International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611

Survival with Complete Neurological Recovery after Prolonged Cardiac Arrest in a Post CABG Patient – A Rare Case Report and Review of the Literature

Dr. Krishnendu Chakrabarti[1], Dr. Sayar Kumar Munshi[2], Dr. Pares Bandyopadhyay[3]

Department of Cardiothoracic & Vascular Surgery (CTVS), Nilratan Sircar Medical College & Hospital [NRSMCH], Kolkata, Under West Bengal University of Health Sciences

Abstract: ***In general outcome of cardiopulmonary resuscitation after cardiac arrest remain poor particularly in patients with risk factors such as unwitnessed arrest, unfavourable initial cardiac rhythm, older age, prolonged resuscitation without return of spontaneous circulation (ROSC). So there are specific guidelines as well for terminating resuscitative efforts in case of cardiac arrests which are deemed futile. Nonetheless, cases of successful resuscitation with good recovery after prolonged cardiac arrest have been documented. We present a case of 55 years old man who survived a cardiac arrest in the post cardiac surgery ITU that lasted approximately 55 minutes. The patient had a full neurologic recovery and was discharged from the hospital in ambulatory condition with stable vitals.***

Keywords: Cardiopulmonary resuscitation, cardiac arrest, post cardiac surgery, neurologic recovery

1. Introduction

Inspite of the advancement in knowledge and improvements in managing cardiac arrests resulting from training, researches and implementation of specific guidelines with definite improvements in survival, the outcome are still generally poor. However management challenges in post cardiac surgery patients are entirely different and is associated with a better prospect of successful outcome. In acknowledgement of this fact, the European Resuscitation Council published a specific resuscitation guidelines in patients with cardiac arrest after cardiac surgery which is in sharp contrast with the guidelines from ACLS (Advanced Cardiac Life Support) that is designed broadly for both out of hospital and in-hospital cardiac arrest [1,2].

The principle causes of cardiac arrest in post surgical patients are due to electrophysiological disturbances like arrhythmia, graft malfunction, cardiac tamponade, major surgical bleeding or tension pneumothorax. Timely emergency re-sternotomy is very crucial in treating such reversible causes [4,5].

Successful outcome in the ITU set up after cardiac surgery is highly favoured by early detection and immediate resuscitative intervention due to close monitoring. Furthermore, the causes of cardiac arrest post cardiac surgery are mostly reversible and the arrest is preceded by progressive deterioration in many instances allowing time to take preparatory measures [3,4]. Most importantly emergency resternotomy performed timely allows correctable causes to be dealt with effective reestablishment of circulation with internal cardiac massage and use of mechanical supportive devices [1].

2. Case Report

A 55 years old male patient presented with anginal chest pain since last 3 years and was under medical management. Since last 2-3 months the anginal pain increased in frequency and was poorly controlled by drugs. Subsequent coronary angiography revealed critical lesion in proximal LAD and origin of D1 along with diffuse narrowing of right coronary artery. The patient was planned to be operated for CABG and admitted in our department. Preoperatively the patient was with stable vitals with pulse rate 92/minute, BP-130/68 mm of Hg, Spo2- 100% in room air. Routine blood investigations and pulmonary function test are within normal limit. Transthoracic echocardiography revealed LVEF -55% with anterior wall motion abnormality. Cardiac valves were normal in morphology and function. The patient was operated for off pump coronary artery bypass grafting through standard median sternotomy under general anaesthesia. Reversed Saphenous vein grafting was done to LAD and D1 separately. During the operation the cardiac function was all right with minimum ionotropic support. Temporary epicardial pacing wire was inserted and mediastinal chest drain was given before sternum was closed. Postoperatively the patient was shifted to ITU and kept in mechanical ventilation in assist control mode under proper sedation. Arterial blood gas analysis revealed pH-7.38, pCO2-39, pO2-126, Hb-11.2, HCT-30.

After about half an hour the patient suddenly experienced a cardiac arrest. He had no femoral or carotid pulse palpable with no ECG or arterial pressure tracing in monitor. As the patient was already in mechanical ventilation with secured airway, cardiopulmonary resuscitation with external CPR was initiated immediately. After two minutes of external CPR immediate resternotomy was done and ventricular fibrillation (VF) was detected. The resuscitation continued with internal cardiac massage and internal cardioversion

with defibrillation with 40 J was done. After the initial shock the cardiac rhythm reverted back with narrow QRS complex and good ejection but only for a few moments and again VF was started. The defibrillation was repeated for 3 times with similar result while continuing cardiac massage to maintain cerebral perfusion. After that lignocaine injection was administered and another shock was given. This time the rhythm reverted back and sustained with good ejection. However there was tachycardia with heart rate around 130/minute, junctional rhythm with narrow QRS complex. Systolic BP was maintained around 90 mm of Hg with all palpable peripheral pulses. Injection amiodarone bolus dose was given 150mg over 30 minutes followed by infusion at the rate of 1mg/min. The chest was kept open overnight with covering of Iodine impregnated sterile sheath with the anticipation of similar episodes. The whole event starting from initial cardiac arrest to gaining of normal cardiac activity took about 55 minutes. The blood gas analysis were done at two hours interval and the parameters including electrolytes are maintained accordingly.

