A Rare Complication of Cardiopulmonary Resuscitation: Tension Pneumothorax

Duygu Kara, Pelin Aydin, Elif Oral Ahiskalioglu, Fatma Karakoc, Emine Karaman

Erzurum Regional Training and Research Hospital, Anesthesiology and Reanimation Department, Erzurum, Turkey

Abstract

Chest compressions during cardiopulmonary resuscitation (CPR) can be traumatic. We report a rare complication of CPR in which the patient experienced 2 rib fractures associated with tension pneumothorax. An 83 year-old man with a history of chronic obstructive pulmonary disease (COPD) and chronic renal disease was accepted with respiratory insufficiency. In a few minutes, he developed hypotension, bradycardia, and hypoxia. As a consequence of cardiac arrest, basic life support was performed. It was realized that the left side of the chest had little movement while the right side was hyperexpanded. Chest radiograph showed a right sided pneumothorax. A 14G intravenous cannula was inserted through the second right intercostal space in the mid-clavicular line. Afterwards an intercostal tube was inserted in the same place. Nevertheless, the patient died approximately 30 hours after admission. Tension pneumothorax is a well known complication of intermittent-positive-pressure ventilation (IPPV) and chronic lung disease. Tension pneumothorax may be difficult to diagnose and therefore, maybe missed during a complex resuscitation attempt. Since diagnosis is difficult during ongoing resuscitation, either a chest tube or intercostal cutdown can be considered following needle thoracocentesis to exclude tension pneumothorax as a probable cause of refractory cardiac arrest in high-risk patients.

Keywords: Cardiopulmonary resuscitation, tension pneumothorax, intensive care

(Rec.Date: Sep 09, 2015 Accept Date: Sep 18, 2015)

Corresponding Author: Duygu Kara, Erzurum Regional Training and Research Hospital, Anesthesiology and Reanimation Department, Erzurum, Turkey
E-mail: drduygukara@yahoo.com **Phone**: +90 506 928 8141

Introduction

Chest compressions during cardiopulmonary resuscitation (CPR) can be traumatic to patients. Sternal fractures occur in 1 of 5 resuscitation attempts, and costal fractures occur in 1 of 3; two-thirds of patients with costal fractures have 3 or more fractures in adjacent ribs [1]. We report a rare complication of CPR in which the patient experienced 2 rib fractures associated with tension pneumothorax.

Case Report

An 83 year old man with a history of chronic obstructive pulmonary disease (COPD) and chronic renal disease was accepted with respiratory insufficiency. An initial assessment showed the patient was unrousable with a respiratory rate <10, blood pressure 70/50 and a

weak central pulse of >140 bpm. In a few minutes, he developed hypotension, bradycardia, and hypoxia. As a consequence of cardiac arrest, basic life support was performed. He was intubated and ventilated and 1mg adrenaline and 3mg atropine were administered. Resuscitation attempts continued with 1mg adrenaline, 500 ml fluid bolus and a 250 mcg bolus of salbutamol. He recovered cardiac output before he arrested again. A total of 8 mg of adrenaline and 2 mg of atropine were administered. On visual assessment, he was noted to have distended neck veins, was difficult to ventilate by hand and there was poor left air entry. It was realized that the left side of the chest had little movement while the right side was hyperexpanded. The correct position of the tracheal tube was confirmed. The highest oxygen saturation on the monitor was 80%. Chest radiograph showed a right sided pneumothorax. A 14G intravenous cannula was inserted through the second right intercostal space in the mid-clavicular line. Afterwards an intercostal tube was inserted in the same place. Resuscitation attempts continued while the right chest drain was inserted, which resulted in a release of air and a return of a pulse. These findings were attributed to the aggressive CPR carried out at the time of cardiac arrest. The patient received conservative management with insertion of a chest tube and ongoing monitoring. Nevertheless, the patient died approximately 30 hours after the intensive care unit (ICU) admission.

Discussion

Chest compressions performed during CPR for cardiac arrest are not without complications. Approximately 30% of victims at autopsy have rib fractures and 20% have sternal fractures [1]. Injuries to the following CPR include pneumothorax, pneumomediastinum, lung contusion, hemothorax and pulmonary edema [1].

