Case Report
Eurasian Journal of Critical Care

Is Thrombolytic Therapy Safe after CPR for Patients with Pulmonary Embolism?

Ramazan ÜNAL[1], Ramazan GÜVEN[1], Bensu BULUT[1], Kemal Biçer[2], Ertuğrul Ak[1], Başar CANDER[1]

[1]Ministry Of Health University of Health Science Kanuni Sultan Süleyman Research and Training Hospital, Emergency Medicine, İstanbul, Turkey
[2]Ministry Of Health Antalya Provincal Health Directorate University Of Health Sciences Antalya Training And Research Hospital, Emergency Medicine, Antalya, Turkey

Abstract

Pulmonary embolism (PE) is a life threatening emergency condition. PE is considered in suspected patients referring due to syncope or shock. Trombolytic treatment may be started for the patients with higher risk for PE according to transthoracic echocardiography (TTE) results. An eighty-year old female patient was taken to the emergency service at an unconscious state by her relatives. No pulse was detected in the first assessment. Cardiopulmonary resuscitation (CPR) was started. Return of spontaneous circulation (ROSC) was achieved at 15th minute of the CPR. TTE revealed dilation in the right ventricle and lower pressure in the left ventricle. There as not any risk factor for pulmonary embolism in preliminary diagnosis. The unstable patient was referred to CT angiography with emergency medicine physician. An image consistent with embolism in both branches of the pulmonary artery was detected in CT angiography and trombolytic treament was started. The patient was admitted to intensive care unit of the emergency service. Thrombolytic treatment may be implemented for high-risk patients for PE and in the patients who achieved return of spontaneous circulation after cardiac arrest. Furthermore, such interventions were detected to be life saving

Keywords: After CPR, Pulmonary embolism, Thrombolytic therapy

Introduction

Pulmonary embolism (PE) is a clinical manifestation, which appears as a result of obstruction of the pulmonary artery and its branches by different substances. Acute PE has a wide clinical presentation from asymptomatic senile disease to hemodynamic instability and shock[1].

PE is the third most common cause for cardiovascular system-originated death causes. Despite all developments in diagnostic and therapeutic methods, PE accounts for 5-15% of hospital deaths. PE progresses to death by 20-30% and deaths usually occur within 1-2 hours. When the condition is diagnosed and appropriate treatment is applied, the early mortality rate decreases to 4.9%.[2]; however, mortality rate may increase up to 65% in the patients who developed cardiac arrest due to PE[3].

PE should be considered for differential diagnosis in all cases referring with cardiac and respiratory system complaints with new onset. Computed tomography pulmonary angiography (CTPA) is gold standard for diagnosis[4]. Thrombolytic treatment may be started by detection of overloading findings to right ventricle through bedside transthoracic echocardiography (TTA)[5].

Although there are treatment examples related to thrombolytic treatment during CPR in cardiac arrests developed due to PE, the data about use of thrombolytic agents after CPR is limited[6, 7]. The aim of the present paper was to present a case who achieved return of spontaneous circulation and was monitored in emergency department intensive care unit (EDICU) after administration of thrombolytic treatment.

Case Report

A 80-year old female patient who became unconscious following shortness of breath was taken to the emergency department by her relatives. The patient had no pulse at referral; endotracheal intubation was performed and CPR started. Spontaneous circulation returned (ROSC) after 15 minutes of CPR. Ventricular extra-systoles were detected in electrocardiography (Figure 1). Findings for right ventricle overloading was detected in the bedside transthoracic echocardiography (TTE). However, the patient had not any previously known risk factor for pulmonary embolism. CTPA was performed due to preliminary diagnosis of PE.

A filling defect consistent with thrombus, which restricts the blood flow, was detected on proximal side and lower segments of right and left pulmonary artery in CTPA (Figure 2). High Risk PE was diagnosed. After patient relatives signed informed consent forms 100 mg of plasminogen activator (rt-PA) was administrated.

The patient was admitted to EDICU after administration; spontaneous warfarin treatment as well as intravenous un-

Corresponding Author: Ramazan Ünal **e-mail:** dr.ramazanunal@gmail.com
Received: 27.11.2020 • **Accepted:** 05.12.2020 • **Orcid:** https://orcid.org/0000-0002-6181-4644

Table1: Arterial Blood Gas (ABG) monitoring scheme of the patient

	Ph	pCO2	pO2	HCO3	K^+	Lactate	Glucose	ProBNP
During CPR	6.611	124	25	12,3	5,6	not measurable	370	
10th of CPR	6,65	65	167	5,7	4,11	not measurable	350	
Post CPR	6,991	36,9	336	8,7	4,85	not measurable	435	
10 min after CPR	7,032	45,6	181	11,8	4,35	13,89	353	
Thrombolytic post 30 minutes	7,138	52,7	113,1	17,5	3,63	10,47	286	
Thrombolytic post 90 minutes	7,181	49	80,7	17,9	3,2	7,25	239	
1st day after thrombolytic	7,336	34,6	113,6	18,1	2,65	4,5	152	2552
Day 2 after thrombolytic	7,359	33	124	18,2	5	2,52	140	
Day 3 after thrombolytic	7,416	35	94	22,1	3,87	1,46	135	

