

**OPIS PRZYPADKU / CASE REPORT**

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***Lazarus phenomenon in Poland – 86 years old woman came back to life*****Anna Kluzik<sup>1,2</sup>, Agnieszka Gaczkowska<sup>1</sup>, Piotr Rzeźniczek<sup>1</sup>,  
Maria Szymaniak<sup>3</sup>, Małgorzata Grześkowiak<sup>1</sup>**<sup>1</sup> Department of Teaching Anaesthesiology and Intensive Therapy, Poznań University of Medical Sciences<sup>2</sup> Department of Anaesthesiology, Intensive Therapy and Pain Treatment, Poznań University of Medical Sciences<sup>3</sup> Department of Transplantology, General and Vascular Surgery, Poznań University of Medical Sciences**Abstract**

We present a case of the Lazarus phenomenon, which is to our knowledge first report from Poland. This is a phenomenon of the heart, which can resume its spontaneous activity and generate circulation. It can happen after ineffective cardiopulmonary resuscitation (CPR) or in a departed person when a resuscitation attempts were not undertaken but a circulation returned spontaneously. The victim was 86 years old woman. She suffered cardiac arrest in a church. The rescuers began CPR, administered one shock and continued pharmacotherapy. After 40 minutes, the CPR was discontinued and death was confirmed. Suddenly after 15 minutes return of spontaneous breathing was recognized. Upon arrival to the hospital her vital signs were: HR 84/min, NIBP 106/70 mmHg, saturation 93%, temperature 36,5 °C. An increase of troponin in repeatable laboratory tests was noticed, but taking into account the extended duration of the cardiac arrest, and the amount of time before CPR was administered as well as patient's age and unfavorable prognosis, the decision was made not to apply any invasive cardiologic intervention. At third day of hospitalization sudden ventricular tachycardia with narrow QRS complexes and destabilization of circulation was observed. At the beginning of a therapy an improvement of a condition of the patient was reported, but later sudden drop in blood pressure appeared with no reaction to the treatment. The patient died at 12.15 pm. *Anestezjologia i Ratownictwo 2024; 18: 81-85. doi:10.53139/AIR.20241808*

*Keywords: Lazarus phenomenon, autoresuscitation, cardiopulmonary resuscitation*

**Introduction**

The term “Lazarus phenomenon” was introduced for the first time by Bray JG Jr in 1993 [1]. This is a phenomenon of the heart, also named as autoresuscitation, which can resume its spontaneous activity and generate circulation [2]. It can happen after ineffective cardiopulmonary resuscitation (CPR) or in a departed person when a resuscitation attempts were not undertaken but a circulation returned spontaneously. K. Linko et al. described the recovery after discontinued CPR for the first time in 1982 [3].

**Case presentation**

We present a case of the Lazarus phenomenon, which is to our knowledge first report from Poland. This took place out of hospital and spontaneous circulation returned after discontinued CPR.

The victim was 86 years old woman. She suffered from hypertension, diabetes mellitus type 2, decrease of memory. She was admitted to a hospital several times due to: dizziness, lack of coordination and diminished level of consciousness. She used the following medications: verapamil, piracetam, alprazolam, valsartan,

gliclazide. She was not allergic.

In 2019, she suffered cardiac arrest in a church. Emergency Medical System was activated. The rescuers began the CPR. Due to ventricular fibrillation (VF) one shock was delivered, asystole developed, adrenaline was administered (total 7mg), the patient was intubated (ventilated with a self-inflating bag, FiO<sub>2</sub> 100%, oxygen flow 10 l/min, RR 15/min, no EtCO<sub>2</sub> monitoring). No improvement was observed. The asystole was still present and dilated pupils were not reacting to light. After 40 minutes, the CPR was discontinued and death was confirmed at 10.00 am. Suddenly at 10.15 am return of spontaneous breathing was recognized. Sinus rhythm of the heart was confirmed on a monitor and also good palpable pulse. The patient was again intubated and transported to a hospital.

After 50 minutes at the admission to a hospital vital signs were: heart rate (HR) 84/min, noninvasive blood pressure (NIBP) 106/70 mmHg, saturation 93%, temperature 36,5°C. At the admission to Intensive Care Unit

(ICU) she was unconscious, breathing spontaneously (rate 18/min), both pupils equal, narrow, no reaction to light, bilateral cracking sounds at the base of the lungs, heart sounds quiet, deaf, NIBP 90/60 mmHg, HR 100/min. abdomen soft with no pathological resistant, lazy peristalsis, no peripheral edema, tendon reflexes present in upper extremities, but impossible to observe in lower extremities.