The patient regained consciousness about 3 hours after but kept sedated overnight and maintained under mechanical ventilation. Next morning the patient was with stable vitals and with good cardiac function. The sternotomy was closed and the patient was gradually weaned from mechanical ventilation. The patient was kept in ITU for next 3 days without any further adverse event and then shifted to ward. Finally the patient was discharged after 15 days.

3. Discussion

Some aspects of resuscitation of cardiac arrest following cardiac surgery are significantly different from any other routine cardiac arrest. These aspects require specific discussion.

The European Association of Cardiothoracic Surgery guidelines recommend a key team of six people playing their vital roles in specific management. These are external cardiac massage, airways and ventilation, defibrillation, drugs, team leader and intensive care coordinator [5].

If stable cardiac output is not achieved within 5 minutes of external cardiac massage following onset of cardiac arrest early resternotomy is strongly recommended [5,8,9,10,11,12,13]. Emergency resternotomy is required in 20-25% of cardiac arrest after cardiac surgery. Resternotomy enables internal massage at a rate of 100 beats / minute, with an aim to achieve systolic arterial pressure of at least 60 mm of Hg. Resternotomy should be considered until 10 days postoperatively, beyond which it should be risk assessed by the operating surgeon [1]. Institution of Cardiopulmonary Bypass (CPB) is sometimes necessary and a 56% survival in 16 patients with refractory VF despite internal cardiac massage has been reported with this strategy. The incidence of emergency reinstitution of CPB after cardiac arrest in cardiac surgery is 0.2% [4,5,6,7,14].

The European Resuscitation Council guideline (2010) recommends three consecutive shocks followed by early sternotomy instead of having 2 minutes of CPR between each shock [1,2,4,5]. Data from the American Heart Association registry of CPR documented that 39% patients survived when defibrillation was performed within 2 minutes and only 22% when it was performed beyond 2 minutes [15]. Many studies revealed that likelihood of restoring a cardiac output declines dramatically from the first to the second shock and declines further from the second to the third and so on [16]. Considering the importance of minimizing the delay to resternotomy not more than three shocks should be delivered prior to performing a chest reopening in patients with VF/VT cardiac arrest after cardiac surgery. This is because of the fact that chances of successful outcome after each passing attempt to defibrillate reduces dramatically [4,5,16,17].

If the cardiac rhythm is a VF or pulseless VT then External cardiac massage may be deferred upto administration of three shock but a defibrillator should be available within one minute of cardiac arrest. If the rhythm is a severe bradycardia or asystole and the epicardial wires are in place then epicardial pacing should be initiated immediately. In any case if the cardiac output is not restored within one minute the external cardiac massage needs to be started. If the rhythm is pulseless electrical activity (PEA) and the patient is being paced, the pacing should be turned off to exclude underlying VF. Along with that external massage should be started immediately [4,5]. Open cardiac massage is superior to external cardiac compression with regards to generating cardiac output. One human study showed that cardiac index (CI) improved from 0.6 l/min/m2 to 1.3 l/min/m2 and the circulation time decreases from 89 seconds to 44 seconds with open cardiac massage [1]. However patient undergoing surgery with partial or nonsternotomy incision pose a major problem for reopening chest [1]. External cardiac massage may cause potentially fatal complications such as disruption of vascular structure and right ventricular rupture [5,18,19]. The automated chest compression devices are not recommended in post cardiac surgery patients.

Adrenaline is recommended cardiac arrest situation to convert a non-shockable rhythm like asystole and PEA to a shockable rhythm and to increase the systemic vascular resistance to maintain more perfusion in the central circulation for the cardiac massage to be effective [1]. In post-surgical patients with cardiac arrest chances of restoring a cardiac output after a defibrillation or after emergency resternotomy is very high. The use of resuscitation dose of adrenaline in this situation may cause dangerous hypertension and catastrophic destruction of surgical anastomoses and reduced myocardial perfusion [5,20]. So the guidelines recommended that the administration of adrenaline should be delayed until the reversible cause of arrest are excluded. In most cases early resternotomy is effective to correct arrest and hence it is safe to use adrenaline cautiously in smaller doses such as 100-300 mcg bolus IV and titrate the dose to response [4,5].

Emergency resternotomy outside the intensive care is associated with poor survival for obvious reasons [1]. The guidelines suggest chest reopening as soon as possible. Early reopening within 10 minutes leads to higher survival to hospital discharge [4,5]. In the cardiac intensive care emergency resternotomy is recommended within 5 minutes

of the onset of cardiac arrest ; after three attempts of defibrillation for VF/VT or immediately if there is no output with external compressions in PEA or asystole [5]. Unlike out-of-hospital cardiac arrest where it is an accepted practice to cool patients to 32-33 degree C for 12-24 hours in order to improve the neurological outcome [21], for cardiac arrest in post cardiac surgery therapeutic hypothermia is not common.

