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Awakening after one-hour cpr and modified-dose thrombolysis in pulmonary embolism arrest: a rare survival case

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Abstract

Background: Pulmonary embolism (PE) is a potentially reversible but often fatal cause of cardiac arrest. Although thrombolytic therapy is recommended in massive PE, its use during ongoing cardiopulmonary resuscitation (CPR) remains controversial because of limited evidence and the potential risk of bleeding.

Case Presentation: A 76-year-old woman with a history of type 2 diabetes mellitus and previous pulmonary embolism presented with progressive shortness of breath. While being transferred for imaging, she developed pulseless electrical activity. High-quality CPR was initiated, and intravenous alteplase was administered using a modified-dose regimen (50 mg bolus followed by 50 mg continuous infusion over two hours). After approximately one hour of continuous CPR, return of spontaneous circulation (ROSC) was achieved. Post-resuscitation imaging revealed bilateral hemothorax, minimal pneumothorax, and rib fractures attributed to chest compressions, but no intracranial hemorrhage. Conservative management was successful, and the patient recovered with intact neurological function.

Discussion: This case demonstrates that intra-arrest thrombolysis can lead to survival and good neurological outcomes even after prolonged resuscitation. The modified-dose alteplase protocol achieved effective reperfusion while avoiding major bleeding complications.

Conclusion: Early recognition of pulmonary embolism, prompt decision-making for thrombolytic therapy, and individualized dosing strategies may significantly improve survival in PE-related cardiac arrest. Extended resuscitation efforts should not preclude thrombolytic therapy when pulmonary embolism is strongly suspected and contraindications are absent.

Keywords: CPR; Thrombolysis; Pulmonary Embolism Arrest

Introduction

Pulmonary embolism (PE) is one of the most life-threatening yet potentially reversible causes of cardiac arrest. Its clinical presentation often overlaps with other acute cardiopulmonary emergencies, such as myocardial infarction or pneumonia, leading to delayed recognition and treatment [1,2]. Massive PE is responsible for approximately 3–5% of all cardiac arrests, and in the majority of these cases, the collapse occurs within one to two hours of symptom onset, leaving limited opportunity for

diagnosis before resuscitation becomes necessary [1].

The prognosis of cardiac arrest secondary to PE remains extremely poor, with survival to hospital discharge reported between 5% and 15% despite advanced cardiopulmonary resuscitation (CPR) [3[. High suspicion, early recognition, and rapid thrombolytic intervention are key determinants of favorable outcomes [2].

In observational cohorts, administration of systemic thrombolysis during resuscitation has been associated with significantly higher rates of return of spontaneous circulation (ROSC) and survival compared to standard CPR alone [3].

Thrombolytic therapy with recombinant tissue plasminogen activator (rtPA, alteplase) remains the most accepted option in high-risk PE, particularly when hemodynamic instability, cardiac arrest, or profound hypotension is present [4].

The optimal dosing strategy during cardiac arrest, however, is still uncertain. Some reports support a single 50 mg intravenous bolus, while others describe successful outcomes with double-bolus or prolonged infusion regimens of 100 mg total döşe [4].

In particular, O'Connor et al. demonstrated ROSC after a second 50 mg bolus without hemorrhagic complications, highlighting the potential role of repeated dosing in refractory cases [4,5].

rts the concept that thrombolytic therapy during cardiac arrest may not only improve immediate resuscitation success but also enhance neurological recovery in survivors [2].

In-hospital analyses, such as the Karolinska cohort, showed survival to discharge rates of 44% in patients treated with alteplase compared to 8% in those without thrombolysis [3]. Similarly, rescue-thrombolysis during ongoing CPR can still achieve return of spontaneous circulation (ROSC) without increasing the incidence of fatal bleeding [3,6].

While major intracranial or gastrointestinal hemorrhage remains a potential complication, several contemporary case series have documented that careful patient selection and modified-dose regimens can limit bleeding risk . Current guideline-based reviews emphasize that, in the context of cardiac arrest due to suspected or confirmed PE, the potential survival benefit of thrombolysis outweighs the bleeding risk when other reversible causes have been excluded .

Here, we present a case of a 76-year-old woman with diabetes mellitus and prior pulmonary embolism who developed cardiac arrest due to suspected recurrent PE. Return of spontaneous circulation was achieved after approximately one hour of CPR and modified-dose thrombolysis, illustrating the potential benefit of individualized alteplase regimens in prolonged resuscitation.

Case Presentation

A 76-year-old woman with a history of type 2 diabetes mellitus treated with oral antidiabetic medication, prior pulmonary embolism, and chronic use of low-dose aspirin presented to the emergency department with progressive shortness of breath. On admission, she was alert (GCS 15) with a blood pressure of 110/70 mmHg, heart rate 98 bpm, and oxygen saturation of 88% on room air. Laboratory analysis showed mild hypoxemia and elevated D-dimer levels, consistent with a thromboembolic process. Given her history and symptoms, pulmonary embolism (PE) was strongly suspected [1,2]. While being transported for imaging, the patient suddenly collapsed and was found to be pulseless with electrical activity on the monitor. Immediate high-quality cardiopulmonary resuscitation (CPR) was initiated. In light of her history and the abrupt deterioration, the cardiac arrest was attributed to massive PE, a scenario described in multiple previous reports [2,4].

