

THE LAZARUS PHENOMENON: AUTO- CARDIOVERSION AFTER TERMINATION OF RESUSCITATION -A CASE REPORT

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Abstract

Introduction: Lazarus phenomenon is rare, and a dramatic occurrence characterised by a delayed return of spontaneous circulation after cardiopulmonary resuscitation is terminated. We report a case of this rare phenomenon.

Case Presentation: A 45-year-old unemployed man with haemorrhagic pericardial effusion developed iatrogenic perforation of the right ventricle and cardiac tamponade during attempted catheter pericardiocentesis. He became hemodynamically unstable for which he was referred to the cardiothoracic centre and an emergency sternotomy was carried out. He arrested as he was being wheeled to theatre. The sternum was opened, the perforations were repaired, direct cardiac massage was

carried out, he was defibrillated 14 times each with 20 joules but there was no response. He was declared dead after 40 minutes of resuscitation. After an additional 20 minutes of no cardiac activity while he was being closed, he regained spontaneous cardiac activity and eventually recovered. Three years of follow up did not reveal any neurological sequelae.

Conclusion: Though the Lazarus phenomenon is rare, it is observable and therefore clinicians should be aware of this phenomenon, and to observe any patient for at least 10-15 minutes (watchful waiting period) using non-invasive monitoring after the termination of Cardiopulmonary resuscitation before confirming death.

Keywords: Cardiac arrest, auto-resuscitation, Lazarus Phenomenon, spontaneous cardiac activity

Introduction

Lazarus phenomenon or auto-resuscitation is a very rare occurrence. It is defined as delayed unassisted return of spontaneous circulation (ROSC) following cessation of cardiopulmonary resuscitation which has been deemed unsuccessful and abandoned.

The phenomenon was named after Lazarus of Bethany in the Bible who was resurrected by Jesus four days after his death (John 11:1-45) Linko et al¹ were the first to report this phenomenon in medical literature and the term was first used in 1993 by Bray².

Autoresuscitation is uncommon following cardiac trauma, and much more uncommon following open cardiac massage. Our report aims to highlight the peculiar circumstance of this unusual phenomenon occurring following aggressive resuscitation which was terminated with great certainty of clinical death.

Cases Presentation

A 45-year-old male patient was undergoing echocardiography-guided pericardiocentesis via the apical approach for a large pericardial effusion. He became hemodynamically unstable in the middle of the

procedure with suspicion of perforation of a cardiac chamber causing cardiac tamponade.

An urgent cardiothoracic surgical consult was sought but suffered cardiac arrest while being wheeled to the operating theatre. Cardiopulmonary resuscitation was initiated and rushed to the theatre, quickly intubated with a hurried skin preparation and draping. A quick median sternotomy was done concurrently with invasive monitoring. Patient had no pulse or ECG activity. Door to sternotomy was conservatively estimated at about 5 - 10 minutes.

The findings were hemopericardium about 1.5L and two puncture points on the anterior aspect of the right ventricle close to the apex which was still squirting. Direct cardiac massage was commenced, and the perforations were repaired with pledgeted sutures. Patient had several episodes of ventricular fibrillation for which he was defibrillated 14 times each with 20 joules. The direct cardiac massage was continued together with boluses of adrenalin and correction of acidosis, transfusion of 2 units of fresh blood with no resumption of spontaneous cardiac activity. We subsequently noticed the heart had become tonically contracted and appeared dusky with no resumption of spontaneous activity after 30 minutes of resuscitation. His pupils were dilated and fixed and was declared clinically dead. Patient was extubated, monitoring discontinued and the family was notified.

We proceeded to close the chest up in layers in the normal fashion, which lasted about 20 minutes in

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preparation for transportation to the morgue. After the closure, a member of the team by stroke of good fortune, checked for a pulse and felt a weak radial pulse following which he raised an alarm. This finding was corroborated by other members of the team, following which monitoring was recommenced, an ECG tracing was now present, and patient remarkably had a sinus rhythm.

He was immediately re-intubated and had an arterial line, central and peripheral lines were re-inserted and full invasive monitoring recommenced. The chest was reopened, right ventricular pacing wires and mediastinal drains were inserted, the chest closed routinely and was sent to the ICU. He developed generalised tonic-clonic seizures on postoperative day 2 and had depressed levels of consciousness with a Glasgow coma scale of 5/15, even though was not sedated the seizures were controlled with phenytoin 100mg 8 hourly and then Keppra 500mg twice daily. He also had Citicoline (somazina) 1000 mg twice daily for obvious hypoxic ischaemic encephalopathy. Tracheostomy was done on the 8th postoperative day on account of prolonged ventilation. He regained full consciousness on the 14th postoperative day and was weaned off mechanical ventilation on 16th postoperative day. He made steady clinical improvement, was fully conscious by the end of the 2nd week with mild cognitive impairments which had resolved as at the time of discharge.

