

# Lazarus phenomenon in an out-of-hospital emergency attended by a home emergency service

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None

Lazarus phenomenon, or spontaneous recovery following cardiopulmonary resuscitation (CPR), is a rare event. We report a possible case attended by our home emergency team in Cadiz, Spain. The family of a patient with chronic obstructive pulmonary disease asked for emergency care for breathlessness. On arrival, we found the patient unconscious and in respiratory arrest but a central pulse could be detected; pupils were fixed, partially dilated, and unresponsive. We immediately commenced advanced life-support measures. Respiratory function deteriorated (severe bronchospasm); there followed a worsening of hemodynamics and cardiac arrest. After 30 minutes of advanced CPR, efforts ceased with the patient in asystole and apneic. Ten minutes later, pulse recovered spontaneously. The patient was reintubated and transferred to the hospital, where he died 12 days later. Although Lazarus phenomenon is unpredictable and rare, 2 conclusions can be drawn about this event in an out-of-hospital setting: a longer delay in providing emergency care favors the persistence of asystole, and respiratory volumes administered must be monitored strictly to avoid the risk of dynamic hyperinflation. [Emergencias 2011;23:43-46]

**Key words:** Lazarus phenomenon. Emergency health services. Cardiopulmonary resuscitation. Out-of-hospital cardiorespiratory arrest.

## Introduction

Knowledge and experience of Advanced Life Support (ALS) techniques allows the professional some degree of certainty when called to intervene in a situation of maximum risk of death such as cardio-respiratory arrest (CRA). The incidence of treated extra-hospital CRA is around 24 cases per 100,000 inhabitants<sup>1</sup>. As opposed to what happens in television series, attempts at resuscitation fail in up to 86% of cases<sup>2</sup>. Expected survival of attended out-of-hospital CRA patients is low, and mainly depends on the links in the survival chain<sup>3</sup>. Of course, there is the very important role of bystanders who alert the emergency services, and often initiate basic resuscitation maneuvers before the ALS team reaches the scene<sup>2</sup>.

We here present the case of a CRA patient with unexpected evolution, documented in the literature as "Lazarus phenomenon", and defined as the spontaneous recovery of blood circulation after heart arrest and failed resuscitation<sup>4</sup>.

## Case report

We attended an 83 year-old man with chronic obstructive pulmonary disease (COPD) whose family had requested attention for respiratory difficulties. The man had been a smoker and drinker; medical history of interest included tuberculous pleuritis in his youth, liver cirrhosis with stable portal hypertension, upper GI bleeding due to Mallory Weis syndrome, a possible pulmonary thromboembolism (PTE) in 2004, left arm arterial ischemia and iron deficiency anemia of unknown etiology. In 1999 he had suffered CRA and received ALS from another 061 emergency team.

On our arrival, the patient had CRA, with gasping and central pulse. The family reported that he had been unconscious since three minutes before. He remained unconscious, with faintly reactive pupils and apnea, but showed normal peripheral and central pulses. Heart auscultation showed rhythmic heartbeat, without murmurs or other noise. We performed manual ventilation pri-

or to airway isolation. A n° 4 oropharyngeal cannula was used, and then orotracheal intubation was performed with a n° 7 tube. Invasive mechanical ventilation was performed using a portable ventilator. An ECG in situ showed sinus tachycardia of 132 beats per minute, intraventricular flow disorder and axis alteration. Blood pressure was measured twice with a 15-minute interval (150/105 y 100/63 mmHg) before the patient's heart stopped beating. By peripheral venous access, we administered a total of 850cc saline solution at 0.9%. The patient presented severe bronchospasm after intubation, with hemodynamic compromise, which led to CRA, and the rest of the ALS maneuvers were completed. Before the CRA, he received 0.5 cc subcutaneous adrenalin in an attempt to control the bronchospasm, as well as 5 mg midazolam and 10 mg intravenous rocuronium. Once the CRA had stabilized, he received 6 mg adrenalin and 3 mg atropine, with doses and intervals as per protocol. There followed a sequence of rhythms, including ventricular fibrillation, ventricular tachycardia with and without heartbeat. All this required successive defibrillation shocks, up to 9 times, and cardioversion with shock provided by our biphasic defibrillator.

