

Case Report

Supraventricular Tachycardia Complicating Pulmonary Embolism

Esam Amer*¹ and Conor Rainey²

*¹ Emergency Medicine Consultant Colchester General Hospital, East Suffolk and North Essex Foundation Trust (ESNEFT)

² ST1 ACute Care Common Stem Trainee, Colchester General Hospital, East Suffolk and North Essex Foundation Trust (ESNEFT)

***Corresponding author:** Esam Amer MBChB, MRCP (UK) (ACUTE MEDICINE), MRCEM, FRCEM, EBCEM, DOccMED, Emergency Medicine Consultant Colchester General Hospital, East Suffolk and North Essex Foundation Trust (ESNEFT).

Abstract

Background: Supraventricular tachycardia (SVT) is a common cardiac dysrhythmia originating from the atria, characterised by a narrow QRS complex (<120 ms) and a ventricular rate >100 bpm on ECG. While SVT can be an independent entity, it can also result from various triggers such as structural heart disease, thyroid abnormalities, electrolyte imbalances, infection, caffeine, and alcohol excess. This case report highlights pulmonary embolism (PE) as a rare yet significant cause of SVT. Early recognition and treatment of PE in such clinical scenarios are essential for preventing complications and improving outcomes.

Case Presentation: We describe a 53-year-old male brought in by ambulance to the emergency department with a heart rate of 200 beats per minute, palpitations, and chest tightness. Despite attempts with vagal manoeuvres and AV node-blocking medications, SVT persisted. Considering the patient's limited mobility from a bilateral knee replacement and recent long-haul flight, a decision was made to perform a CT pulmonary angiography (CTPA) that confirmed the presence of bilateral small pulmonary emboli.

Discussion: PE as a cause of SVT is uncommon but crucial to consider in the evaluation of persistent tachycardia. This case emphasizes the need for a high index of suspicion and thorough investigation, especially when common treatments show limited efficacy. Recognition and management of PE are pivotal in preventing complications and mortality.

Conclusion: This case study aims to raise awareness of the potential association between pulmonary embolism and persistent supraventricular tachycardia. Clinicians should remain vigilant in recognizing this

rare but critical connection, especially when conventional treatments prove inadequate. Early diagnosis and intervention for pulmonary embolism can significantly impact patient outcomes.

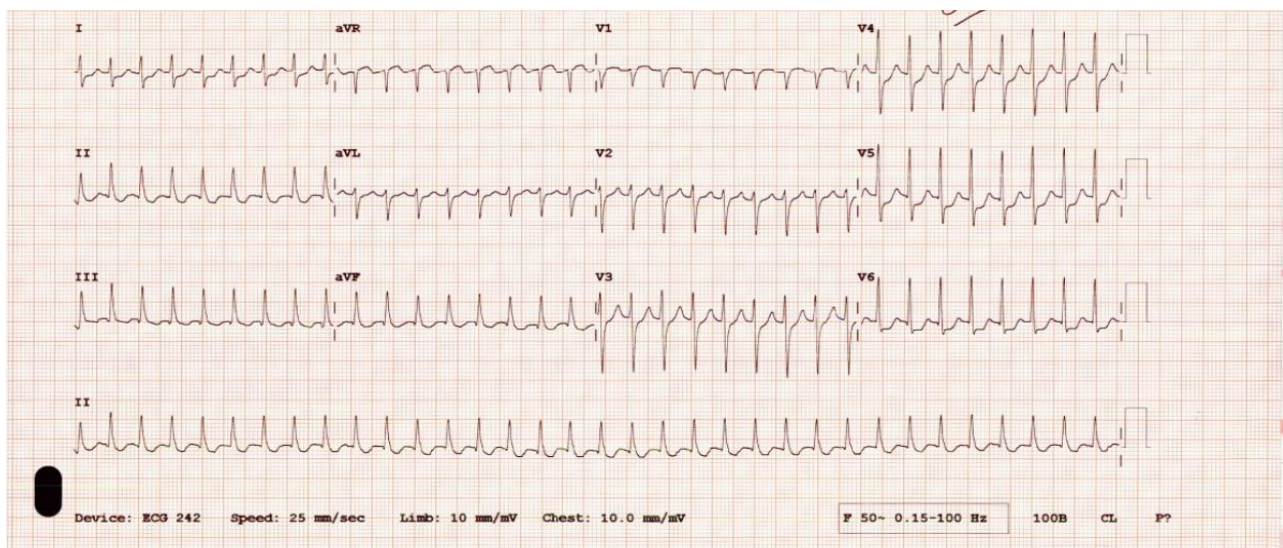
Introduction

This report presents a case of supraventricular tachycardia complicating undiagnosed pulmonary embolism. The patient's presentation with persistent supraventricular tachycardia and the limited response to conventional treatment prompted further investigation, leading to the diagnosis of pulmonary embolism. Pulmonary embolism is a serious condition wherein a blood clot obstructs the lung arteries, and the clot often originates from the leg veins also known as deep vein thrombosis. This case highlights the importance of considering pulmonary embolism in the differential diagnosis of tachycardia, especially when standard treatments are ineffective.

