

Multiple thoracic vertebral fractures as a complication of cardiopulmonary resuscitation: A case report

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ABSTRACT

A 50-year-old man experienced cardiac arrest. The patient underwent standard cardiopulmonary resuscitative measures for approximately 20 minutes before spontaneous circulation returned. He was diagnosed with variant angina, and subsequent imaging for evaluation of upper back pain revealed fractures of the fifth through eighth thoracic vertebrae. Multiple thoracic vertebral fractures are extremely rare. Here we report a case of multiple thoracic vertebral fractures as a complication of cardiopulmonary resuscitation.

Keywords: Cardiopulmonary resuscitation; electric countershock; osteoporosis; spinal fractures; thoracic vertebrae.

INTRODUCTION

Cardiopulmonary resuscitation (CPR) currently includes external chest compressions and ventilation as well as definitive emergency maneuvers and is a desperate but potentially life-saving measure for recovery of spontaneous circulation. However, several complications resulting from CPR have been reported.^[1,2] The most common injuries sustained from CPR include rib fractures, with the literature suggesting an incidence of 13%–97%, and sternal fractures, with an incidence of 1%–43%.^[3] Vertebral body fractures can also occur; however, they are seldom observed, and multiple fractures rarely occur.^[4] Here, we report a case of multiple thoracic vertebral body fractures sustained in a 50-year-old man during CPR.

CASE REPORT

A 50-year-old man with no medical history developed sudden chest pain and lost consciousness while sitting in a bathtub. An emergency team arrived 10 minutes after being notified, and the patient became alert upon their arrival. He lost consciousness again 15 minutes after departing for the hospital

and received chest compressions from an emergency medical technician in the ambulance because of cardiac arrest caused by ventricular fibrillation. The patient arrived at the emergency room after undergoing 5 minutes of chest compressions. The cardiac arrest persisted, and he was defibrillated twice with 200 joules (J) for ventricular tachycardia. The emergency room physician performed additional chest compressions for periods of 8, 10, and 10 minutes. Spontaneous circulation resumed, and the patient's vital signs stabilized after CPR. Cardiac angiography was performed to evaluate the cause of the cardiac arrest, and it revealed minimal stenosis at the proximal portion of the left anterior descending artery. The patient was treated with nitroglycerin, aspirin, and clopidogrel. A provocation test utilizing ergonovine was performed, and near-total spastic obstructions of the left anterior descending artery and the left circumflex coronary artery following injection of ergonovine 20 mcg were observed. A change to a Mobitz type II atrioventricular block was observed on echocardiography. A temporary pacemaker was inserted for variant angina. Since then, no arrhythmia was observed on Holter monitoring.

Because the patient had persistent severe upper back pain, particularly during movement, thoracic spine radiographs were obtained, and radiography and computed tomography of the thoracic spine revealed fifth, sixth, seventh, and eighth thoracic vertebral compression fractures and a sternal fracture. Magnetic resonance imaging showed additional tears in the sixth and seventh interspinous ligaments but no damage to the spinal cord (Fig. 1). The Cobb angle (or thoracic kyphotic angle) as measured from T1 to T12 was 30°, well within the normal range (25–40°). Osteopenia was diag-

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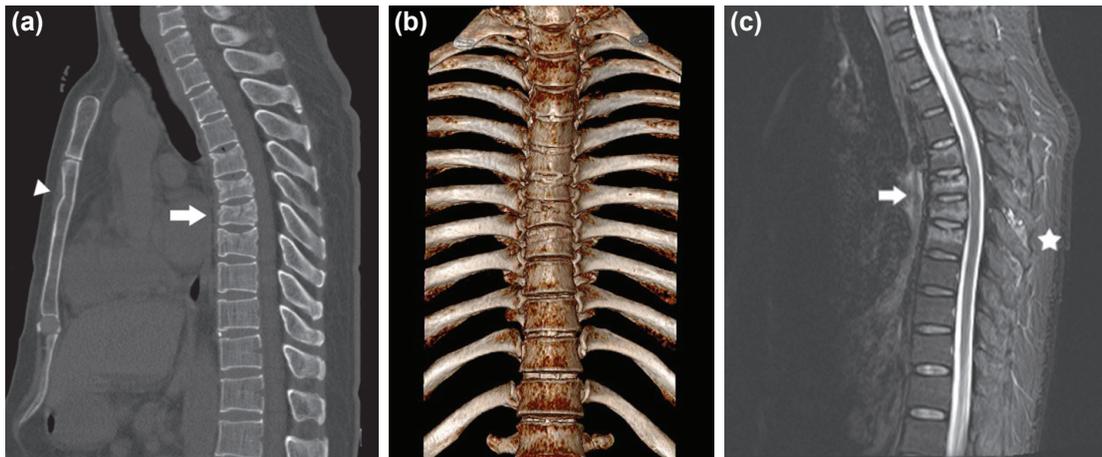