4. Conclusion

Survival rates after cardiac arrest remain low. However despite poor overall outcomes, casr reports of successful resuscitation after prolonged cardiac arrest give hope for improved overall outcome in future. Several factors contributed to our patients recovery – firstly, early detection and immediate initiation of resuscitative measures in the post cardiac surgery ITU, secondly, the arrest resulted from ventricular arrhythmia which is reversed with defibrillation and medications, thirdly, timely emergency resternotomy provide access for internal cardiac massage to maintain cardiac output. The obvious preservation of his neurological function throughout the arrest was pivotal in our decision to continue resuscitative efforts and cardiopulmonary support.

References

[1] Managing cardiac arrest after cardiac surgery: the impact of a five year evolving resternotomy policy and a review of the literature, Maccaroni M, Watson N, Mukherjee S, Ngage L; Analgesia & Resuscitation : Curreant Research 2013, S1.
[2] Soar J, Deakin CD, Nolan JP, Abbas G, Alfonzo A, et al. (2005) European Resuscitation Council guidelines for resuscitation 2005. Section 7. Cardiac arrest in special circumstances. Resuscitation 67 Suppl 1: S135-170.
[3] Ngaage DL, Cowen ME (2009) Survival of cardiorespiratory arrest after coronary artery bypass grafting or aortic valve surgery. Ann Thorac Surg 88: 64-68.
[4] Nolan JP, Soar J, Zideman DA, Biarent D, Bossaert LL, et al. (2010) European Resuscitation Council Guidelines for Resuscitation 2010 Section 1. Executive summary. Resuscitation 81: 1219-1276.
[5] Dunning J, Fabbri A, Kolh PH, Levine A, Lockowandt U, et al. (2009) Guideline for resuscitation in cardiac arrest after cardiac surgery. Eur J Cardiothorac Surg 36: 3-28.
[6] Birdi I, Chaudhuri N, Lenthall K, Reddy S, Nashef SA (2000) Emergency reinstitution of cardiopulmonary bypass following cardiac surgery: outcome justifies the cost. Eur J Cardiothorac Surg 17: 743-746.
[7] Lees NJ, Powell SJ, Mackay JH (2012) Six-year prospective audit of 'scoop and run' for chest-reopening after cardiac arrest in a cardiac surgical ward setting. Interact Cardiovasc Thorac Surg 15: 816-823.
[8] ÄOEanÃ¡dyovÃ¡ J, Zmeko D, MokrÃ¡Äek A (2012) Re-exploration for bleeding or tamponade after cardiac operation. Interact Cardiovasc Thorac Surg 14: 704-707.
[9] Dunning J, Kirmani B, Ley J, Bartley T, Strang T, et al. (2012) The Cardiac Surgery Advanced Life Support Course.
[10] Vanden Hoek TL, Morrison LJ, Shuster M, Donnino M, Sinz E, et al. (2010) Part 12: cardiac arrest in special situations: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 122: S829-861.
[11] Choudhry S, Levine A, Dunning J. (2005) Running a cardiac surgery advanced life support course. Career focus. Br Med J 331: 200-201.
[12] Dunning J, Prendergast B, Mackway-Jones K (2003) Towards evidence-based medicine in cardiothoracic surgery: best BETS. Interact Cardiovasc Thorac Surg 2: 405-409.
[13] Zaritsky A, Morley P (2005) The evidence evaluation process for the 2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Circulation 112: 128-130
[14] Rousou JA, Engelman RM, Flack JE 3rd, Deaton DW, Owen SG (1994) Emergency cardiopulmonary bypass in the cardiac surgical unit can be a lifesaving measure in postoperative cardiac arrest. Circulation 90: II280-284.
[15] Chan PS, Krumholz HM, Nichol G, Nallamothu BK; American Heart Association National Registry of Cardiopulmonary Resuscitation Investigators (2008) Delayed time to defibrillation after in-hospital cardiac arrest. N Engl J Med 358: 9-17.
[16] Richardson L, Dissanayake A, Dunning J (2007) What cardioversion protocol for ventricular fibrillation should be followed for patients who arrest shortly post-cardiac surgery? Interact Cardiovasc Thorac Surg 6: 799-805.
[17] International Liaison Committee on Resuscitation (2005) International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Part 4: Advanced life support. Resuscitation 67: 213-247.
[18] Böhrer H, Gust R, Böttiger BW (1995) Cardiopulmonary resuscitation after cardiac surgery. J Cardiothorac Vasc Anesth 9: 352.
[19] Kempen PM, Allgood R (1999) Right ventricular rupture during closed-chest cardiopulmonary resuscitation after pneumonectomy with pericardiotomy: a case report. Crit Care Med 27: 1378-1379.
[20] Tsagkataki M, Levine A, Strang T, Dunning J (2008) Should adrenaline be routinely used by the resuscitation team if a patient suffers a cardiac arrest shortly after cardiac surgery. Interact Cardiovasc Thorac Surg 7: 457-462.
[21] Nolan JP, Morley PT, Vanden Hoek TL, Hickey RW, Kloeck WG, et al. (2003) Therapeutic hypothermia after cardiac arrest: an advisory statement by the advanced life support task force of the International Liaison Committee on Resuscitation. Resuscitation 57: 231-235.