After 1 hour 30 minutes, with ALS maneuvers and a final asystole rhythm, resuscitation measures were stopped. Ten minutes later, with the patient now extubated, spontaneous recovery of heartbeat was observed; the patient was re-intubated and transferred to hospital. He was admitted to the emergency department with a diagnosis of bronchospasm and CRA. The patient died 12 days later, in hospital, of pneumonia due to massive right aspiration of Gram negative microorganisms after CRA.

## Discussion

Although Lazarus phenomenon is exceptional, the literature contains a surprisingly high number of reports.

In 1993 Bray described a case where occlusion pressure of the pulmonary artery was monitored indicating probable rupture, evolving to CRA and ALS attempts with final asystole. Five minutes later, the patient recovered heartbeat. However, there was no neurological viability and after some days the patient was disconnected<sup>5</sup>. In response to this case report, the same journal published various cases of spontaneous heartbeat recovery after failed ALS<sup>6</sup> with subsequent hospital discharge and independent life. En 1995, *Annals of Emergency*

*Medicine* published a case of spontaneous recovery without neurological sequelae, involving a patient with CRA secondary to hyperkalemia<sup>7</sup>. Maleck et al. in 1998 reported the case of an 80 year-old patient with pancreatitis, infection by multi-resistant *S. aureus* and cerebral infarction. After failed resuscitation maneuvers, the patient was considered to have died but heartbeat spontaneously recovered; the patient died 2 days later<sup>8</sup>. A year later, the same journal published the case of a 59 year-old woman hospitalized for exacerbated chest pain and dyspnea study: she suffered acute myocardial infarction with heart failure and subsequent heart arrest. After a period of failed resuscitation, the patient was considered dead. Approximately 5 minutes later she showed spontaneous breathing effort and carotid pulse. Thirty minutes later the patient was declared dead, after gradual disappearance of these signs of life<sup>9</sup>.

En 1999, *Anesthesiology* published the case of a 76 year-old COPD patient with heart arrest. After resuscitation, the patient recovered heartbeat and breathing. Twenty four hours later, with hypoxic encephalopathy confirmed, the patient's condition deteriorated and no further attempts at resuscitation were made<sup>10</sup>. Another possible case of Lazarus phenomenon involved a 27 year-old man who, following heroin abuse, suffered respiratory failure; after initial attention, he presented CRA, with failed ALS and was considered to have died. A minute later, he presented EEG activity and heartbeat was detected. Thirteen days later he was discharged from hospital with complete neurological recovery<sup>11</sup>. In 2002, Maeda et al. described the case of a 65 year-old man found unconscious. After failed ALS maneuvers, he was considered dead and transferred to a mortuary where spontaneous movements were observed. The patient died on day 5 of hospital re-admission<sup>12</sup>. In 2004, De Salvia presented another possible case of Lazarus phenomenon: an 81 year-old woman with sudden fainting and loss of heartbeat and breathing. After a short period of resuscitation, she was declared dead, but then temporarily recovered heartbeat and breathing. More complete resuscitation failed and the patient died 20 hours later<sup>13</sup>. In 2004, an article in the *Spanish Journal of Anesthesiology and Resuscitation* described the case of a 94 year-old woman undergoing surgery for duodenal perforation who suffered electromechanical dissociation and underwent unsuccessful resuscitation maneuvers during 40 minutes. Two or three minutes later, heartbeat was observed; the patient died 72 hours later of multiorgan failure<sup>4</sup>.

