be a useful tool to detect pulmonary embolism in moderate-to-high risk probability cases in emergency settings. Detection of thrombus in major pulmonary vasculature is a rare finding in echocardiography, which was seen in our case.[16,17]

Untreated clinical pulmonary embolism has mortality rate of 11% to 23% and untreated proximal deep vein thrombosis (DVT) has clinical PE in 26%–67% cases. Under treatment, the incidence of clinical PE decreases to 5% and mortality to less than 1%.[18] Some point out the mortality rate in diagnosed and treated acute pulmonary

embolism to be about 8%. 10% of acute PE die suddenly. Two out of three die within 2 h of presentation.[2]

Anticoagulation remains cornerstone therapy for all cases while thrombolysis has role in limited setting especially in case of massive pulmonary embolism only. Patients who are young, not on dual antiplatelet therapy and have normal renal function are considered to have low risk of bleeding. When the contraindications of thrombolysis are absent, thrombolysis is a good option in submassive pulmonary embolism that are expected to deteriorate soon with hemodynamic compromise.[19] Choice of thrombolysis in submassive or intermediate risk pulmonary embolism needs individualization of cases. On contrary, it acts as medical embolectomy and is the first standard of choice in massive pulmonary embolism. We proceeded immediately with thrombolysis in our case because of low risk of bleeding, potential for deterioration, presence of RV dysfunction, visible thrombus on pulmonary vessel on echocardiography. The patient improved clinically and was discharged on long-term anticoagulation. The preferred agent for thrombolysis is alteplase 100 mg intravenous infusion over 2 h followed by intravenous heparin infusion provided activated partial thromboplastin time (aPTT) is less than 80 s. Such thrombolysis can be done up to 14 days.[19] However, we did thrombolysis with streptokinase because it is cheaper than alteplase and is easily available. Besides, streptokinase has been a traditional agent used with good experience and results. In either of cases of massive or submassive pulmonary embolism, thrombolysis has been shown better than heparin infusion alone in outcome. These agents lyse thrombi in major pulmonary vessels and relieve acute right ventricle pressure overload, hence relieving hemodynamic compromise. The dose used in our case was 2.5 lakh unit intravenous bolus followed by 1 lakh unit/hour for 12 h.[20]

4 | CONCLUSIONS

Testosterone replacement therapy rarely presents with life-threatening submassive pulmonary embolism. Bedside echocardiography in presence of plausible clinical scenario can be a lifesaving decision-making bedside tool in resource-limited settings where availability of pulmonary angiogram may be time consuming or nonfunctioning. History of androgens intake can be a clinical clue to diagnose pulmonary embolism in absence of classical risk factors of thrombosis.

AUTHOR CONTRIBUTIONS

Shambhu Khanal: Conceptualization; data curation; resources; writing – original draft. **Suman Adhikari:** Conceptualization; writing – original draft. **Vijay Yadav:** Data curation; resources. **Savita Aryal:** Data curation; investigation; resources. **Shreya Thapa:** Data curation; resources; writing – review and editing. **Ratna Mani Gajurel:** Conceptualization; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest regarding publication of this case report.

DATA AVAILABILITY STATEMENT

Data related to the case report can be made available on request.

ETHICS STATEMENT

Need for ethical approval was waived. Consent from the patient deemed to be enough.

CONSENT

Written informed consent was taken from the patient for the publication of the case report. A copy of the consent form will be available for review if asked by editor in chief of journal.

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