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Case Report

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Expanding the discussion on fibrinolytic contraindications

Ertan SÖNMEZ[1], **Serdar ÖZDEMİR**[2,*], **Bedia GÜLEN**[1], **Bahadır TAŞLIDERE**[1], **Ayşe Büşra ÖZCAN**[1]

[1]Department of Emergency Medicine, School of Medicine, Bezmialem Vakıf University, Istanbul, Turkey
[2]Clinic of Emergency Medicine, University of Health Sciences İstanbul Ümraniye Training and Research Hospital, Istanbul, Turkey

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Abstract
The European Resuscitation Council Guidelines recommend the administration of fibrinolytic therapy when acute pulmonary embolism is a known or suspected cause of cardiac arrest. However, contraindications that limit the use of fibrinolytics are sometimes challenged by clinicians, including head trauma in the previous three weeks. We report on the successful use of rescue fibrinolytic therapy on a patient with acute head trauma who had a cardiac arrest in the emergency department as a result of a pulmonary embolism (PE). To the best of our knowledge, this is the first case of successful fibrinolytic therapy for a patient with acute head trauma in the literature.

Keywords: cardiopulmonary resuscitation, pulmonary embolism, resuscitation, thrombolytic therapy

1. Introduction

Pulmonary embolism (PE) is a pulmonary emergency that is often difficult to diagnose and sometimes fatal within a short time. In the treatment of patients with PE-related cardiac arrest or near to cardiac arrest, 50mg IV tissue plasminogen activator (Alteplase) bolus can be given for two minutes. The dose can be repeated after 15 minutes if the return of spontaneous circulation (ROSC) is not achieved (1).

Potentially fetal bleeding complications of systemic fibrinolytic therapy in acute PE are an important limiting factor. One of the absolute contraindications is recent head trauma (<3 weeks) (2). However, for a patient who has undergone cardiopulmonary resuscitation (CPR), fibrinolytic therapy may be the only option.

We present a patient with head trauma who had recurrent cardiopulmonary arrest associated with PE and was successfully resuscitated with rescue fibrinolytic therapy, followed by discharge from the hospital without complications. To our knowledge, this is the first case of successful fibrinolytic therapy in a PE-induced cardiopulmonary arrest patient with severe acute head trauma.

2. Case

A 72-year-old female patient was admitted to the emergency department with syncope, chest pain, and head trauma. She fell from her height (158cm tall) uncontrollably and hit her head on the concrete floor, creating a 2-cm incision on her right eyebrow. Her Glasgow Coma Scale was 14, vital signs were unstable (blood pressure: 85/47 mmHg; pulse: 112 beats/min. rhythmic; O_2 saturation: 78%). When we did a point-of-care ultrasound, the right ventricle was seen dilated with tricuspid regurgitation. She had a right branch block, an s1q3t3 pattern, and sinus tachycardia on her electrocardiogram (Fig. 1).

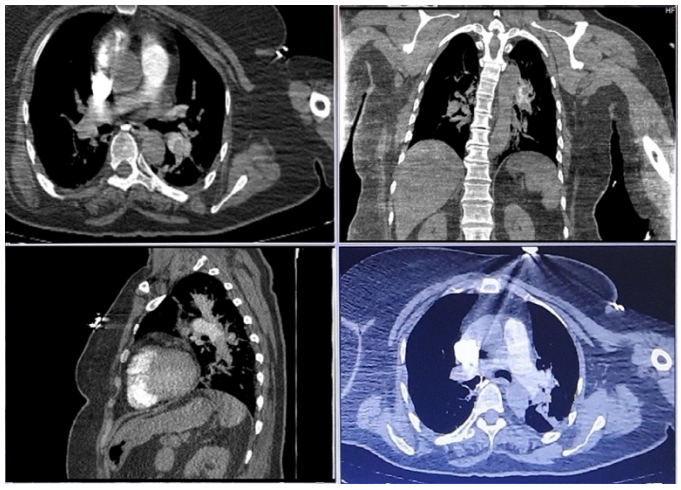

Fig. 1. Arrows show the PE settling on the main pulmonary artery branches

We excluded other causes of hypotension with ultrasonography (USG). However, due to the lack of deep vein thrombosis and the patient's acute head trauma, we did not want to give fibrinolytic therapy without brain and pulmonary computerized tomography (CT) angiography scanning. Moreover, the emergency department had an easily accessible CT. After the diagnosis was made, the patient suffered sudden cardiac arrest. The ROSC was achieved after two cycles of CPR. We stabilized the patient with a positive

* Correspondence: dr.serdar55@hotmail.com

inotropic agent and conducted CT scanning. The patient went into cardiac arrest again, and we started CPR. There was no bleeding, contusion, or similar pathology in the brain tomography, but there was a massive pulmonary embolism in the chest tomography (Fig. 2).

