CASE REPORT

Intraoperative cardiac arrest during cervical spine stabilization surgery in a 74-year-old male with pre-existing comorbidities: A case report

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ABSTRACT

In this report, we present a case of intraoperative cardiac arrest in a 74-year-old male patient undergoing elective two-stage cervical stabilization for C5-C6 fracture (type B3) associated with diffuse idiopathic skeletal hyperostosis (DISH) and an oblique fracture of the C5 spinous process. This case highlights the challenges of perioperative hemodynamic management in elderly patients with multiple comorbidities and an extended surgical duration. The case was successfully managed with immediate resuscitation, multidisciplinary team involvement, and postoperative intensive care support, ultimately leading to a favorable neurological outcome. The case report aims is to share a prone-supination cardiac massage procedure that can play a very significant role in the management of patients and who develop cardiac arrest during surgery. Incorporating training routines and protocols for healthcare professionals involved in the surgical room work of prone-supination massage could have a very significant impact on the survival of patients. (www.actabiomedica.it)

Key words: cardiac arrest, cervical stabilization, diffuse idiopathic skeletal hyperostosis

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Introduction

Cardiac arrest remains one of the leading causes of mortality worldwide, placing significant burden on healthcare systems. Furthermore, during the COVID-19 pandemic the management of time-dependent medical conditions, including cardiac arrest, was significantly challenged due to prolonged healthcare response times and resource constraints (1-2). During the pandemic, research interest and the number of studies of cardiac arrest declined, and many topics that were the subject of interest in the scientific world took a back burner compared to the pandemic (2). Despite the reduction of interest in the scientific world, especially in the general population, interest in cardiac arrest has not declined significantly given to his high incidence and the role of targeted training in life-saving maneuvers; this element is essential for both healthcare professionals and the general public, empowering them to effectively respond during critical emergencies (3-4). Cardiac arrest can be broadly divided in out-of-hospital cardiac arrest (OHCA) and intra-hospital cardiac arrest (IHCA), based on the geographical location of the event (5-6), notwithstanding the strong interest for OHCA in the community, the topic of IHCAs remain a relevant issue for healthcare. Notably, IHCA could also occur in the operating room, during surgical procedures, especially in vulnerable patient as the elderly and with comorbidities (7). Additionally, the complexity and duration of major surgical interventions can further increase this risk, emphasizing the need for careful monitoring and prompt management strategies to enhance patient outcomes. This statement applies to neurosurgical procedures, such as patients undergoing extensive spinal surgeries which are at increased risk of perioperative complications, including cardiovascular events. The adherence to specific clinical protocols is a cornerstone element for improving survival and neurological outcomes, therefore it it is essential that healthcare personnel are trained in the recognition and proper management of emergencies in the operating room, including cardiac arrest (8-9). In order to continue studies regarding IHCA and a very relevant topic for guidelines, which is the possibility of performing CPR with pronation, we wanted to share our experience of case report of a 74-year-old male who suffered an intraoperative cardiac arrest due to hypovolemic shock and a vasovagal response, triggered by prolonged surgery and substantial blood loss. The immediate recognition and prompt intervention by the surgical and anesthesiology teams facilitated successful resuscitation and post-surgical recovery.

Case presentation

Patient profile and preoperative assessment

- Age/Gender: 74-year-old male
- Anthropometrics: Weight 101 kg, Height 178 cm, BMI 32.16
- ASA Physical Status Classification: ASA III
- Excessive alcohol consumption, compensated with vitamin supplementation
- Hypertension managed with sartans
- Previous nasal bone fracture with occasional epistaxis
- History of left-sided thoracoscopic wedge resection of the upper lobe and right shoulder atheroma excision
- Chronic kidney disease (CKD), stage 3 secondary to nephroangiosclerosis
- Chronic, macrocytic normochromic anemia (100 g/L at admission) attributed to folate deficiency

Initial presentation and surgical indication

The patient was admitted to the emergency department following a fall likely linked to alcohol consumption and recent zolpidem (10 mg) use. Imaging revealed a C5-C6 type B3 fracture on a DISH background and an oblique fracture of the C5 spinous process, warranting cervical stabilization surgery.

