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An Unusual Resuscitation Experience: The Phenomenon of CPR-Induced Consciousness

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ABSTRACT

Cardiopulmonary resuscitation-induced consciousness (CPR-IC), as the name implies, can readily be recognised by the presence during cardiac arrest of spontaneous and purposeful patient movements that immediately cease after stopping chest compressions. It is increasingly being reported across the world [1]. High quality cardiopulmonary resuscitation (CPR) may transiently generate sufficient cerebral perfusion to cause signs of consciousness during CPR which disappears on cessation of CPR. Hereby we present two cases, a 40-year-old male presenting with myocardial infarction and a 67-year-old male who presented with concurrent ischemic stroke and myocardial infarction. Both patients went into cardiac arrest and showed signs of consciousness upon immediate initiation of CPR. This led to a state of confusion, as many of the team members were not aware of this phenomenon in both cases and were reluctant to continue CPR as it can cause confusion among healthcare providers and potentially lead to interruptions in life-saving measures. Given the potential impact of CPR-IC on resuscitation efforts, it may be beneficial for healthcare providers to undergo further education and training regarding this phenomenon and develop sedation guidelines specific to managing CPR-IC. The Emirates Health Services (EHS) could help improve outcomes and standardize practice. Only the former patient survived with a GCS of 15/15 after undergoing the needed interventions. Despite the death of the other patient, CPR-IC has been associated with improved survival in in-hospital cardiac arrest. Additionally, more research in this area could provide valuable insights into how best to recognize and manage CPR-IC in different clinical scenarios.

Keywords
CPR-induced consciousness, Cardiopulmonary resuscitation, Spontaneous movement.

Case Report 1

A 67-year-old male with a medical background of diabetes mellitus (DM), hypertension (HTN), and a known smoker, was brought to the emergency department by national ambulance with a complaint of left-sided body weakness and slurred speech that started around 40 minutes prior to arrival. Symptoms were associated with one episode of non-bilious, non-bloody vomiting. Collateral history from a first-degree relative revealed the patient was having symptoms of dysphagia and headache for the past 3 days. Upon initial assessment, the patient's airway was patent and he was vitally stable with a heart rate of 98 beats per minute, blood pressure 141/72 mmhg, SPO2 99% on room air, with a normal capillary refill time. Pupils were equal and reactive, and Glascow Coma Scale was 15/15. Point-of-care blood glucose was 13.3 mmol/L. Examination was remarkable for right facial droop, left-sided hemiparesis with a power of 0/5 in both left upper and left lower limbs, and scattered psoriatic lesions were seen upon exposure.

Code stroke was activated immediately and the patient was sent for CT brain without contrast which revealed no intracranial bleed, and a hyperdensity in the middle cerebral artery. Plain CT was

followed by a CT angiogram which revealed total occlusion of the right internal carotid artery and opacification of M1 segment of the right middle cerebral artery through the anterior communicating artery, as seen in Figure 1. An ECG was also done (Figure 2) which revealed an anterolateral STEMI. Troponin level was sent and came back high at 6133 ng/dl. The remainder of the blood results were unremarkable.

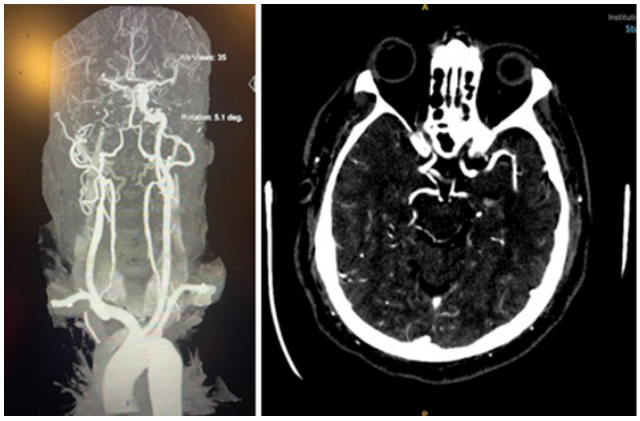

Figure 1: CT brain and neck angiogram: total occlusion of the right internal carotid artery (right image) and non- opacification of M1and M2 segments of right middle cerebral artery representing occlusion (left image).

Thrombolytics were administered in consensus from both the medical and cardiology team in an attempt to treat his STEMI and ischemic stroke concurrently. Patient was thrombolysed with alteplase 0.9 mg/kg.