Tension pneumothorax is an uncommon condition with a high mortality rate most frequently reported to occur in prehospital, emergency department, and intensive care unit (ICU) settings [2-5]. This condition is frequently lethal in injured and ventilated ICU patients without early diagnosis and treatment [6-8]. Although the incidence of tension pneumothorax remains poorly estimated, it may occur in up to 1% to 3% of prehospital, major trauma and ICU patients [2,4]. Tension pneumothorax is a well known complication of intermittent-positive-pressure ventilation (IPPV) and chronic lung disease. The combination of chronic lung disease and asynchronous cardiac compressions with IPPV further increases the risk. The ipsilateral lung collapses and the mediastinum is displaced away from the affected side. When such a diagnosis is considered, the correct course of action is immediate decompression before obtaining radiological confirmation. Tension pneumothorax may be difficult to diagnose [9-11] and therefore, maybe missed during a complex resuscitation attempt [12,13]. Since diagnosis is difficult during ongoing resuscitation, either a chest tube or intercostal cutdown can be considered following needle thoracocentesis to exclude tension pneumothorax as a probable cause of refractory cardiac arrest in high-risk patients.

The possible failure of needle thoracocentesis and the role of empirical treatment of potential tension pneumothorax should be highlighted during resuscitation training. Following the performance of a needle thoracocentesis, a chest drain is required [12] although this can be technically difficult during ongoing cardiac compressions. Tension pneumothorax during cardiac arrest should be considered in all patients with raised airway pressure, particularly when associated with chronic airway disease. Since diagnosis can be difficult during ongoing resuscitation, we believe that either a chest tube or intercostal cutdown should be considered following needle thoracocentesis to exclude tension pneumothorax as a probable cause of refractory cardiac arrest in high-risk patients. The potential failure of needle decompression needs to be included in emergency care training.

No written consent was obtained from the patient since no visual content or ID information that could reveal the identity or violate the privacy of the patient was used in the article.

Conflict of Interest

No conflict of interest was declared by the authors.

References

1. Krischer JP, Fine EG, Davis JH, Nagel EL. Complications of cardiac resusciation. Chest. 1987;92(2):287-91.
2. Roberts DJ, Leigh-Smith S, Faris PD, Ball CG, Robertson HL, Blackmore C, Dixon E, Kirkpatrick AW, Kortbeek JB, Stelfox HT. Clinical manifestations of tension pneumothorax: protocol for a systematic review and meta-analysis. Syst Rev. 2014;3:3.
3. Cameron PA, Flett K, Kaan E, Atkin C, Dziukas L. Helicopter retrieval of primary trauma patients by a paramedic helicopter service. Aust N Z J Surg. 1993;63(10):790-7.
4. Coats TJ, Wilson AW, Xeropotamous N. Pre-hospital management of patients with severe thoracic injury. Injury. 1995;26(9):581-5.
5. Eckstein M, Suyehara D. Needle thoracostomy in the prehospital setting. Prehosp Emerg Care. 1998;2(2):132-5.
6. ATLS Subcommittee; American College of Surgeons' Committee on Trauma; International ATLS working group. Advanced trauma life support (ATLS®): the ninth edition. J Trauma Acute Care Surg. 2013;74(5):1363-6.
7. Leigh-Smith S, Harris T. Tension pneumothorax—time for a re-think? Emerg Med J. 2005;22(1):8-16.
8. Chen KY, Jerng JS, LiaoWY, Ding LW, Kuo LC, Wang JY, Yang PC. Pneumothorax in the ICU: patient outcomes and prognostic factors. Chest. 2002;122(2):678-83.
9. Beards SC, Lipman J. Decreased cardiac index as an indicator of tension pneumothorax in the ventilated patient. Anaesthesia. 1994;49:137-41.
10. Leigh-Smith J, Davies G. Tension-pneumothorax: eyes may be more diagnostic than ears. EMJ. 2003;20(5):495-6.
11. Friend K. Prehospital recognition of tension pneumothorax. Prehosp Emerg Care. 2000;4(1):75-7.
12. Mines D, Abbuhl A. Needle thoracostomy fails to detect a fatal tension pneumothorax. Ann Emerg Med. 1993;22(5):863-6.
13. Jones R, Hollingsworth J. Tension pneumothoraces not responding to needle thoracocentesis. EMJ. 2002;19(2):176-7.