

## Brief Communication

## Full Recovery after Cardiopulmonary Resuscitation in Lateral Position Necessitated by Hemorrhagic Shock

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### Abstract

Cardiac arrest during general anesthesia is often predictable with appropriate prognosis. However, it may have some difficulties as positions other than supine. A 43-year-old woman underwent a left radical nephrectomy due to renal cancer while in a lateral position. Massive bleeding because of a laceration in the inferior vena cava complicated her operation. Due to rapid blood loss, pulseless electrical activity occurred. Chest compressions were administered with the patient in the lateral decubitus position. Following a blood transfusion, intravenous fluid administration, fresh frozen plasma, induced hypothermia, fresh whole blood and norepinephrine infusion, the patient was stabilized. She was transferred to ICU, and after 24 hours, she was extubated. The next week she was discharged with no neurological damage. Initiating chest compressions as soon as possible even in positions other than supine could minimize hypoxic complications and enhance prognosis of cardiac arrest.

**Keywords:** Cardiopulmonary Resuscitation, Circulatory Arrest, Deep Hypothermia; Induced, Exsanguination, Posture

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### Introduction

Cardiac arrest during operation is fortunately rare event and the outcome is better compared to cardiac arrest in other setting because of earlier diagnosis and treatment. It is usually witnessed and often anticipated, the patient is known to the anesthetic team, and resources and equipment are ready and available in the theatre and CPR can start immediately (1).

The principles of any resuscitative effort are similar regardless of the patient medical issues and cause and place of arrest is called chain of survival

and include the following steps: Recognition of arrest and appropriate activation of support systems, CPR, Electrical therapy and shock if appropriate, Instituting advanced care as soon as possible, Continued care after cardiac arrest (1).

Maintaining blood perfusion to organs is the principle of any CPR in any situation. Therefore alternative types and techniques of chest compression have been described, for example: open-chest cardiac massage, cough CPR, precordial thump, and percussion pacing and so on (2).

Although intraoperative cardiac arrest is rare, it

has some difficulties when the patient is in positions other than supine (3). Accessing bleeding site, time consuming reposition due to surgical instrument installation could delay maintaining circulation (3). In literature prone CPR is described by placing left fist under sternum and pushing mid-thoracic spine with right hand. Therefore one strategy could be placing lateral arrested patient to prone position as described by Sheron L (3). Raheel Bengali described the first lateral compression by using right hand against mid thoracic spine and left hand on sternum (2).

On the other hand, Neurological injury is the main cause of mortality and morbidity post successful (CPR) following cardiac arrest, about two third of patients who were discharged from hospital post cardiac arrest will suffer from moderate to severe cognitive deficits for the next three months post discharge (4). Therapeutic hypothermia (body temperature kept at 32–35°C) can reduce the mortality and improve the neurologic outcome and cardiac function in patients post cardiopulmonary resuscitation (5). Hypothermia can improve the microcirculation and prevent microthrombi formation after cardiac arrest. Therapeutic hypothermia has a minimal effect on coagulation system and platelet count and function is still normal however severe hypothermia leads to coagulopathy (6).

## Case Report

A 43-year-old woman (BMI 44.4) with no significant past medical history had been scheduled for radical nephrectomy due to renal tumor. Pre-operative examination was significant for difficult intubation with grade 3 in Mallampati score. At preoperative laboratory results including blood counts, blood tests and coagulation study were within the normal range.

The patient was successfully intubated by fibers optic bronchoscope after administration of 1000µgr of Alfentanil and 10 puffs of Lidocaine 20% spray as local anesthesia of mouth and throat. Propofol 2mg/kg and Atracurium 0.3mg/kg were used for induction of anesthesia. Maintenance of anesthesia continued with Propofol infusion 100µ/kg/min and Remifentanil 1µ/kg/min. Our patient was ventilated with 100% FiO<sub>2</sub> under mechanical ventilation. Two large bore IV access was inserted due to predicted

risk of bleeding. The patient was positioned in left lateral decubitus and standard monitoring was set.