Approximately 2 hours later, the patient's GCS dropped and he was found snoring with cold extremities, unresponsive and no pulse was palpable. CPR was immediately started using the the The Lund University Cardiopulmonary Assist System (LUCAS) device and resuscitation was initiated according to the Advanced Cardiac Life Support (ACLS) algorithm. The airway was secured with a 7.5 mm endotracheal tube. Initial rhythm was PEA which then later changed to ventricular fibrillation in which 5 shocks were delivered; the rhythm then converted to PEA again. No reversible causes of death were identified and the patient was announced dead after 1 hour and 10 minutes of resuscitation.

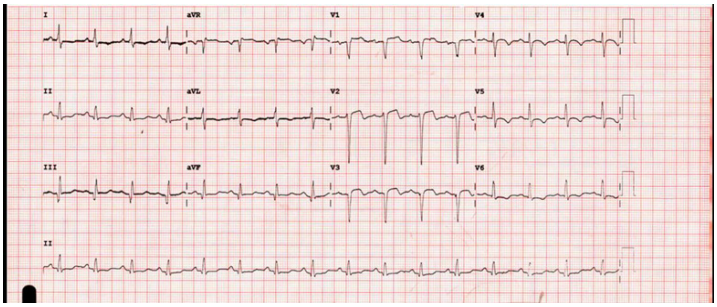

Figure 2: ECG with anterolateral STEMI.

During CPR, the patient was localizing to pain, and attempting to remove the LUCAS device to stop chest compressions. He also attempted to remove his endotracheal tube and kept moving his extremities in a purposeful manner. However, these movements seemed to cease during rhythm check and when CPR is not in progress. The patient remained pulseless throughout and ROSC was not achieved. He demonstrated the same purposeful movements whenever CPR was initiated again, and showed no signs of life whenever CPR was stopped for rhythm check. Eventually, the ED team agreed unanimously to stop resuscitation after 1 hour and 10 minutes despite being reluctant to do so initially in view of the patient's unexplained behavior.

Case Report 2

The second case is about a 40-years-old male from Nepal, brought in by national ambulance as pre-alert, who presented to the emergency department with crushing chest pain radiating to both shoulders for more than 2 hours; this was a first time episode. The ECG showed anterolateral STEMI (Figure 3). There was no history of loss of consciousness or seizures and he is a chronic smoker. As soon as the ambulance crew boarded over the ambulance bay, the patient went into ventricular fibrillation and was given 1 DC shock and had achieved ROSC immediately. He was conscious, alert, oriented, and then was momentarily shifted to the red zone and attached to the cardiac monitors. He had the following vitals: BP 118/68 mmhg, HR 82 beats per minute, RR 17 breaths per minute and temperature was 36.8°C. He was then given 300 mg of Aspirin and 180 mg of ticagrelor, awaiting to be shifted to the cath lab, when he suddenly started snoring, lost consciousness, pulse and went into ventricular fibrillation again. A cardiac arrest was witnessed 10 minutes later, and 1 DC shock was delivered after which the patient achieved return of spontaneous circulation.

VBG showed: PH 7.2 , co2 53, hco3 20, hb 16, na 137, k 4, glu 10 and lactate 6.6.

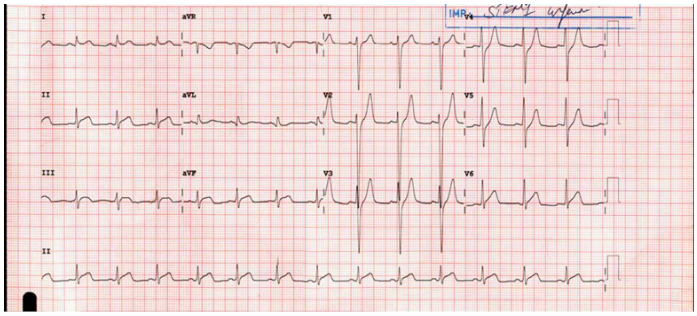

Figure 3: ECG showing anterolateral STEMI.

