Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Cardiology

Interest of Tenecteplase in Thrombolysis of Pulmonary Embolism: A Case Report

Hanaa Amchaarou[1*], Mohamed EL Minaoui[1]

[1]MD, Cardiology Department University Hospital Agadir, Faculty of Medicine & Pharmacy Ibn Zohr University, Agadir, Morocco

DOI: 10.36347/sjmcr.2022.v10i11.004 | **Received:** 11.09.2022 | **Accepted:** 14.10.2022 | **Published:** 05.11.2022

***Corresponding author:** Hanaa Amchaarou
MD, Cardiology Department University Hospital Agadir, Faculty of Medicine & Pharmacy Ibn Zohr University, Agadir, Morocco

Abstract **Case Report**

Pulmonary embolism is one of the most common and serious symptoms of venous thromboembolic disease. It is a potentially fatal condition associated with significant morbidity and mortality, and because of that, rapid and effective management is very important. Fibrinolytic treatment is a major step in the therapeutic process, principally in intermediate to high-risk forms. Through this case and a review of the literature, we will discuss the interest in thrombolysis by tenecteplase in intermediate-high-risk pulmonary embolism. A 42 years old, taxi driver, chronic smoker, with a family history of treated deep vein thrombosis, was admitted with acute respiratory distress leading to the discovery of a high intermediate-risk pulmonary embolism. sPESI score was 4 points. High-sensitive cardiac troponin I was elevated to 23 times the normal value. Echocardiography revealed an acute pulmonary heart with low cardiac output at 2,24 l/min and a cardiac index of 1,25 L/min/m2, with no visualizable thrombus. The patient underwent urgent thrombolysis with tenecteplase with a very good clinical evolution. No precipitating factors were identified. Etiological investigation revealed a protein C deficiency. The patient is put on vitamin K antagonist for life with close monitoring of the INR. This case demonstrates that even though tenecteplase is not currently approved for the treatment of acute pulmonary embolism according to current guidelines, it is a promising treatment for patients with intermediate or high- risk forms with remarkable efficacy and safety.

Keywords: Pulmonary embolism, thrombolysis, high or high intermediate risk, efficacity, safety.

Introduction

Pulmonary embolism is one of the most frequent and serious symptoms of venous thromboembolic disease. It is a potentially fatal condition associated with significant morbidity and mortality [1], and because of that, rapid and effective management is very important. Fibrinolytic treatment is the cornerstone in the therapeutic arsenal when it comes to severe pulmonary embolism [2], but its place in patients at intermediate risk is still subject to debate. Through our case and a literature review, we discuss the interest in thrombolysis by tenecteplase in high intermediate-risk pulmonary embolism patients.

Case Report

A 42-year-old professional taxi driver with a history of long-time smoking and no recent COVID infection. He also has a brother who was treated for an episode of deep vein thrombosis. The patient was seen for class III dyspnea of the NYHA classification, which progressed over 14 days to class IV. At his admission the patient is conscious, blood pressure was 99/73 mm Hg, heart rate was 143 beats/min, respiratory rate was 33 breaths/min, and oxygen saturation was 84%. Cardiovascular and pulmonary examination revealed no abnormalities, including no clinical signs of heart failure. In addition, no clinical signs of deep vein thrombosis were found.

An emergency CT angiography showed bilateral proximal pulmonary embolism extended to segmental and subsegmental lobar branches (Figure 1).

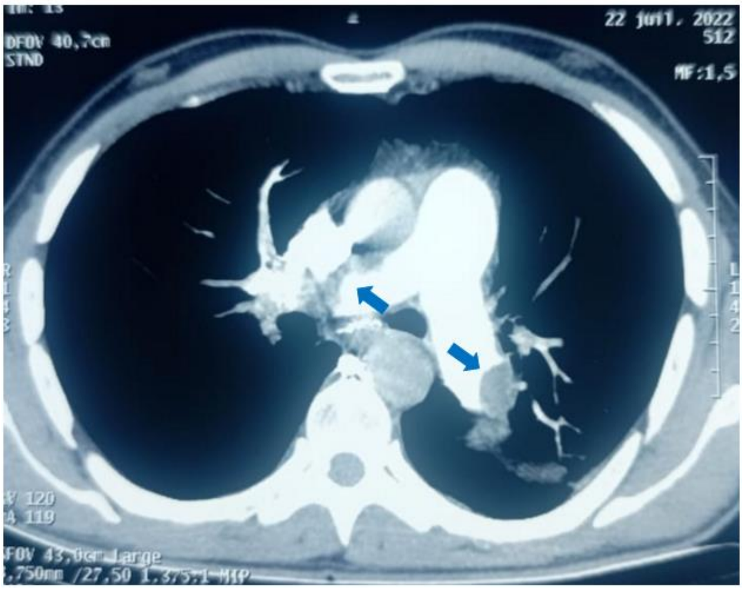

Figure 1: Proximal pulmonary embolism of both pulmonary arteries

sPESI score was 4 points. High-sensitive cardiac troponin I was elevated to 23 times the normal value (normal value at 138 ng/l). Transthoracic echocardiography revealed a dilated right ventricle with impaired function, paradoxical septum, and pulmonary hypertension at 58 mmHg; with precarious hemodynamics documented by low cardiac output of 2,24 l/min and a cardiac index of 1.25 L/min/m2, no visualizable thrombus was found.