Surgical and anesthetic details

Procedure outline

- Surgical Approach: Two-stage cervical stabilization (anterior and posterior)

- Anterior Approach: Skyline plate fixation and bone grafting at C5-C6
- Posterior Approach: C3-C7 lateral mass screw fixation (Magerl technique), C6 laminectomy with crosslink

Anesthetic management

We utilized invasive arterial blood pressure monitoring through radial artery catheterization, along with standard monitoring for ECG in lead DII, heart rate, ETCO2, Spo2, and oral body temperature. Regarding peripheral venous access, due to poor venous access quality, we used two peripheral venous catheters sized 18G and 16G, through which electrolyte solutions and catecholamines were infused.

- Induction Agents: Fentanyl, propofol, and rocuronium
- Maintenance Anesthesia: Sevoflurane with continuous remifentanil infusion; low-dose norepinephrine to sustain normotension
- Intraoperative Hemodynamics: Blood loss during the anterior stage was approximately 1 liter, managed with transfusion of 2 units of packed red blood cells (initial Hb: 107 g/L, post-transfusion Hb: 90 g/L)

Intraoperative cardiac arrest

Onset of cardiac arrest

During the second stage in the prone position, approximately nine hours into the procedure, the patient experienced hypovolemic shock due to ongoing blood loss (estimated at 1.5 liters) and a vasovagal response. Pre-arrest signs included bradycardia and severe hypotension (systolic BP 65 mmHg, diastolic BP 35 mmHg, heart rate 30 bpm), managed initially with 10 mcg bolus epinephrine, continuous norepinephrine infusion, and crystalloid administration.

Cardiac arrest and resuscitation

The patient progressed from a peri-arrest state to pulseless electrical activity (PEA), necessitating immediate prone-position cardiopulmonary resuscitation (CPR). Chest compressions were delivered at the T8-T9 vertebrae level.

Resuscitation measures included:

- Medications Administered: 1 mg IV epinephrine bolus followed by two cycles of CPR with additional epinephrine boluses totaling 2 mg
- Feedback Indicators: Positive end-tidal CO2 > 20 mmHg and invasive diastolic pressure > 25 mmHg
- Return of Spontaneous Circulation (ROSC): Achieved after the second CPR cycle, with restoration of sinus rhythm and normotension (maintained with continuous norepinephrine and epinephrine infusions)

During the cardiac arrest phase, for the transfusion of packed red blood cells, due to the difficulty in obtaining an adequately sized venous access, we successfully employed intraosseous access in the distal tibia.

Post-resuscitation measures

Following ROSC, the patient's hemoglobin level was found to be 76 g/L with pH 7.27 and lactate 0.6 mmol/L. He received an additional 2 units of packed red blood cells. Once hemodynamic stability was confirmed, the surgery was successfully completed approximately two hours later.

Postoperative course

Intensive care management

The patient was transferred to the intensive care unit (ICU) where he was monitored closely for hemodynamic stability and neurological function.

Postoperative assessments included:

- Radiologic Evaluation: Cranial CT scan showed no acute intracranial pathology
- Neurological Recovery: Gradual reduction of sedation; extubation with a Glasgow Coma

Scale (GCS) score of 14/15; transient confusion and agitation suspected to be alcohol withdrawal, managed with oxazepam and quetiapine
- Hemodynamic Support: Continued norepinephrine and crystalloid infusions; temporary diuretic therapy at the end of the ICU stay
- Cardiac Assessment: ECG showed no new abnormalities; elevated troponin levels were attributed to recent CPR. Echocardiography confirmed preserved global systolic function.

Outcome and discharge

The patient was eventually discharged from the ICU to a medical ward for management of a hospital-acquired pneumonia due to Serratia species. On follow-up, 12 days post-arrest, he exhibited no neurological deficits or cognitive impairments, with a CPC value of 1.

