Case Report

Lazarus Syndrome After Aortic Aneurysm Repair

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Abstract

Introduction
Lazarus syndrome is defined as the spontaneous return of circulation after cessation of cardiopulmonary resuscitation (CPR). Though there have been multiple cases of Lazarus syndrome documented in the literature, it is a significantly underreported phenomenon with less than 100 cases reported in the literature since the first case in 1982.

Case Presentation
After elective aortic aneurysm repair, an 88-year-old with a do-not-resuscitate directive had cardiac arrest, briefly showing post-mortem respiration and pulse. Despite resuscitation efforts including pharmacological intervention and CPR, he passed away within an hour. This case highlights complexities in end-of-life care and warrants exploration of post-mortem physiological responses.

Conclusion
The Lazarus phenomenon, rare post-CPR circulation return, challenges resuscitation cessation. Our case, among the oldest, highlights extended monitoring necessity, especially in chronic obstructive pulmonary disease patients. Debate persists on monitoring duration after failed CPR, lacking established Lazarus syndrome prevention guidelines.

Keywords
Lazarus syndrome; cardiopulmonary resuscitation; CPR; return of spontaneous circulation; autoresuscitation; resuscitation

Introduction
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Most documented cases of the Lazarus phenomenon are in patients over 60. However, there are relatively few documented cases with patients over 85. We present the case of an 88-year-old patient who underwent spontaneous resuscitation over 1 hour after cessation of CPR, which represents one of the oldest documented patients as well as one of the most prolonged durations between cessation of CPR and documented resuscitation.

Case Presentation
An 88-year-old male with a past medical history of chronic obstructive pulmonary disease (COPD) and unruptured aortic aneurysm presented to the hospital for elective endovascular aortic aneurysm repair with the simultaneous embolization of the inferior mesenteric arteries. The patient underwent coil embolization of the mesenteric arteries without complications. On postoperative day 1, at 10:31 AM, the patient was noted by nursing to be pulseless and apneic while seated on the bedside commode. The patient's cardiac rhythm had pulseless electrical activity (PEA) at the time. A code blue emergency response was called at 10:32

AM, and chest compressions were initiated immediately. The patient was intubated, and the advanced cardiovascular life support (ACLS) protocol was followed. Per ACLS protocol, 4 boluses of epinephrine and amiodarone were administered through a peripheral intravenous (IV) line. The patient was not defibrillated due to a non-shockable rhythm. Due to the patient's age and overall poor prognosis, CPR was discontinued after 20 minutes. The patient was unresponsive to verbal or noxious stimuli. No spontaneous respirations were noted. There were absent peripheral and central pulses. Blood pressures were unable to be elicited. The patient was pronounced dead at 10:52 AM and was extubated at this time. A member of the code team observed the patient for 5 minutes to establish and confirm irreversible cardiorespiratory arrest.

At 11:50 AM, a nurse assistant was present to place the patient into a shroud bag and noticed spontaneous respirations. The intensive care team was informed of the status and evaluated the patient. The patient's respirations were 16 per minute, and blood pressure was 76/46 mm Hg. The patient had a palpable carotid and femoral pulse verified by a Doppler ultrasound. As the family was unavailable, the medical power of attorney was contacted at this time. They made the patient's do-not-resuscitate status known per the patient's best wishes. Our patient was extubated at this time and placed on comfort measures only. The patient continued spontaneous respirations for approximately 1 hour until they were confirmed deceased.

Discussion

Lazarus syndrome describes delayed autoresuscitation (AR) after cessation of CPR, named after the biblical story of Lazarus of Bethany, who was resurrected from the grave by Jesus Christ. The first recorded case was in 1982, with less than 100 recorded cases thereafter.[1] However, the clinical incidence and significance may be underestimated.[2] Occurrences of Lazarus syndrome are rare, though the incidence is likely higher than documented reports suggest.[3]

Gordon et al described 65 patients who underwent AR with a mean age of 61±24 years. Of their included data, only 4 patients were above the age of 88.[1] Adihyaman et al described 38 patients who underwent AR. Of these patients, only 1 underwent AR after an abdominal aneurysm repair at the age of 70. Our patient, therefore, represents a comparatively small population of those having undergone AR.

The mechanism of autoresuscitation remains unknown, though several theories have been postulated. One mechanism suggests delayed epinephrine delivery to the heart per cardiac resuscitation guidelines may induce spontaneous restoration. This delay may be due to impaired venous return during manual ventilation. After stopping dynamic hyperinflation, venous return improves, and medications administered during CPR may have superior availability. Our patient was administered 4 boluses of epinephrine, though it is impossible to tell if this was the mechanism that reintroduced cardiopulmonary activity.

Another mechanism called auto-positive end-expiratory pressure (PEEP) involves rapid manual ventilation that may induce dynamic hyperinflation, which increases the end-expiratory pressure. Previous literature demonstrates examples of excessive PEEP and tidal volume causing severe hypotension.[4] The pathophysiology is analogous to cardiac tamponade, where increased intrathoracic pressure (either due to interventional means or other mechanical obstruction) causes obstacles to cardiac filling. This pressure decreases preload and causes hypovolemia. COPD may also exacerbate auto-PEEP due to an alveolar decrease in elasticity, causing residual gas trapping.[5] As this phenomenon may cause PEA, it has been suggested that practitioners intermittently discontinue ventilation to allow for sufficient venous return.[6]

Transient asystole after defibrillation for ventricular fibrillation (VF) arrest is also implicated in the pathogenesis of AR. Asystole after countershock of VF is well-documented in the literature, and a review of the literature demonstrates at least 1 case of interrupted CPR after a cardioversion attempt resulting in asystole, with a return of spontaneous circulation obtained 7 minutes after discontinuation of CPR.[7,8] This finding partially explains cases of AR within the 6-10-minute range of CPR termination. However, it would not explain cases where the duration of asystole lasted longer.

Our patient underwent cardiopulmonary arrest with an initial rhythm of PEA. Thus, this mechanism is unlikely the cause for the pathogenesis of AR in our patient.

Linko et al have recommended continuous monitoring for 10 minutes after cessation of CPR.[9] In our case, however, our patient underwent AR after an hour. This time range may raise discussion regarding post-CPR length of monitoring, as most patients documented in the literature that undergo AR have signs of life noticed under 5 minutes. Gordon et al described the majority of cases noted signs of life under 5 minutes. However, 14 out of 63 patients were noted to have life signs between 6-10 minutes after termination of CPR. The remainder were not noted until several hours after death or had inadequate documentation in the medical notes.[1,2] Extending the length of monitoring after cessation of CPR may be warranted to more adequately capture cases of spontaneous AR.

There has been a recent interest in the use of zolpidem, a non-benzodiazepine sedative, in the use of persistent vegetative states that can cause arousal not dissimilar to autoresuscitation. Though the mechanism is unlikely to be similar to the mechanism behind AR and the effects of zolpidem did not persist with discontinuation of the drug, more investigation is warranted in this subject.[2]

Conclusion

The Lazarus phenomenon is a rare case of spontaneous return of circulation after failure of CPR in patients in cardiac arrest. This phenomenon raises questions regarding patients spontaneously "returning to life," with implications regarding cessation of resuscitation efforts. Our case reports one of the oldest patients in the literature to undergo autoresuscitation. Increased monitoring may be warranted in patients who have failed CPR, especially in patients with a history of COPD, which may exacerbate mechanisms of autoresuscitation. Further discussion is warranted regarding the length of monitoring after failed CPR, as no definitive guidelines have been established for the prevention of Lazarus syndrome.

Conflicts of Interest

The authors declare they have no conflicts of interest.

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