After ten minutes of CPR without return of spontaneous circulation (ROSC), intravenous alteplase was administered using a modified protocol: 50 mg IV bolus followed by 50 mg over two hours. This regimen was selected based on previously reported intra-arrest thrombolysis protocols where a divided dose of alteplase yielded ROSC with acceptable safety [4,6,7]. CPR was continued throughout the infusion.

After approximately one hour of continuous resuscitation, spontaneous circulation returned. The patient exhibited eye opening and spontaneous movements shortly after ROSC, resembling neurologic recovery patterns reported in prolonged CPR cases with successful thrombolysis [2]. She was sedated to prevent self-extubation and maintained on mechanical ventilation.

Following ROSC, vital parameters stabilized (BP 110/65 mmHg, SpO_2 95%) with low-dose norepinephrine support. Post-resuscitation CT imaging revealed no intracranial hemorrhage. Thoracic CT showed bilateral hemothorax (right-sided layering hematoma, minimal on the left), mild pneumothorax, and subcutaneous emphysema, consistent with CPR-related thoracic injury [1,2]. Rib fractures (fifth and sixth ribs) were also noted. The chest surgery team recommended conservative management without tube thoracostomy; gentle saline lavage and aspiration were performed.

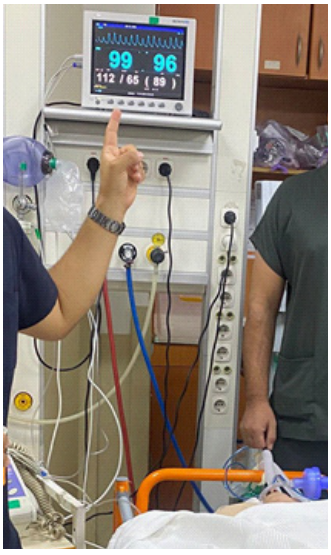

Figure 1: Monitor display showing return of spontaneous circulation after prolonged CPR (identifying information removed).

Within the next hours, minor bloody secretions were aspirated from the endotracheal tube, but hemoglobin levels remained stable (10.4 g/dL). No major bleeding occurred, consistent with findings from large thrombolysis cohorts

reporting minimal severe hemorrhage despite intra-arrest alteplase use(3,8).

Laboratory reassessment demonstrated normalization of arterial pH, decreasing lactate levels, and improvement in gas exchange, paralleling previously described recovery patterns after successful intra-arrest thrombolysis; anticoagulation was resumed with unfractionated heparin after 24 hours of stability, in line with recommendations from case-based evidence(9).

Over the next 48 hours, the patient remained hemodynamically stable, ventilator support was gradually reduced, and follow-up imaging showed regression of the pleural effusions. The clinical evolution resembled other reports of prolonged resuscitation survivors where timely thrombolysis resulted in intact neurological outcomes .

Discussion

Cardiac arrest secondary to pulmonary embolism (PE) represents one of the most challenging resuscitation scenarios due to its abrupt onset and extremely poor prognosis. Reported survival rates vary between 5% and 15%, depending on patient selection and the timing of thrombolytic therapy(1,3). In the present case, spontaneous circulation returned after approximately one hour of continuous CPR following modified-dose alteplase administration, with full neurological recovery — an outcome consistent with rare survival cases described in the literatüre(2,4).

Early suspicion and immediate initiation of thrombolytic therapy remain essential determinants of success in PE-related cardiac arrest. In most published series, including the Vienna cohort and subsequent registry analyses, PE accounted for roughly 3–5% of all arrests, often presenting with pulseless electrical activity (PEA) as the initial rhythm(1,3). Similar to our patient, O'Connor et al. reported ROSC after a second 50 mg alteplase bolus in a massive PE arrest, with no major bleeding complications(4). These findings suggest that repeating or modifying standard alteplase dosing may improve outcomes when the initial bolus fails to restore perfusion.

The optimal thrombolytic regimen during arrest remains debated. Traditional guidelines recommend a 50 mg intravenous bolus, but several authors have proposed extended or double-bolus protocols when ROSC is not achieved within the first 20–30 minutes(4,7). Rescue-thrombolysis analyses have also demonstrated improved survival without a proportional rise in major bleeding, supporting more aggressive dosing strategies in refractory PE arrests(6,8). In our case, a 50+50 mg protocol resulted in ROSC after prolonged CPR and only minor airway bleeding, aligning with observations that modified-dose regimens can balance efficacy and safety.