Case Report

A 53-year-old male presented to the emergency department with chest tightness, palpitations, and dizziness. He arrived by ambulance with a heart rate of around 200 beats per minute. He had no significant past medical history except for a bilateral knee replacement 5 years ago and a recent 8-hour long-haul flight to Abu Dhabi. On examination, there were no notable findings and apart from the heart rate the rest of the vital signs were within normal parameters. A 12-lead ECG confirmed the diagnosis of supraventricular tachycardia (SVT). The patient temporarily responded to vagal manoeuvres, such as carotid massage and modified Valsalva, but the SVT quickly returned. A trial of oral sotalol was also used with no response.

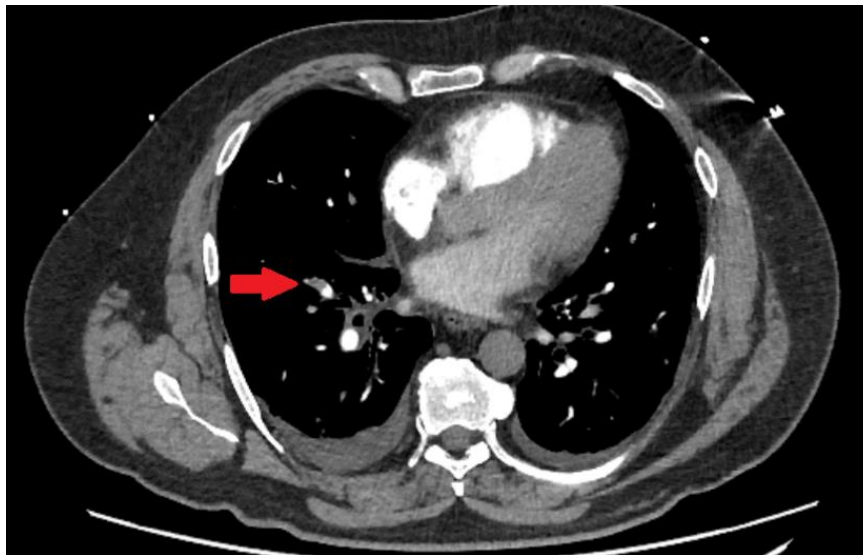
Figure 1: ECG of the patient, demonstrating SVT.

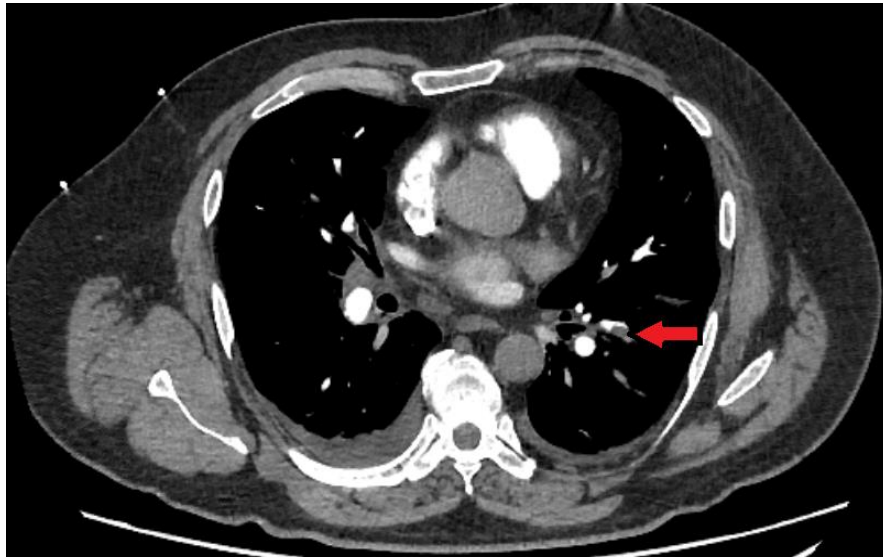


Due to the persistent SVT and limited response to vagal manoeuvres and medication, further investigation was needed. The chest X-ray was normal, and point-of-care transthoracic echocardiography (POCUS) showed no signs of right ventricular strain, LV systolic dysfunction or pericardial effusion. Blood tests revealed normal electrolyte levels, thyroid function, and no markers of inflammation. Considering the patient's limited mobility from the knee replacements and recent long-haul flight (PERC rule of two and Well's score of 4.5), a CT pulmonary angiogram was performed. It confirmed small bilateral pulmonary embolisms (PE) without features of right heart strain. The patient was started on anticoagulation and admitted under the medical team, followed by a cardiology consultation.