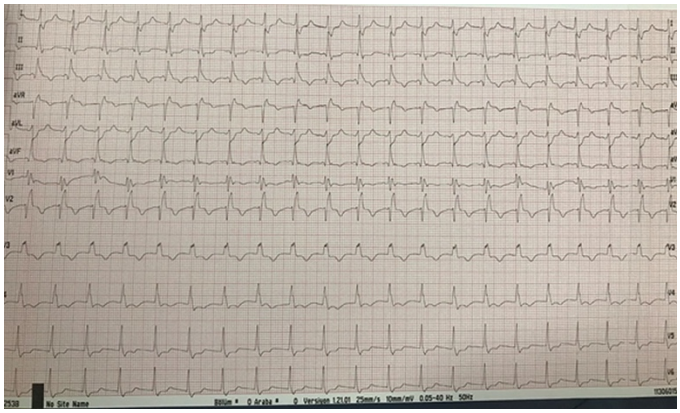

Fig. 2. This ECG with the finding of s1q3t3 is extremely specific for pulmonary embolism

We applied an Alteplase 50-mg bolus therapy for 15 minutes and gave her a 50-mg infusion for 1.5 hours. The ROSC was achieved in the third cycle. After 15 minutes of the Alteplase bolus, her blood pressure increased to a normal level. We saw no intracerebral hemorrhage as a complication. She was discharged with warfarin treatment six days later without any neurological sequelae. A detailed statement that written patient consent/next of kin is present.

3. Discussion

PE is the cause of 2–9% of out-of-hospital and 5–6% of in-hospital cardiac arrests (1-3). Different methods are chosen according to the clinical conditions and risk factors of the patients at the stage of diagnosis. Differential diagnoses in clinical probability high-risk PE include acute valve dysfunction, cardiac tamponade, acute coronary syndrome, and aortic dissection. In these situations, the most useful initial test is bedside transthoracic echocardiography, which will provide evidence of acute pulmonary hypertension and right ventricular (RV) dysfunction if acute PE is the cause of the patient's hemodynamic decompensation. In a hemodynamically unstable patient, echocardiographic evidence of RV dysfunction is sufficient to order reperfusion therapy immediately without further testing. As soon as the patient can be stabilized with supportive therapy, the diagnosis should be confirmed with CT angiography (2).

A trained emergency department clinician can easily identify findings suggestive of PE, such as deep venous thrombosis, right heart thrombus, increased pulmonary artery or right ventricle pressures, RV dilatation, tricuspid regurgitation, and interventricular septal deviation, with the help of point-of-care ultrasound (3, 4). Early relief of pulmonary obstruction leads to a rapid decrease in pulmonary artery pressure/resistance and a concomitant improvement in RV function (2).

Meta-analyses have shown that RV dysfunction, when detected by echocardiography, is associated with increased short-term mortality, even in those who are not hemodynamically unstable (5). In our case, we excluded the other causes of hypotension with an echocardiographic examination. The RV cavity was dilated with the absence of diastolic paradox wall motion, and the bilateral lower extremity doppler USG was negative. The patient's acute head trauma caused concern about giving fibrinolytic therapy without brain and pulmonary CT angiography scanning. However, there was an easily accessible CT in the emergency department.

Primary reperfusion therapy, especially in systemic fibrinolysis, is the preferred treatment for patients with high-risk PE. In-hospital mortality associated with PE is lower for unstable patients receiving fibrinolytic therapy compared to those who do not (5). Those who are unsuitable for fibrinolysis can be treated with surgical embolectomy or percutaneous catheter-directed therapy (2). However, systemic fibrinolysis may be the only option in CPR patients or in hospitals where such treatment options are not available, despite its contraindications. Although our hospital has a cardiovascular surgery team that can perform mechanical thrombectomy, we did not want to waste time, as it would take time to prepare the team, and we preferred systemic fibrinolysis. The European Society of Cardiology's 2014 PE guidelines (5) suggest that many fibrinolytic contraindications should be considered relative in life-threatening high-risk PE patients, this recommendation is not in their 2019 guidelines (2).

Absolute contraindications to systemic fibrinolytic therapy in acute PE include hemorrhagic stroke or a history of unknown stroke, ischemic stroke in the previous six months, major trauma, surgery, head trauma in the previous three weeks, bleeding diathesis, central nervous system neoplasm, and active bleeding (6). Fibrinolytic therapy has a risk of major bleeding, including intracranial hemorrhage. An analysis of the collected data from studies using various fibrinolytic agents and regimens showed that intracranial bleeding rates were reported between 1.9% and 2.2% (6). Advanced age and the presence of comorbidities are associated with the risk of bleeding complications (7). The use of low-dose recombinant tissue plasminogen activator was proven safe in a moderate PE setting in one study, and similar results were reported in another study in 118 patients with hemodynamic instability with massive PE (8,9).

Geriatric Triage Criteria (age ≥ 70 years) consider falling from any height, including standing, with evidence of traumatic brain injury severe head trauma (10). The patient had complained of syncope with serious head trauma, and she was of advanced age. No complications developed either during or after fibrinolytic therapy.

In one case report, a cardiopulmonary arrest because of

massive PE occurred in a patient who had been operated on for glioblastoma multiforme 20 days prior. Treatment included administering a 50-mg Alteplase bolus after 10 minutes of CPR and within minutes, and the ROSC was achieved. No bleeding complication developed in the patient (11).

As a result of the reported data and an analysis of the available literature, it is emphasized that the last surgery should be evaluated as a relative rather than an absolute contraindication for thrombolysis (12).

We believe that fibrinolytic contraindications in acute trauma patients merit further discussion because it seems that some absolute contraindications may be ignored in certain cases, and some patients may be treated without complications. However, because few complicated cases have been published, it is difficult at this time to reach a definitive interpretation of this situation. Nevertheless, it may be reasonable to ignore complication risks in high-risk patients.

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