(CPR: Cardiopulmonary Resuscitation, Lac: Lactate, ProBNP: Brain Natriuretic Peptide, K^+: Potassium, HCO3: Bicarbonate, pO2: Partial oxygen saturation, pCO2: Partial carbondioxide saturation)

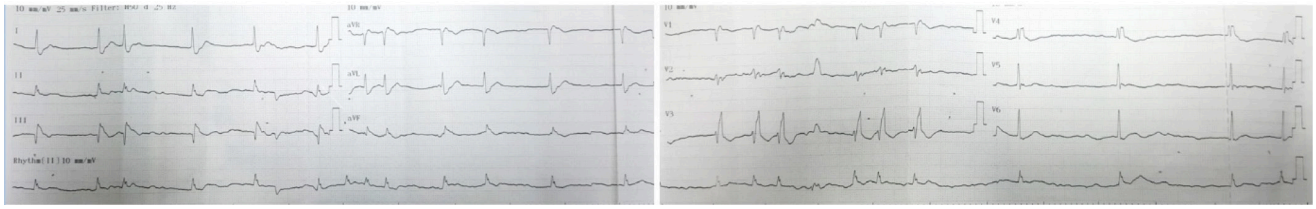

Figure 1: ECG after CPR (ventricular extrasystole)

fractionated heparin infusion were started. Decrease in Pulmonary artery pressure (PAP) and regression in right ventricle overloading were detected during bedside TTE monitoring in EDICU. Sinus tachycardia was detected in the control ECG (Figure 3). Furthermore, improvement was observed in ProBNP and blood gas analysis as well as hemodynamic signs of the patient. At the 24th hour of the patient's follow-up, Ph returned to normal values (Ph: 7,336). After 48 hours, Lactate decreased from unmeasurable values to 2.52 (mEq/L) and ProBNP decreased from 2552 (pg/ml) to 688 (pg/ml)(Table 1).

There was not any predisposing factor or disease detected for PE development in aetiological research. Deep vein thrombosis (DVT) was not detected in Doppler ultrasound scan of the lower limbs during intensive care follow-up. Upon achievement of spontaneous ventilation at 25th day of EDICU admission, the patient was extubated. The patient whom we have monitored for about 30 days were transferred to the clinic. The patient had spontaneous ventilation; vital signs were stable, she was conscious, she has cooperation and orientation at time of discharge from EDICU. Verbal consent was obtained from the patient's relatives to be presented as a case.

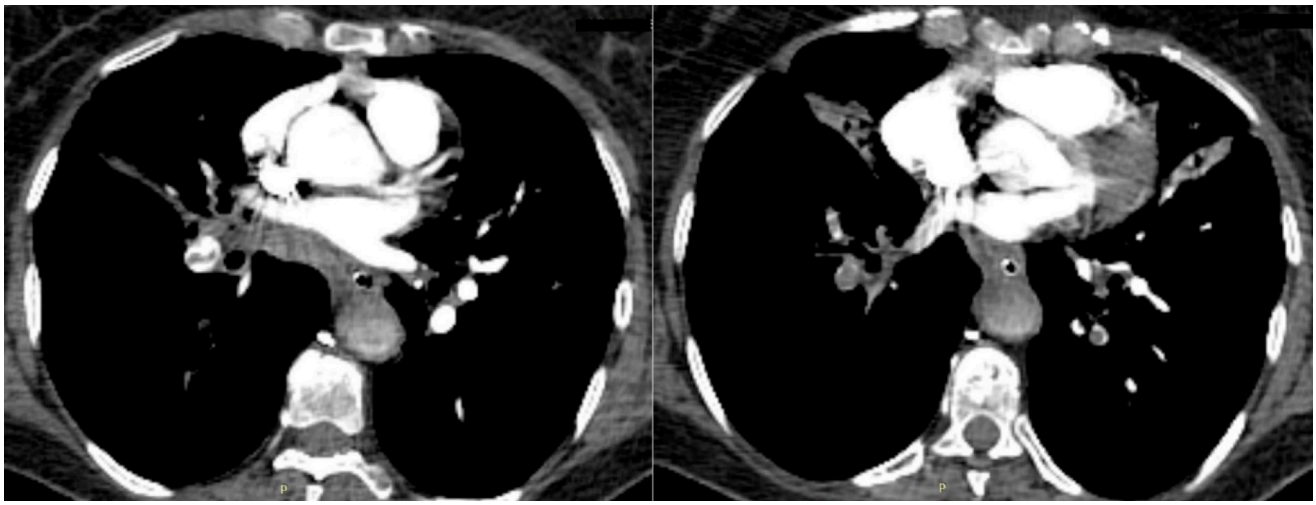

Figure 2: Thoracic CT Angiography (pulmonary embolism causing filling defect in pulmonary artery branches bilaterally)

Discussion

Pulmonary embolism is a condition, which is the third most common deaths caused by cardiovascular system disorders with high morbidity and mortality. Initial test for the patients with high risk for PE referring by shock or hypotension should be CTPA, if available, or bedside TTE which shows the findings caused by acute pulmonary hypertension and overloading of the right ventricle[5].