At ICU mechanical ventilation and analgosedation was started. A cannula to a central line as well as a cannula to an artery were inserted. A continuous infusion of noradrenaline and hemodynamic monitoring was initiated. A standard material for laboratory and microbiological tests were taken. Microbiological tests (VRE, carbapenemases) were negative. The X-ray of the patient showed enlarged vascular cavities, without pneumothorax, pleural cavities without fluid.

The results of laboratory tests and blood gas analysis are presented in table I and II.

Table I. The results of laboratory tests

	On admission	2 <sup>nd</sup> day	3 <sup>rd</sup> day
Na (mmol/L)	141	141	141
K (mmol/L)	4.13	4.3	4.1
Troponin (ng/L)	198 / 477 / 1262 <sup>1</sup>	5008	
NT proBNP (pg/ml)	414		
ALT (U/l)	346	314	
AST (U/l)	340	628	
PCT (ng/mL)	0.02	5.53	
CRP (mg/l)	1.9	85.4	296.1
Creatinine (mg/dL)	1.41	1.61	
WBC (x 10 <sup>3</sup> /μl)	22.78	15.94	14.18
RBC (x 10 <sup>3</sup> /μl)	3.99	3.65	3.31
HGB (g/dl)	12.6	11.6	10.5
PLT (x 10 <sup>3</sup> /μl)	239	230	174
Glucose (mg/dL)	445	176	214

<sup>1</sup>(3 samples)

Table II. The results of arterial blood gas analysis

	1 <sup>st</sup> day			2 <sup>nd</sup> day			3 <sup>rd</sup> day
	On admission	14:00	21:00	6:00	14:00	21:00	6:00
PCO <sub>2</sub> (mmHg)	40.1	42.1	35.1	37.7	43.1	41.7	47
PO <sub>2</sub> (mmHg)	71.4	83.4	106	77	75.2	71	73.8
O <sub>2</sub> -S (%)	89.2	94.5	97.9	95.9	95.3	94.2	94.6
HCO <sub>3</sub> (mmol/L)	13.7	17.4	16.8	22.5	24.5	24.5	26.9
BE-B (mmol/l)	-14.6	-9.8	-9.0	-2.3	-1.0	-0.7	1.2
pH	7.14	7.22	7.28	7.38	7.36	7.37	7.36
LAC (mmol/l)	8.0	4.3	6.0	4.6	3.8	3.5	2.3

A routine intensive treatment for post resuscitation syndrome was begun with a goal of hemodynamic stabilization. As soon as the patient presented myoclonic movement and Jackson's attacks, continuous infusion of Depacine was given. In order to increase of troponin in repeatable laboratory tests a doctor on duty informed a cardiologist on call (from the Centre of Angiography). Taking into account the extended duration of the cardiac arrest, and the amount of time before CPR was administered as well as patient's age and unfavorable prognosis, the decision was made not to apply any invasive cardiologic intervention (coronography/coronoplasty).

At second day of hospitalization, the CT scan of the head showed no displacement of ventricular system. Subarachnoid spaces were widened and sustention was narrow. There were ischemic changes at different times and part of them was recent. At third day of hospitalization sudden ventricular tachycardia with narrow QRS complexes and destabilization of circulation was observed. At the beginning of a therapy an improvement of a condition of the patient was reported, but later sudden drop in blood pressure appeared with no reaction to the treatment. The patient died at 12.15 pm.

## Discussion

Lazarus phenomenon presented by us is a rare known condition and therefore is rare reported. The meta-analysis presented the published causes of auto-resuscitation and characteristics of the patients [4-7]. Based on the publications it is known that autoresuscitation can affect children [8-11] as well as adults, but mostly is common in senior age [12-27]. Only one case of Lazarus phenomenon without performing CPR was presented. The victim was 97 years old patient in whom CPR was not initiated due to many advanced chronic diseases (one of them was heart insufficiency in which a spontaneous return of circulation began after 2 minutes from a moment of death's confirmation) [17].

The main present rhythms in the Lazarus phenomenon, described by the authors in the literature, are non-shockable (asystole, PEA) [28]. When comparing the rhythm of the presented case with the dominated rhythms in the Lazarus phenomenon, the similarity was noticed.

Among many causes presented by researchers of autoresuscitation are: hyperventilation and alkalosis, auto PEEP phenomenon, delayed drugs action,

hyperkalemia, toxins, cardiomyopathy, not observed minimal vital signs and metabolic disorders [4, 21, 23].