The cardiology review concluded that the pulmonary embolism was attributed to the patient's limited mobility and recent long flight. The patient was started on a direct-acting oral anticoagulant (DOAC) and scheduled for an outpatient echocardiogram and electrophysiology study, with the possibility of ablation.

Figure 2: Images demonstrating bilateral inferior segmental pulmonary embolism





Discussion

It should be noted that pulmonary embolism can manifest with various clinical features, and the diagnosis can be easily overlooked. Pulmonary embolism presenting as supraventricular tachycardia is uncommon but should be considered when investigating persistent tachyarrhythmias¹. This case underscores the significance of recognising subtle risk factors, such as recent surgeries and travel history, which may contribute to venous thromboembolism. Diagnostic tools, including chest X-rays, blood tests, and decision-aid tools like the PERC Rule² and Well's Score³, are crucial in predicting the pretest likelihood of pulmonary embolism.

Table 1: PERC rule.

Pulmonary Embolism Rule-out Criteria Rule (PERC)	
Rules out Pulmonary embolism if NO criteria are present and pre-test probability \leq 15%	
<ul style="list-style-type: none">• Age \geq 50• HR \geq 100• Oxygen saturation on room air $<$ 95%• Prior history of DVT or PE• Recent trauma or surgery• Haemoptysis• Exogenous Oestrogen• Unilateral leg swelling	

Table 2: Two-level Wells Score for PE

Clinical Feature	Points
Clinical signs and symptoms of DVT	+3
PE is the #1 diagnosis OR equally likely	+3
Heart rate $>$ 100	+1.5
Immobilisation at least 3 days OR surgery in the previous 4 weeks	+1.5
Previous, objectively diagnosed PE or DVT	+1.5
Haemoptysis	+1
Malignancy w/ treatment within 6 months or palliative	+1

Clinical features of pulmonary embolism

Pulmonary embolism can present with a variety of symptoms that include chest pain, shortness of breath, cough, haemoptysis, palpitations, light-headedness and excessive sweating. It is worth noting that not all patients will have those symptoms, and some will present with atypical symptoms or no symptoms at all.

Clinical examination findings for pulmonary embolism are non-specific and they include the presence of a fast heart rate, unexplained hypoxia, cardiac arrhythmia on ECG and the presence of leg deep vein thrombosis (DVT).

Workup and Diagnosis

The diagnosis of pulmonary embolism, as with any vascular emergency, requires a high index of suspicion. This typically involves a combination of clinical assessment, blood tests, and the use of decision-aid tools such as the Pulmonary Embolism rule-out criteria (PERC Rule) and the Pulmonary Embolism Well's Score.

Both the PERC rule and Well's score play a crucial role in enhancing pretest probabilities for suspected pulmonary embolism. They facilitate communication with the duty radiologist to authorise the confirmatory test for pulmonary embolism, which is the CT pulmonary angiogram (CTPA).

Risk stratification of pulmonary embolism

Given that not all patients with suspected pulmonary embolism necessitate immediate medical admission and same-day CT pulmonary angiogram, risk stratification is essential to determine suitable candidates for outpatient management. The Hestia Criteria⁴ for Outpatient Pulmonary Embolism Treatment serves as a valuable tool to identify low-risk patients who can be discharged home on anticoagulants pending a CT pulmonary angiogram. However, the Hestia Criteria has limitations in predicting the high-risk group of patients.

The use of certain blood biochemical markers such as the high sensitivity troponin and Pro-BNP alongside point-of-care transthoracic echocardiography (POCUS) looking for signs of right heart strain can help in identifying those who fall under the intermediate high-risk category of patients⁵.

In addition to occasionally visualising the thrombus in the right ventricle on Echocardiography other features suggestive of right ventricular strain include right ventricular enlargement, McConnell's sign, interventricular septal flattening and paradoxical septal motion⁶.

According to one study, it is estimated that about 31% of normotensive patients with acute pulmonary embolism have right ventricular strain⁷.

Depending on the size and location of the clot within the pulmonary arteries (also known as the clot burden) and the presence or absence of right heart strain, pulmonary embolism can potentially be fatal.