As the patient was awaiting to be shifted to the cath lab, he went into cardiac arrest with a vfib rhythm; CPR was immediately initiated, however the patient was moving his upper limbs to move away the hands of the person doing chest compressions, and later moving the LUCAS away. ACLS protocol was ongoing; he was shocked twice and given amiodarone 300mg then epinephrine

1mg every other cycle. Amiodarone 150 mg and lidocaine were tried, however the patient remained in ventricular fibrillation every time. Dual shock was attempted, while he was still in ventricular fibrillation, then the ED team decided to intubate and give the patient sedation with ketamine to decrease the anxiety of the team running the code as the patient was moving and many thought he is alive. Thereafter, the cardiology team decided to thrombolyse the patient, and continued CPR for 45 minutes and checking the pulse every 2 minutes. The patient had achieved ROSC after 50 minutes of continuous CPR; VBG then was ph 6.9, co2 67, hco3 16, hb 17, na 139, k 3.8, glu 12, lactate 11. Bedside ECHO showed ejection fraction (EF) of 40-50%, 1 litre of normal saline was given along with vasopressors; vitals were: BP 143/67, HR 87 bpm and the oxygen saturation 100 %. He was then shifted for rescue PCI through the radial artery. Post procedure findings stated that the left anterior descending (LAD) artery had a 90% proximal thrombotic lesion. The left circumflex artery (LCA) had mid segment significant lesion at bifurcation with OM1, and the right coronary artery (RCA) had proximal significant (80%) thrombotic lesion. The patient again arrested multiple times in the cath lab with ventricular fibrillation.

Thereafter, the patient was shifted to ICU, still on mechanical ventilator, intubated and was on amiodarone and noradrenaline infusion. Patient's vasopressors requirements were decreased and he was eventually extubated the next day. He was monitored in the ICU for 2 days then shifted to the cardiology ward. He was discharged fully conscious with no neurological deficits. The patient stayed a total of 9 days in the hospital and left walking on DAPT for 1 year and enoxaparin.

Discussion

Here, both cardiac arrest cases with varying pathological reversible causes, show that the phenomenon is not dependable on the cause of arrest but rather on the swiftness of starting CPR upon recognition. CPR-IC could also be a surrogate of sustained high levels of regional cerebral oxygen saturation, which has been associated with increased ROSC and neurologically favorable survival following cardiac arrest. Cases involving CPR-IC were more often witnessed to arrest by EMS, had a first monitored arrest rhythm of VF/VT, and had fewer delays between collapse and EMS arrival. These findings may suggest that CPR-IC is dependent on the duration of no-flow time before the commencement of CPR [2].

Current prehospital CPR-IC guidelines vary significantly. More than twenty five guidelines we identified, and each had a different way to manage CPR-IC. The discrepancy between guidelines has a flow on effect to research. The non-standardised treatment of CPR-IC across multiple prehospital services makes it impossible to look for trends and relationships between treatment and outcome [3].

It's not evident yet whether the unintentional movements by the patient is considered localizing to pain so analgesia shall be given or sedation would suffice. And most importantly, the recognition of CPR-IC from national authorities and perhaps the possibility of introducing this phenomena in BLS courses for the public would be beneficial, so as to not stop CPR if they experienced CPR-IC, and thus increasing the chance of patient survival with excellent neurological outcomes. Future research efforts should focus on establishing guidelines and local protocol for the use of sedation and physical restraints [4].

Another resource states that the use of sedative and analgesic drugs such as ketamine may be the best choice to manage cardiopulmonary resuscitation-induced consciousness, as an alternative to physical restraint [1].

Multiple cases reporting CPR-IC end with non-favourable neurological outcomes or death [5], but our second case advocates for the high possibility of an intact neurological outcome and the first to be reported in the United Arab Emirates.

Our patients had only purposeful movements as signs of CPR-IC but many more like eye opening, agonal breathing, localizing painful stimuli, purposeful arm movements, verbal and non-verbal communication with the resuscitation team, and following instructions are reported too [6]. Patient's combativeness during CPR may increase the risk of injury to the patient. Let us not forget the psychological impact of witnessing such a phenomena on the people involved in the resuscitation, whether it is the public, paramedics or hospital healthcare workers.

Conclusion

While CPR-induced consciousness (CPR-IC) can take caregivers by surprise due to the bizarre nature of unexpected movements seen from the patients, it is linked to better survival rates and may serve as a marker of excellent CPR quality and brain perfusion. These factors justify the consideration of extending resuscitation efforts. Therefore, once identified, the primary focus in management should be on maintaining high-quality CPR with minimal interruptions despite the growing occurrence of this phenomenon. It is crucial to conduct more research in this area to avoid compromising CPR outcomes in responsive patients. Further investigation is needed to assess the prevalence of CPR-IC in the UAE, increase awareness amongst healthcare providers establish guidelines for managing this condition effectively in terms of sedation.

Acknowledgment

Statement of Ethics

All personally-identifying information, such as name, was excluded from the study. Written informed consent for publication of case and images was obtained from the patient.

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