The patient remained hemodynamically stable for the first 25 minutes when inferior vena cava was cut because of attachment to posterior wall of renal mass. She lost about 2 liters of blood in 2 minutes and blood pressure dropped to 42/20 measured by non-invasive blood pressure (NIBP). Meanwhile all the infused anesthetic drugs were discontinued, two units of cross-matched packed cells was given via 4 large IV lines (two extra IV lines were obtained) but due to sudden and ongoing bleeding, patient developed pulseless electrical activity.

Chest compression initially started in lateral position with two resuscitators, one supporting posterior chest wall with both hands and the other one pressing chest wall against it to achieved compression of chest cavity with the ratio of one third. This decision was made because repositioning takes time and the surgeons should have access to bleeding site to control bleeding. One mg IV epinephrine was commenced and bleeding site was packed with sterile gauze then the patient was repositioned to supine after 3 cycles of chest compression. Three minutes afterwards, her radial pulse was palpable with heart rate of 130/minute.

After stabilizing hemodynamic, central venous catheter was inserted, the patient was hydrated and two extra units of packed cells were infused. Operating room temperature reduced to achieve central temperature at 32°C with guidance of central temperature monitoring. Arterial line catheter was placed and first arterial blood gas (ABG) after cardiopulmonary resuscitation (CPR) showed metabolic acidosis with Base Excess of -17.3 which was corrected with bicarbonate infusion. The patient was repositioned and surgery proceeded by excision of tumor which was about 127\*93 mm with posterior adherence to inferior vena cava.

She was stable for 45 minutes meanwhile the acidosis was corrected, and hemodynamic was stable and total intravenous anesthesia (TIVA) was started. At this time, our patient rebleed due to detachment of packed gazes. She became bradycardic, our arterial waves dissolved and chest compression started laterally, TIVA discontinued, Epinephrine 1mg each 3-5 minutes was administered meanwhile the patient

repositioned to supine. After 15 minutes carotid pulses were palpable.

We infused three isogroup packed cells, and four units of fresh frozen plasma (FFP). The operation continued in supine position in order to repair the rupture in IVC. Due to ongoing oozing from operation site and unavailability of FFP, 100 ml of fresh whole blood was transfused.

In post-anesthesia care unit (PACU), the patient had been having unstable blood pressure, which stabilized by infusion of Norepinephrine 8µg/min.

The patient was transferred to intensive care unit (ICU); body temperature remained at about 32°C. ABG obtained in ICU revealed respiratory and metabolic acidosis, which was corrected by infusion of bicarbonate and correction of ventilator, induced hypoventilation. After two hours, her hemodynamic was acceptable and Norepinephrine infusion was tapered and discontinued. 15 hours later, she became conscious and able to follow the commands. Therefore, after tolerating spontaneous breathing test trial, she was extubated. The patient was discharged from ICU in the following day and 7 days later discharged home, fully recovered and with normal neurologic examination.

## Discussion

We present successful CPR after two cardiac arrests consequently, in which cardiac compression started in lateral position. As mentioned in literature, in some situations initiating chest compressions should start in positions other than supine.

It is well demonstrated that prone CPR could be more successful due to time consuming repositioning and difficulty in accessing wound site. Sun et al in 1992 described prone chest compression by placing the left clenched fist under the sternum while compressing the mid-thoracic spine with the right hand (7). In 1994 Tobias, et al. explain a modified version in which surgeon compressed the thoracic cage with a palm placed over the scapula on each side of the spinal wound (8). However, there are limited case reports on initiating CPR in lateral position. Another study described two case of pulseless electrical activity in which they repositioned the patient for initiating chest compression and both

were unsuccessful, he suggested performing compressions in prone position may alter the results (3). There were two reports describing pediatric cases in whom chest compression were initiated by using the two thumb-encircling hand technique (9, 10). Bengali, et al. described a successful adult case in which due to Wolff–Parkinson–White syndrome (WPWS) wide QRS developed with unstable hemodynamic. In that case compression initiated with the palm of the right (dominant) hand against the patient's mid-thoracic spine, and the palm of the left (nondominant) hand directly opposite, against the sternum (2).

## Conclusion

In our experience, after lateral cardiac arrest, performing compressions in the same position with the ration of not consuming time and maintain position for the surgeon in order the control-bleeding site could be resuscitative. Further studies with modeling of different techniques of lateral chest compression could be helpful in advocating standardized lateral chest compression.

## Acknowledgment

None.

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

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