Bleeding complications remain a key concern in intra-arrest thrombolysis. However, data from large cohorts and recent reviews indicate that the incidence of fatal or intracranial hemorrhage is low when thrombolytics are used judiciously(2,3). Our patient developed limited hemothorax and minor tracheobronchial bleeding, findings similar to those reported after CPR-induced thoracic trauma rather than true drug-related hemorrhage. Comparable experiences were described in recent real-world evaluations where major bleeding was absent despite systemic alteplase administration .

Post-resuscitation management also mirrors prior evidence: early stabilization, avoidance of premature heparin resumption, and serial imaging to exclude ongoing hemorrhage(2). In previous survival reports, including Pasha et al. and the Swedish in-hospital registry, neurological outcomes were favorable when ROSC was achieved within 60 minutes of CPR(3). Similarly, neurological recovery in our patient underscores that prolonged resuscitation can still yield intact outcomes when thrombolytic therapy restores pulmonary flow.

The pathophysiologic mechanism underlying these recoveries is consistent across published studies: restoration of pulmonary perfusion reduces right ventricular afterload, increases left ventricular filling, and reverses circulatory collapse(1). Experimental and clinical analyses have also demonstrated that rtPA infusion during CPR improves coronary and cerebral perfusion pressures, indirectly promoting ROSC and neurologic preservation .

Recent evidence-based reviews and guideline commentaries support this approach, concluding that in cases of cardiac arrest with suspected PE and no contraindication, thrombolysis should not be delayed . The benefit of restoring circulation outweighs the bleeding risk, particularly when other reversible causes have been excluded.

In summary, this case contributes to the growing evidence that intra-arrest thrombolysis, even after prolonged CPR, can result in survival with good neurological outcomes. Our experience reinforces prior findings that individualized alteplase dosing — such as the 50 mg bolus followed by 50 mg infusion — may optimize the balance between efficacy and safety. As highlighted across multiple case series and reviews, prompt recognition of PE, early thrombolysis, and multidisciplinary post-resuscitation care remain the cornerstones of improving outcomes in this otherwise fatal condition.

Conclusion

This case illustrates that even after prolonged cardiopulmonary resuscitation, survival with full neurological recovery is possible in cardiac arrest secondary to pulmonary embolism when thrombolytic therapy is administered appropriately. The use of a **modified-dose alteplase regimen (50 mg bolus + 50 mg infusion)** provided rapid restoration of circulation without major hemorrhagic complications, consistent with prior evidence from both case reports and cohort studies(2,3,4).

Early recognition of pulmonary embolism as a potential cause of arrest, timely decision to initiate thrombolysis, and meticulous post-resuscitation monitoring are crucial for favorable outcomes. This case adds to existing literature by demonstrating that individualized alteplase dosing can achieve effective reperfusion while minimizing bleeding risk. Incorporating such patient-tailored approaches, guided by clinical judgment and multidisciplinary coordination, may improve survival and neurological outcomes in this otherwise lethal condition.

References

1. Kürkciyan I, Meron G, Sterz F, et al. *Pulmonary Embolism as a Cause of Cardiac Arrest: Presentation and Outcome.* Arch Intern Med. 2000;160(10):1529–1535.

2. Pasha SM, Baiju B, Varghese B, Sunny AA. *A Case of Acute Massive Pulmonary Embolism with Multiple Cardiac Arrests and Successful Systemic Thrombolysis.* Ann Afr Med. 2025;24(4):925–928.

3. Henriksson C, Bjursten H, Krantz J, et al. *In-Hospital Cardiac Arrest Due to Pulmonary Embolism – Treatment and Outcomes in a Swedish Cohort.* Resuscitation Plus. 2021;7:100152.

4. O'Connor G, Fitzpatrick G, El-Gammal A, Gilligan *P. Double Bolus Thrombolysis for Suspected Massive Pulmonary Embolism During Cardiac Arrest.* Case Rep Emerg Med. 2015;2015:367295.

5. Choi MJ, Park JH, Lee SY, et al. *Evidence-Based Diagnosis and Thrombolytic Treatment of Cardiac Arrest Caused by Pulmonary Embolism.* J Thromb Thrombolysis. 2018;45(3):408–414.

6. Sharifi M, Bay C, Skrocki L, Rahimi F, Mehdipour M. *Impact of Rescue-Thrombolysis During Cardiopulmonary Resuscitation in Massive Pulmonary Embolism.* Catheter Cardiovasc Interv. 2019;93(6):E337–E343.

7. Altun D, Yilmaz M, Erdem AF, et al. *Cardiac Arrest Due to Pulmonary Embolism: A Case Report and Review of Literature.* Turk J Emerg Med. 2019;19(2):81–84.

8. Tütüncü A, Schmidt H, Wienemann H, et al. *Emergency Thrombolysis During Cardiac Arrest from Massive Pulmonary Embolism.* Intensive Care Med. 2001;27(7):1072–1078.

9. Azab W, Elmallakh RS, Salam AM. *Effects of Thrombolytic Therapy in Patients with Cardiac Arrest from Suspected Pulmonary Thromboembolism.* Am J Emerg Med. 2017;35(9):1281–1285.