He developed superficial sternal wound infection, which was managed with antibiotics, had tracheostomy decannulated and was subsequently discharged home on the 24th day. On out-patient follow-up over the last 3 years, he has had no gross neurological sequelae but developed osteomyelitis of the sternum (Fig. 2) which was managed successfully with oral clindamycin.

Discussion

Lazarus phenomenon or autoresuscitation was first reported in medical literature in 1982 and the term Lazarus phenomenon was first used by Bray in 1993². It is probably under reported largely due to medico-legal reasons, fear that people will discredit health professionals and question whether the resuscitation was properly conducted or terminated prematurely^{4,8}

Our case was unique in several aspects; Firstly, it followed cardiac trauma albeit iatrogenic. This is quite rare as there is only one previously reported case of autoresuscitation following polytrauma to the best of our literature search³. Also, this patient underwent emergency sternotomy with evacuation of 1.5L of clotted hemopericardium, direct internal cardiac massage, intracardiac injection of 3mg adrenalin and direct defibrillation 14 times with 20 joules each; Resuscitation was terminated after 40 minutes; when there was no cardiac activity, heart has become dusky, all pulses were absent, flat ECG tracing, pupils were dilated and fixed and patient declared clinically dead with great certainty, extubated and just when skin was

been closed for transfer to the morgue he came back to life.

From a recent scoping review by Gordon et al, only about 35% of patients with in-hospital autoresuscitation survive to hospital discharge. Of these subsets, the majority (85%) surprisingly and remarkably have good neurological outcomes⁴.

Our patient did not experience any long-term neurological sequelae after 3 years of follow up. The Mechanism is not exactly clear⁸; But multifactorial mechanisms have been proposed to explain this rare occurrence:

(a) Dynamic hyperinflation of the lung causing increased positive end expiratory pressure (PEEP) is one of the proposed mechanisms, which is seen in patients with airway obstructive disease, (b) Myocardial stunning, (c) Delayed action of drugs administered during CPR, (d) transient asystole and (e) hyperkalaemia^{1,2}.

Our patient showed signs of “resurrection” within the 20 minutes window after termination of cardiopulmonary resuscitation which was consistent with observations made by various authors⁴

The mechanism of autoresuscitation in our patient is still unclear and no single proposed mechanism can explain this scenario⁷; It could be a combination of factors such as Positive end expiratory pressure (PEEP), during CPR dynamic hyperinflation occurs as a result of rapid manual ventilation without time for exhalation, this leads to overventilation and subsequent increased intrathoracic pressure, gas trapping, an increase in the end-expiratory pressure (called auto-PEEP) leading to delayed venous return, low cardiac output and even cardiac arrest. The effect of auto-peep on venous return was also exaggerated by the cardiac tamponade and hypovolemia this patient had. CPR was conducted by an experience team of cardiothoracic surgeons, anaesthesiologists and nurses⁵

Delayed action of drugs used for resuscitation which were administered through peripheral veins were inadequately delivered centrally due to impaired venous return due to the cardiac tamponade and hypovolemic shock; The inotropic drugs therefore did not exert the desired effect on the heart and So after sternotomy, evacuation of the clotted hemopericardium and repair of the ventricular perforation the venous return may have improved coupled with intracardiac injection of adrenaline and atropine^{1,2}

The presence of hypovolemia because of right ventricular perforation and hemopericardium may have caused myocardial ischaemia and subsequent myocardial stunning.^{1,2}

The implication of this rare phenomenon on our practise as cardiothoracic surgeons has been humbling; firstly, strengthens our faith in the dictum always give your patient the chance in terms of medical care as no cases of autoresuscitation were reported to have occurred without CPR¹⁰; This patient had coded at the time of our intervention.

We have learnt to wait for at least 10-15 minutes after termination of CPR before declaration of death indeed patient came to say thank you (Figure 1) to our staff on the day of discharge.



Figure 1: Patient in all white with a sternotomy site dressing came to say thank you to our nurses on the day of discharge from hospital



Figure 2: Sternotomy scar and discharging sinus (blue arrow) from the lower sternal border.

He developed osteomyelitis of the sternum (Figure 2) however the unanswered question is how despite

prolonged acute cerebral hypoxia and the poor prognosis associated with autoresuscitation¹², our patient survived miraculously and had no long-term neurological sequelae after 3 years of follow up.



Figure 3: Patient came for last review

Conclusions

Though the Lazarus phenomenon is rare, it is observable and therefore clinicians must be aware of this phenomenon and to observe any patient for at least 10-15 minutes^{2,8,9} (watchful waiting period) using non-invasive monitoring after termination of Cardiopulmonary resuscitation before confirming death.

Consent for Publication

Informed consent was obtained from patient and nursing staff before publication of article and use of photos as part of this publication.

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