Table 3: Hestia Criteria (Hestia criteria: If “Yes” to ANY of the above criteria, the patient is deemed not suitable for Outpatient management)

Hemodynamically unstable	Yes	No
Thrombolysis or embolectomy needed	Yes	No
Active bleeding or high risk for bleeding	Yes	No
>24 hrs on supplemental oxygen required to maintain SaO ₂ >90%	Yes	No
PE diagnosed while on anticoagulation	Yes	No
Severe pain needing IV pain medication required >24 hr	Yes	No
Medical or social reason for admission >24 hr	Yes	No
Creatinine clearance <30 mL/min	Yes	No
Severe liver impairment	Yes	No
Pregnant	Yes	No
Documented history of heparin-induced thrombocytopenia (HIT)	Yes	No

Treatment of pulmonary embolism

Treatment of pulmonary embolism is tailored on a case-by-case basis. Anticoagulation therapy forms the primary intervention to prevent clot propagation. In specific instances, the administration of thrombolytic therapy or the insertion of an inferior vena cava filter (IVC filter) may be suitable for a particular cohort of patients. The choice of treatment depends on the clinical presentation and often involves a multidisciplinary team.

Conclusion

Supraventricular tachycardia complicating pulmonary embolism necessitates a comprehensive approach to diagnosis and management. Clinicians should maintain a high index of suspicion, particularly in cases where standard treatments are ineffective. Early diagnosis and risk stratification are essential to guide appropriate interventions, emphasizing the need for a multidisciplinary approach in patient care. This case report aims to enhance awareness of the potential link between pulmonary embolism and persistent supraventricular tachycardia.

References:

1. Mendoza JAF, Nieto JAC, Benitez JR, Gallardo I, Aguilera D, Jaime JF. SUSTAINED VENTRICULAR TACHYCARDIA AS AN INITIAL PRESENTATION OF COVID-19 RELATED PULMONARY EMBOLISM DESPITE PREVIOUS RIVAROXABAN THERAPY. *J Am Coll Cardiol.* 2022 Mar 8;79(9):2335. doi: 10.1016/S0735-1097(22)03326-5. Epub 2022 Apr 1. PMID: PMC8972343.
2. Read by QxMD. (n.d.). Prospective multicenter evaluation of the pulmonary embolism rule-out criteria. [online] Available at: <https://read.qxmd.com/read/18318689/prospective-multicenter-evaluation-of-the-pulmonary-embolism-rule-out-criteria?redirected=slug> [Accessed 26 Mar. 2024].
3. Wells PS, Anderson DR, Rodger M, Stiell I, Dreyer JF, Barnes D, Forgie M, Kovacs G, Ward J, Kovacs MJ. Excluding pulmonary embolism at the bedside without diagnostic imaging: management of patients with suspected pulmonary embolism presenting to the emergency department by using a simple clinical model and d-dimer. *Ann Intern Med.* 2001 Jul 17;135(2):98-107. doi: 10.7326/0003-4819-135-2-200107170-00010. PMID: 11453709.
4. Zondag W, Mos IC, Creemers-Schild D, Hoogerbrugge AD, Dekkers OM, Dolsma J, Eijsvogel M, Faber LM, Hofstee HM, Hovens MM, Jonkers GJ, van Kralingen KW, Kruijper MJ, Vlasveld T, de Vreede MJ, Huisman MV; Hestia Study Investigators. Outpatient treatment in patients with acute pulmonary embolism: the Hestia Study. *J Thromb Haemost.* 2011 Aug;9(8):1500-7. doi: 10.1111/j.1538-7836.2011.04388.x. PMID: 21645235.
5. Janisset L, Castan M, Poenou G, Lachand R, Mismetti P, Viallon A, Bertoletti L. Cardiac Biomarkers in Patients with Acute Pulmonary Embolism. *Medicina (Kaunas).* 2022 Apr 14;58(4):541. doi: 10.3390/medicina58040541. PMID: 35454379; PMCID: PMC9025162.
6. Chen JY, Chao TH, Guo YL, et al. A simplified clinical model to predict pulmonary embolism in patients with acute dyspnea. *Int Heart J.* 2006;47:259–271.
7. Grifoni, S., Olivotto, I., Cecchini, P., Pieralli, F., Camaiti, A., Santoro, G., Conti, A., Agnelli, G. and Berni, G. (2000). Short-Term Clinical Outcome of Patients With Acute Pulmonary Embolism, Normal Blood Pressure, and Echocardiographic Right Ventricular Dysfunction. *Circulation*, 101(24), pp.2817–2822. doi:<https://doi.org/10.1161/01.cir.101.24.281>

Citation: Esam Amer, Arch Med Clin Case Stud, “*Supraventricular Tachycardia Complicating Pulmonary Embolism*”. 2024; 2(1): 110

Received Date: April 09, 2024; Published Date: April 22, 2024

Copyright: © 2024 Esam Amer. This is an open-access article distributed under the terms of the Creative Commons Attribution License.