Regarding to the risk status of the patient (high intermediate) and the poor hemodynamic status, the decision to administer tenecteplase, the only thrombolytic we have in our hospital, was taken in combination with heparin therapy. The evolution was marked clinically by the progressive improvement of the respiratory patient's state; he was weaned off oxygen ten days later. The patient remained hemodynamically stable throughout the hospital stay with improvement in cardiac output on ultrasound control performed the day after thrombolysis to 3,3 l/min. Radiologically, a CT angiography control performed 20 days later showed permeability of the pulmonary arteries with a clear regression of the thrombotic burden (Figure 2).

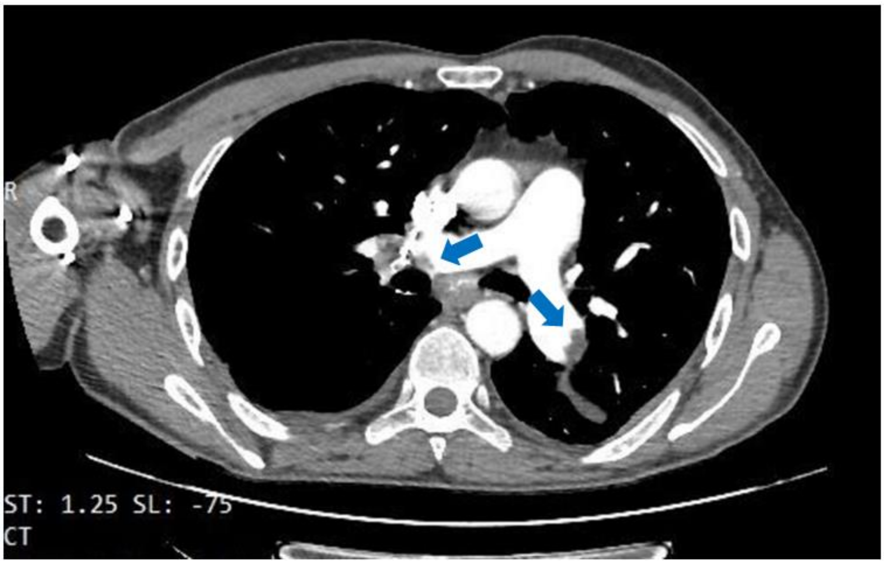

Figure 2: Post-thrombolysis scan control of pulmonary embolism

No precipitating factors were identified in our patient. On the other hand, the etiological investigation revealed a protein C deficiency. The patient is put on AVK for life with close monitoring of the INR.

DISCUSSION

Thrombolytics used for the treatment of pulmonary embolism have remained controversial for several decades since the FDA approval of streptokinase for acute pulmonary embolism in 1977 [3]. Tenecteplase, a genetically modified variant of alteplase, initially demonstrated its potential in the treatment of stroke and cardiovascular disease [4]. Currently, it is being considered for use in pulmonary embolism.

The Pulmonary Embolism THrOmbolysis (PEITHO) study is a prospective, international, multicenter, randomized, double-blind comparison demonstrating the efficacy of tenecteplase plus single-bolus heparin in normotensive patients with acute pulmonary embolism and evidence of right ventricular dysfunction and myocardial injury [5].

A study published in 2013 involving 30 patients showed favorable efficacy of Tenecteplase in the management of acute pulmonary embolism in terms of hemodynamic improvement and reduction in right ventricular systolic pressure. Of the 30 patients who were included in the study, there was a resolution of thrombus in all except four patients who had massive pulmonary embolism with evidence of thrombus in the main and segmental pulmonary arteries. It was also observed that the resolution of symptoms and thrombus on follow-up CT was earlier in patients who presented within 48 hours of symptom onset [3].

Reduction of right ventricular dysfunction and recurrent pulmonary embolism by reperfusion to rebuild blood flow and stabilize hemodynamics are the primary goals of treatment of acute pulmonary embolism, particularly in intermediate-risk patients [4].

A recent meta-analysis published in October 2021, including four randomized controlled trials and two cohort studies, sought to summarize the efficacy and safety of tenecteplase versus anticoagulant therapy in patients with pulmonary embolism. It demonstrated that for patients with high-risk pulmonary embolism, tenecteplase increased 30- day survival and did not increase the incidence of bleeding. For patients with intermediate-risk pulmonary embolism, as in our patient, they suggested that tenecteplase decreased right ventricular failure at 24 hours of onset and the incidence of hemodynamic failure without affecting short- and long-term mortality, thereby reducing the length of stay in the intensive care unit and costs. However, tenecteplase was associated with a high risk of bleeding [4].

Tenecteplase has three properties that favor its use in the treatment of pulmonary embolism. The first advantage is that it is a single-dose bolus thrombolytic. Second, its bolus administration may allow for more rapid formation of plasmin, which may promote more rapid clot removal and faster resolution of symptoms compared with the infusion regimen. Third, there is no continuous infusion of thrombolytic therapy [3].

At last, the use of ultrasound hemodynamic parameters in monitoring the success of thrombolysis is recognized today [6]. On the other hand, the use of these parameters in this case; the cardiac output and the cardiac index; is not included in the decision to indicate this therapy or not. Randomized trials in this direction should be conducted to verify their interest in addition to clinical criteria, for a better selection of eligible patients.

Conclusion

Through our case, we have been able to demonstrate that although tenecteplase is not currently approved for the treatment of acute pulmonary embolism according to current recommendations, it is a promising drug for patients with intermediate or high-risk forms with remarkable efficacy and safety.

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