Cardiac arrest may develop in the cases with high risk PE and 52% to 65% of these cases may be mortal[8]. Live saving thrombolytic treatment is recommended during CPR in case of cardiac arrest caused by PE[5].

Jiang-Ping Wu et al. reported a case who achieved spontaneous circulation through administration of thrombolytic due to suspected PE simultaneously with CPR after arrest and failure of achieve spontaneous circulation after 100 minutes of CPR. It was reported that the aforementioned case recovered without any sequel[7].

Aliyev et al. In a case report with cardiac arrest due to PE, the patient undergoing thrombolytic treatment did not develop any complication of bleeding despite the CPR that lasted longer than 55 minutes[9].

It was reported in a meta-analysis, which evaluated efficiency and safety of thrombolytic treatment in CPR, that, CPR and thrombolytic treatment started within 15 minutes after CPR have possible advantages than potential risks. ROSC, long-term survival and neurological recovery rates were detected significantly higher in those patients. Furthermore, there was not any evidence that treatment-induced bleeding may cause death[10].

In a study evaluating 49 patients with pulmonary embolism whom thrombolytic was administrated during and after CPR, two patients who achieved ROSC after CPR and received thrombolytic died after then. However, the basic cause for death of these patients was considered as a delay in the treatment rather than a complication due to thrombolytic[11].

No complication developed in our case whom we administrated thrombolytic after CPR and monitored in EDICU for 30 days during thrombolytic treatment and EDICU follow-ups; furthermore, regression in ventricle overloading and improvement in laboratory and vital signs were detected.

Conclusion

Thrombolytic treatment may be used safely if high risk PE is considered fro the patients who achieved ROSC after CPR. However, further studies are needed.

References

1. Kourkouta, Lambrini & Konstantinos, Koukourikos & Christos, Iliadis & Petros, Ouzounakis & Areti, Tsaloglidou. (2018). Pulmonary Embolism: A Literature Review. 10.11648/j.ajns.s.2018070301.19.
2. Duru, Serap, et al. "Pulmoner embolide klinik, laboratuvar ve bilgisayarlı tomografi pulmoner anjiyografi sonuçları: 205 hastanın retrospektif değerlendirmesi." Anadolu Kardiyol Derg 12 (2012): 142-9.
3. Blohlávek, Jan, Vladimír Dytrych, and Aleš Linhart. "Pulmonary embolism, part I: Epidemiology, risk factors and risk stratification, pathophysiology, clinical presentation, diagnosis and nonthrombotic pulmonary embolism." Experimental & Clinical Cardiology 18.2 (2013): 129.
4. Moore, Alastair JE, et al. "Imaging of acute pulmonary embolism: an update." Cardiovascular diagnosis and therapy 8.3 (2018): 225.
5. Authors/Task Force Members, et al. "2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism: The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC) Endorsed by the European Respiratory Society (ERS)." European heart journal 35.43 (2014): 3033-73.
6. Yin, Qin, Xiao Li, and Chunsheng Li. "Thrombolysis after initially unsuccessful cardiopulmonary resuscitation in presumed pulmonary embolism." The American journal of emergency medicine 33.1 (2015): 132-e1..
7. Wu, Jiang-Ping, et al. "Good neurological recovery after rescue thrombolysis of presumed pulmonary embolism despite prior 100 minutes CPR." Journal of thoracic disease 6.12 (2014): E289.
8. Yamamoto, Takeshi. "Management of patients with high-risk pulmonary embolism: a narrative review." Journal of intensive care 6.1 (2018): 16.
9. Aliyev, Dostali, Cihan Şahin, and Onur Özlü. "Masif Pulmoner Emboliye Bağlı Kardiyak Arrest ve Başarılı Sistemik Tromboliz."
10. Jiang-Ping Wu, Dan-Yan Gu, Sheng Wang, Zhen-Jun Zhang, Jian-Cang Zhou and Rui-Feng Zhang "A meta-analysis of cardiopulmonary resuscitation with and without the administration of thrombolytic agents." Resuscitation 70.1 (2006): 31-36.
11. Beydilli İ, Yılmaz F, Sönmez BM, Kozacı N, Yılmaz A, Toksul İH, et al "Thrombolytic therapy delay is independent predictor of mortality in acute pulmonary embolism at emergency service." The Kaohsiung journal of medical sciences 32.11 (2016): 572-78.