Predisposing factors given in the literature are: bleeding, dehydration, age > 60 years, ischemic heart disease, renal insufficiency and diseases of respiratory system like asthma and chronic obstructive pulmonary diseases [29]. Hyperventilation leads to decrease of partial pressure of carbon dioxide (pCO<sub>2</sub>) and later to respiratory alkalosis and finally to a shift to the left side of the hemoglobin's dissociation curve and decrease of oxygen delivery in the tissue. The result is constriction of the vessels in a brain, which can lead to tissue hypoxia particularly in central nervous system. The leading mechanism of hyperventilation is reduction of expiration time causing elevation of pressure in a chest and decrease of venous return with decrease of cardiac output [11]. The decrease of venous return is responsible for delay of drugs administration to the central circulation (equals with delay in drugs action), which is described as a next mechanism of Lazarus phenomenon.

Auto PEEP (Positive End Expiratory Pressure), air trap phenomenon, same as hyperventilation can cause increase of intrathoracic pressure, then decrease of venous return and cardiac output [27]. Similarly the decrease of venous return can cause slower distribution of drugs to the central circulation described as a mechanism of delay in drugs action. Delay distribution of drugs can happen when drugs are administered to a peripheral cannula (which took place in our presented case). Unfortunately this is not confirmed mechanism, but only suggested by few authors [29].

A presence of harmful substances in a body, f.e.g. toxins, narcotics, or overdose of drugs, can affect physiological processes in a body and cause reversible interactions at different levels. This is also a cause of autoresuscitation presented in the literature. Same, electrolyte disturbances as hyperkalemia, hypovolemia, hypothermia, which are reversible causes of cardiac arrest, can be a cause of unobserved minimal vital signs in a patient. In hypothermia, biochemical processes are slower, so vital signs are also slower and in this case breathing and pulse may not be detectable. Too high level of potassium affect heartbeat in a mechanism of sodium-potassium pump and a consequence can be life-threatening arrhythmias leading to cardiac arrest.

Among the predisposing factors leading to auto-resuscitation including also acute heart ischemia and

electromechanical dissociation: the group of factors with delay of Q-T (genetic or acquired), reperfusion of the heart – dysfunction/stun after ischemia, are presented. The other group are patients with cardiomyopathy and circulatory insufficiency. This group of patients used to have short breaks in circulatory flow (decrease of cardiac output), which is a consequence of frequent presence of such incidents during long periods of their cardiac/circulatory diseases. When interpreting the causes of autoresuscitation the fact of co-occurrence of many diseases (f.e.g. cancer, heart disease like cardiomyopathy, heart ischemia, sepsis, diabetes mellitus) and advanced age of a patient, is emphasized [29].

In the case of our patient the electrolyte disturbances were not present (K 4,13 Na 141), the changes in blood gas analysis were not too big (SpO<sub>2</sub> 71, pCO<sub>2</sub> 40, BE – 14,6) in laboratory test done just after admission to a hospital. The patient was not hyperventilated. The most common cause of autoresuscitation could be a mechanism of reperfusion of the heart, or auto-PEEP and coexistence of some chronic diseases.

## Summary

When cardiopulmonary resuscitation is performed, it is important to take into consideration the circumstances of cardiac arrest and to take a control of the effectiveness of resuscitation particularly artificial

ventilation. Medical staff should be well educated to recognize minimal vital signs and adequate monitor a patient. The advanced diagnostic methods should be considered to make a decision whether to continue or stop CPR. Additionally minimum 10 minutes of monitoring and observation of a patient after confirmation of his/her death is recommended.

The important factor is a need to report all the cases of Lazarus phenomenon in order to create a base with the data. It can be done for example by an Internet web site where the doctors could report the cases of autoresuscitation of their patients.

### Conflict of interest

None

### ORCID

Anna Kluzik 0000-0003-3865-300X

Agnieszka Gaczowska 0000-0003-1823-0552

Piotr Rzeźniczek 0009-0008-9214-4058

Małgorzata Grześkowiak 0000-0003-4215-8730

### Correspondence address

✉ Małgorzata Grześkowiak

Department of Teaching Anaesthesiology and Intensive Therapy, Poznań University of Medical Sciences  
ul. Marii Magdaleny 14, 61-861 Poznań

☎ (+48 61) 668 78 36

✉ mgrzesko@ump.edu.pl

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