Figure 1. Computed tomography (a and b) and magnetic resonance imaging with fat suppression (c) of the thoracic spine, showing fifth, sixth, seventh, and eighth thoracic vertebral compression fractures (arrow); sixth and seventh interspinous ligament tears (star); and a sternal fracture (arrowhead).

nosed following a bone mineral density test T-score of -2.4 . A thoracolumbosacral orthosis (TLSO) was applied, and he was treated with pain medication without surgery since there was no instability from the thoracic vertebral fractures or any neurologic deficits. The total hospitalization period was 45 days (12 days in the Cardiology Department and 33 days in the Spine Department). At discharge, it was recommended that he wear the TLSO whenever performing activity and to rest whenever possible to prevent aggravation of compression fractures. He was treated with teriparatide, a recombinant form of parathyroid hormone, and calcium additive for the osteopenia. Follow-up imaging obtained 6 months after discharge revealed no interval changes.

DISCUSSION

Complications following CPR have been described in several publications. Skeletal injuries, particularly fractures of the ribs and sternum, are the most common complications of CPR. In addition, upper airway complications, including tracheal and esophageal rupture, and injuries of the gastrointestinal system, including liver laceration, gastric rupture, and pneumoperitoneum, have been reported.^[1,2]

However, vertebral body fracture following CPR has only been reported by four groups. Azuma et al.^[4] reported two cases: a 90-year-old man with rhabdomyolysis who received chest compressions for 60 minutes and whose autopsy revealed an eleventh thoracic vertebral compression fracture and a 71-year-old man who had cardiopulmonary arrest due to sepsis caused by a urinary tract infection. Our patient received compressions for 30- and 15-minute periods, and his autopsy revealed a first lumbar compression fracture. Goldberg et al.^[5] reported the case of a 76-year-old woman who had cardiopulmonary arrest due to acute myocardial infarction and received chest compressions lasting 30 and 15 minutes and whose autopsy showed a tenth thoracic vertebral compression fracture. Jeong et al.^[6] reported the case of a

54-year-old woman in whom spontaneous circulation returned after external cardiac massage and cardiac shock (400 J) were delivered twice and whose thoracic spine radiograph showed sixth, seventh, and eighth thoracic vertebral compression fractures.

Four causes of vertebral body fractures may be considered. First, it is possible to fracture the vertebral bodies by using excessive force during chest compressions. Although chest compressions were performed by an emergency medical technician who had completed special CPR training, excessive force could have been delivered while chest compressions were being performed during transit to the hospital. Second, severe kyphosis of the thoracic spine with a sagittal imbalance may increase lumbar lordosis, exposing the spine to greater shearing forces during chest compression^[4,7] and resulting in a fragile thoracic spine. Third, osteopenia decreases the bearable force of the vertebral body to external impact.^[8,9] Chest compressions during CPR provide adequate trauma to induce fractures of the vertebral bodies in a patient with severe kyphosis and osteopenia. Fourth, defibrillation causes instantaneous muscle contractions and could lead to such fractures. The most common fracture location is at the mid-thoracic level, because compressive forces during muscle contraction are concentrated along the anterior and middle columns of the mid-thoracic kyphotic curve.^[3,5] Takahashi et al.^[10] reported that a 34-year-old man with persistent severe back pain after a seizure was diagnosed with sixth and seventh thoracic spine compression fractures. Such forceful muscle contractions during a convulsive seizure could result in a vertebral compression fracture. In the current case, our patient with osteopenia underwent defibrillation three times, as well as lengthy chest compressions. We hypothesize that a patient with a bone-weakening condition would not be able to withstand forceful muscle contraction and external trauma and would therefore develop multiple vertebral fractures.

Conclusion

CPR is an essential lifesaving procedure but has several possible complications. Repetitive education is necessary to prevent such complications. However, complications can occur unintentionally, even with proper technique. Vertebral fractures are rare and easily missed. Therefore, while performing CPR, one must recognize that it is possible to fracture the vertebral body by sudden muscle contraction and external trauma, particularly in patients with osteopenia or osteoporosis. If the patient complains of persistent back pain after CPR, a spinal evaluation should be performed.

Conflict of interest: None declared.

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OLGU SUNUMU - ÖZET

Kardiyopulmoner resüsitasyonun bir komplikasyonu olarak çoklu torasik vertebra kırıkları: Bir olgu raporu

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Elli yaşındaki bir adam kardiyak arrest geçirdi. Hasta spontane dolaşım geri dönmeye 20 dakika standart kardiyopulmoner resüsitasyon uygulandı. Hastaya varyant anjina tanısı kondu. Ardından üst sırt ağrısını değerlendirmek için yapılan görüntüleme beşinci ila sekizinci torasik vertebra arasında kırıklar olduğunu ortaya çıkardı. Çoklu torasik vertebra kırıkları son derece seyrek görülmektedir. Burada kardiyopulmoner resüsitasyonun bir komplikasyonu olarak çoklu torasik vertebra kırıklı bir hasta sunuldu.

Anahtar sözcükler: Elektrik kontrşok; kardiyopulmoner resüsitasyon; osteoporoz; spina kırıkları; torasik vertebra.

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