Cases of Lazarus phenomenon may be divided into those presenting in hospital or those attended by out-of-hospital emergency teams. The former receive almost immediate attention, especially in resuscitation units and ICUs. In our case, the patient was attended at home. Although the family member was most collaborative and able to describe exactly when the CRA had occurred, she was unable to actually help, so all the ALS resuscitation maneuvers were performed by our team. In principle, the consequences of initial delay and lack of any maneuvers are probably negative<sup>14</sup>.

The presence of hyperkalemia<sup>15,16</sup> has been described as a possible cause of non-response to ALS maneuvers during heart attack. Dialysis allowed subsequent recovery of the patient in this case. In our patient, no electrolyte imbalance was detected in laboratory tests. Possibly, atherosclerotic plaque rupture leading to cardiac or pulmonary infarction or embolism with subsequent spontaneous revascularization could explain this case, as documented in a previously published case report<sup>17</sup>.

In our patient, considering his medical history and symptoms, the origin of the picture was clearly respiratory. Analyzing the case later, and bearing in mind the sequence of initial respiratory arrest and bronchospasm, we have considered the possibility that we employed excessive volume in the mechanical ventilation to overcome airway resistance. One hypothesis to explain the Lazarus phenomenon is that dynamic hyperinflation may trigger venous return disorder due to excess pressure in the ribcage that induces severe hemodynamic alteration in the form of low cardiac output and subsequent heart arrest. Discontinuation of artificial ventilation may allow the recovery of normal thoracic pressure and heartbeat<sup>4</sup>. We do not absolutely rule out this possibility in our case, but have certain reservations for two reasons: first, we applied moderate volumes, 8-9 ml Kg<sup>-1</sup> and, secondly, the disorders accompanying the heart arrest never involved electrical activity without heartbeat, but rather were chaotic rhythms that were susceptible to defibrillation and cardioversion. Another possible explanation may be the delayed effects of the drugs administered during the process of resuscitation. Given the arsenal of drugs received by the patient, this possibility deserves consideration<sup>10,11,13</sup>.

In short, two conclusions can be drawn from cases such as this. Firstly, monitoring should be continued for a reasonable period to confirm the persistence of asystole. And secondly, ventilation volumes and times should be adjusted to avoid possible airway entrapment and increased intra-thoracic pressure which hinders systemic circulation of the blood.