Discussion

This case report highlights the high risk of perioperative cardiac events in elderly patients with complex medical history undergoing extensive spinal surgery. Key elements for successful management were careful intraoperative monitoring, early recognition of peri-arrest indicators, and coordinated resuscitation efforts involving all members of the multidisciplinary team by a pronoposition cardiac arrest massage. This report reinforces the importance of tailored anaesthetic and haemodynamic management strategies in preventing and responding to intraoperative complications. As presented by our previous literature review (10), there are other case reports analyzing this type of procedure, unfortunately the last two studies to our knowledge date back to before the pandemic (11-13), so it is essential to restart research on prone-supination CPR. Finally, we must emphasise that in the literature there are no multicenter or case-control studies for this type of procedure, but only analyses and hypotheses, so we hope that our study may be of interest to the scientific community and aimed at helping to define possible studies, in fact the study of rare conditions of cardiac arrest is very important for the progress of future therapy and guidelines (14). The suggestion to practice this type of CPR is also linked to the current lack of contraindications (15) and the presence of procedures that could be introduced into routine clinical practice (16).

Conclusion

Intraoperative cardiac arrest in a high-risk patient can be successfully managed with timely, protocol-driven intervention and a multidisciplinary approach. This case highlights the potential for complete neurological recovery despite prolonged resuscitation, emphasizing the value of personalized perioperative care in complex surgical settings and the possible role of prone supination massage.

Conflict of interest: Each author declares that he or she has no commercial associations (e.g., consultancies, stock ownership, equity interests, patent/licensing, arrangement etc-) that might pose a conflict of interest in connection with the submitted article.

Authors contribution: N.R., M.G. and P.M. have managed the medical case, E.C. a wrote the first version of the manuscript. All authors reviewed the final draft and approved it.

Declaration on the use of AI: None

Institutional review board statement: The study was conducted in accordance with the hospital regulations and Informed consent was obtained from the patient.

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Appendix

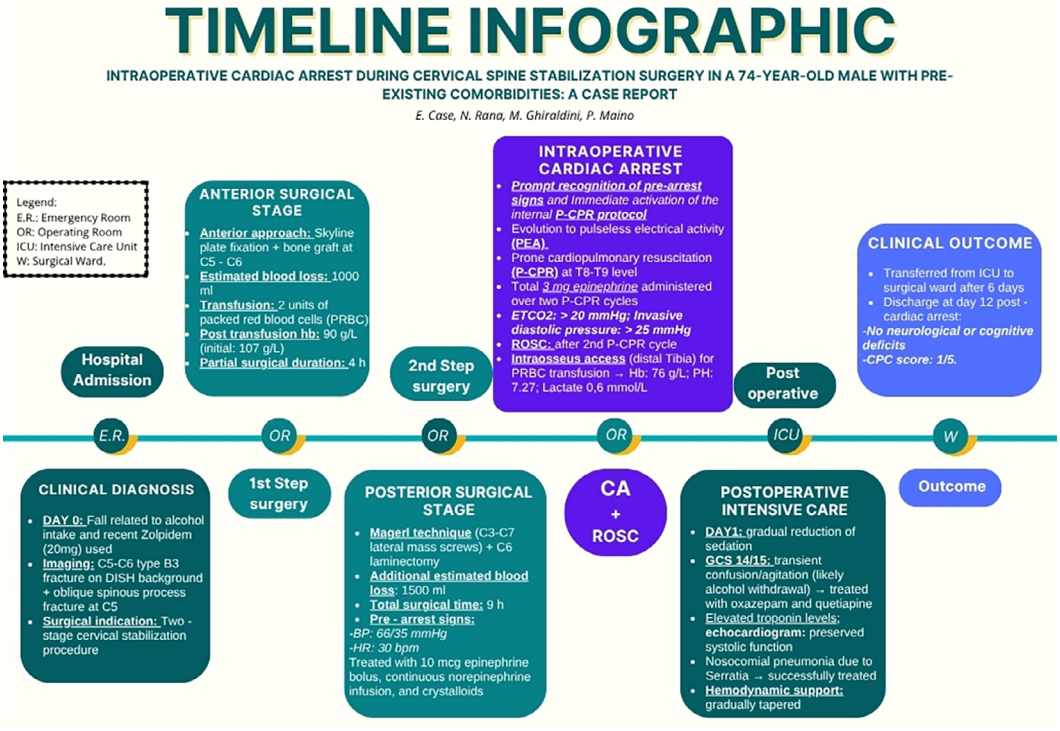

Figure S1. The appendix contains a timeline of events involving the patient and the main interventions.