## References

- 1 Navalpotro Pascual JM, Fernández Pérez C, Navalpotro Pascual S. Supervivencia en las paradas cardiopulmonares en las que se realizó reanimación cardiopulmonar durante la asistencia extrahospitalaria. *Emergencias*. 2007;19:301.
- 2 Casal Codesido JR, Vázquez Lima MJ. Reanimación cardiopulmonar extrahospitalaria: ¿dónde estamos? Editorial. *Emergencias*. 2007;19:295.
- 3 Adrie C, Adib – Conquy M, Laurent I, Monchi M, Vinsonneau C, Fitting C, et al. Successful cardiopulmonary resuscitation after cardiac arrest as a "sepsis – like" syndrome. *Circulation*. 2002;106:562-8.
- 4 Casielles García JL, González Latorre MV, Fernández Amigo N, Guerra Vélez A, Cotta Galán A, Bravo Capaz E, et al. El fenómeno de Lázaros: Reanimación espontánea. *Rev Esp Anestesiología Reanimación*. 2004;51:390-4.
- 5 Bray JG. The Lazarus Phenomenon Revisited (letter) *Anesthesiology*. 1993;5:991.
- 6 Hill DJ. The Lazarus Phenomenon Re – revisited: II (letter). *Anesthesiology*. 1993;(79)6:1438.
- 7 Koblin DD. Prolonged Asystolic Hyperkalemic Cardiac Arrest with no neurologic sequelae: The Lazarus Phenomenon arises again (letter). *Ann Emerg Med*. 1995;4:562.
- 8 Maleck WH, Piper SN, Triem J, Boldt J, Zittel FU. Unexpected return of spontaneous circulation after cessation of resuscitation (Lazarus phenomenon). *Resuscitation*. 1998;39:125.
- 9 Bradbury N. Lazarus phenomenon: another case? (letter). *Resuscitation*. 1999;41:87.
- 10 MacGillivray RG. Spontaneous Recovery after Discontinuation of Cardiopulmonary. Letter. *Resuscitation* (letter). *Anesthesiology*. 1999;91:585-6.
- 11 Walker A, McClelland H, Brenchley J. The Lazarus phenomenon following recreational drug use. *Emerg Med J*. 2001;18:74.
- 12 Maeda H, Fujita MQ, Zhu BL, Yukiota H, Shindo M, Quan L, et al. Death following spontaneous recovery from cardiopulmonary arrest in a hospital mortuary: "Lazarus phenomenon" in a case of alleged medical negligence. *Forensic Science International*. 2002;127:82-7.
- 13 De Sálvia A, Guardo A, Orrico M, De Leo D. A new case of Lazarus phenomenon? *Forensic Science International*. 2004;146S:513-515.
- 14 Kida M, Kawamura T, Fukuoka T, Tamakoshi A, Wakai K, Ohno Y, et al. Out – of – hospital cardiac arrest and survival: an epidemiological analysis of emergency service reports in a large city in Japan. *Circ J*. 2004;68:603-9. Referenciado en Navalpotro Pascual JM, Fernández Pérez C, Navalpotro Pascual S. Supervivencia en las paradas cardiopulmonares en las que se realizó reanimación cardiopulmonar durante la asistencia extrahospitalaria. *Emergencias*. 2007;19:300-5.
- 15 Adhyanan V, Adhyanan S, Sundaram R. The Lazarus phenomenon. *J R Soc Med*. 2007;100:552-7.
- 16 Kämäräinen A, Virkkunen I, Holopainen L, Erkkilä E, Yli-Hankala A, Tenhunen J. Spontaneous defibrillation after cessation of resuscitation in out-of-hospital cardiac arrest: a case of Lazarus phenomenon. *Resuscitation*. 2007;75:543-6.
- 17 Frolich MA. Spontaneous Recovery after Discontinuation of Intraoperative Cardiopulmonary Resuscitation: Case Report. *Anesthesiology*. 1998;89:1252-3.

## Fenómeno de Lázaro durante una asistencia urgente extrahospitalaria

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El fenómeno de Lázaro, recuperación espontánea tras una parada cardiorrespiratoria (PCR), no es un evento frecuente. Presentamos un paciente con enfermedad pulmonar obstructiva crónica (EPOC) cuya familia solicitó asistencia en el domicilio por disnea. A nuestra llegada, se encontraba inconsciente, con pupilas medias y arreactivas y en situación de parada respiratoria, pero mantenía pulso central. Inmediatamente comenzamos maniobras de soporte vital avanzado. El paciente evoluciona con deterioro de la función respiratoria con broncoespasmo severo, seguido de deterioro hemodinámico y parada cardíaca. Tras 30 minutos de mantenimiento de la reanimación cardiopulmonar avanzada, cesamos las maniobras, y el paciente quedó en situación final de asistolia y apnea. A los diez minutos, el paciente recupera el pulso espontáneamente. Se reintubó y se trasladó al hospital, donde falleció a los doce días. Aunque se trata de un fenómeno de aparición impredecible y rara, hay dos conclusiones básicas que se pueden extraer a nivel extrahospitalario: el incremento del tiempo de espera para asegurar la persistencia de la asistolia y la vigilancia estricta de los volúmenes respiratorios administrados para evitar el riesgo de hiperinsuflación dinámica. [Emergencias 2011;23:43-46]

**Palabras clave:** Fenómeno Lázaro. Emergencias. Resucitación cardiopulmonar. Parada cardiorrespiratoria y extrahospitalaria.