Case Report

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Transient Complete Right Bundle Branch Block Due to Lung Contusion: Case Report

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Abstract

Right bundle branch block (RBBB) may occur in lung diseases and cardiovascular diseases. A 25-year-old male patient was admitted to emergency department after a motorcycle accident. Contusion was detected in bilateral lungs, and pneumothorax with laceration were detected in the right lung. ECG revealed103 bpm, right axis deviation, and complete RBBB. ECGrevealed 83 bpm, complete RBBB continued at the 6th hour after tube thoracostomy, andhigh sensitive TnI was normal. Chest X-ray wasnormal on the 4th day of hospitalization, and ECG revealed74 bpm, normal sinus rhythm. In thoracic trauma, ECG changes may develop as a result of lung contusion. ECG findings improve as the lung contusion heals.

Keywords: Lung contusion, Right bundle branch block, RBBB, Thorax trauma

Introduction

Right bundle branch block (RBBB) is a common finding in older people and its prevalence increases with age. Complete right bundle branch block is associated with an increased risk of all-cause mortality in the population and in patients with heart disease. RBBB may occur in lung diseases in which right ventricular pressure increases, such as pulmonary hypertension/cor pulmonale, pulmonary thromboembolism (PE), and in cardiovascular diseases such as myocarditis, ischemic heart disease, congenital heart disease and hypertension. Transient or permanent RBBB may result from iatrogenic etiology during procedures such as right heart catheterization and septal ablation. Cases of temporary complete RBBB in spontaneous pneumothorax and traumatic pneumothorax have been reported. However, complete RBBB due to blunt trauma was mostly detected in cases of cardiac contusion (1-4).

In this case presentation, the relationship between lung injury and ECG changes in a patient who developed pneumothorax, lung contusion, and temporary complete RBBB as a result of thoracic trauma was discussed.

Case

A 25-year-old male patient was brought to the emergency department (ED) by ambulance after a motorcycle accident that occurred 1 hour ago. It was learned that the patient fell on his right side after being hit by a car while riding a motorcycle. He had pain in his chest and right shoulder. The patient was conscious, Glasgow Coma Scale was 15, blood pressure was 110/70 mmHg, pulse was 101 beats per minute (bpm) and rhythmic, respiratory rate was 32 breaths/min, and arterial oxygen saturation was 70%. The patient had no disease in his medical history. On physical examination, there was tenderness in the right chest and decreased breath sounds. There was a deformity in the right shoulder and proximal humerus, and there was a 3 cm incision on the right knee. Blood sugar was 180mg/dL. In arterial blood gas, pH: 7.48, pCO2: 39mmHg, pO2: 59mmHg, lactate: 2.1 mmol/L were measured. The patient's 12-lead standard electrocardiogram (ECG) and right-sided ECG were taken. ECG revealed rate: 103 bpm, PR interval: 160ms, QTc: 447ms, QRS interval: 124ms, QRS axis: 114°, right axis deviation, complete right bundle branch block (RBBB) (Figure-1). There were T-wave inversions from V3R to V6R in the right-sided ECG. (Figure-2). RBC: 5.28 106/µL, Hb: 15.8g/dL, hematocrit: 46.7%, high sensitive TnI: 21.4ng/L (reference range: 0-47ng/L) were measured. The patient was started on oxygen at 8L/min via mask. Computed tomography (CT) images of the patient were taken.

Thorax CT images were interpreted by the radiologist and the diameters of the heart chambers were measured.

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Thorax CT showed ground glass densities and septal thickening consistent with contusion in both lungs, more prominent on the right side. Pneumothorax in the right pleural space and laceration in the right lung were detected. Displaced fractures were observed lateral to the right 5th and 7th ribs. Left ventricle diameter: 41.1 mm, right ventricle diameter: 36 mm, inferior vena cava: 21.6 mm, ascending aorta diameter: 32.7 mm, main pulmonary artery diameter: 22.9 mm, heart and vascular structures were normal, there was no pericardial fluid (Figure-3). The patient had a tube thoracostomy placed on the right hemithorax in the emergency department, and there was a significant improvement in respiratory parameters. The patient was transferred to the intensive care unit. Oxygen therapy was continued at 8L/min via mask. Lung expansion was observed on chest X-ray (Figure-4). At the 6th hour of hospitalization, the ECG showed rate: 83 bpm, PR interval: 152ms, QTc: 441ms, QRS interval: 128ms, QRS axis: 66°, complete RBBB (Figure-5). RBC: 4.18 106/µL, Hb: 12.7 g/dL, hematocrit: 36.8%, high sensitive TnI: 195ng/L were measured. The chest tube was removed on the 3rd day of hospitalization. High sensitive TnI: 17ng/L was measured on the 4th day of hospitalization. Chest X-raywas normal on the 4th day of hospitalization (Figure-6). In the ECG, rate: 74 bpm, PR interval: 160ms, QTc: 390ms, QRS interval: 94ms, QRS axis: 62°, normal sinus rhythm was detected (Figure-7). The right-sided ECG was normal (Figure-8). The patient was discharged with full recovery.

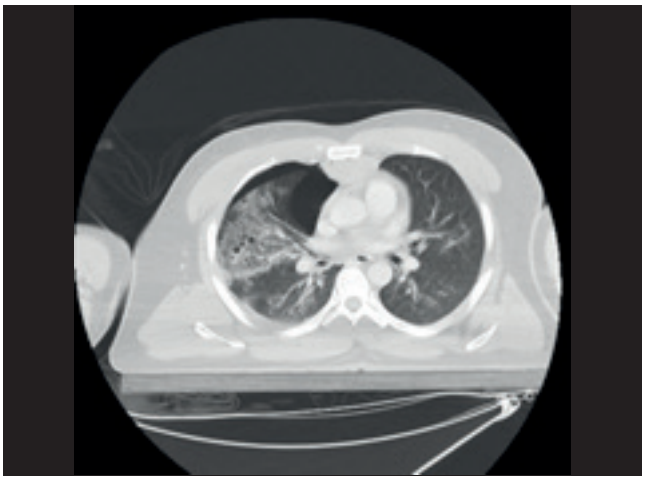

Figure 3. Thorax CT showed ground glass densities and septal thickening consistent with contusion in both lungs, more prominent on the right side. Pneumothorax in the right pleural space and laceration in the right lung were detected.

Figure 4. After tube thorocostomy, the lung expanded and lung contusion continues.

Figure 1. The patient's first ECG revealed tachycardia, right axis deviation, and complete right bundle branch block

Figure 5. The ECG after lung expansion showed complete right bundle branch block.

Figure 2. T-wave inversions from V3R to V6R in the right-sided ECG

Figure 6. The patient's chest X-ray was normal on the 4th day of hospitalization

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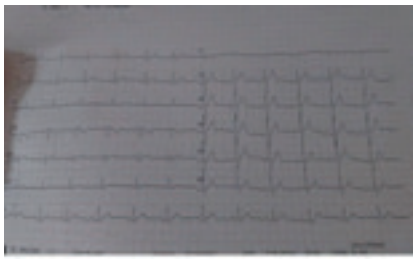

Figure 7. The patient's ECG was normal on the 4th day of hospitalization.

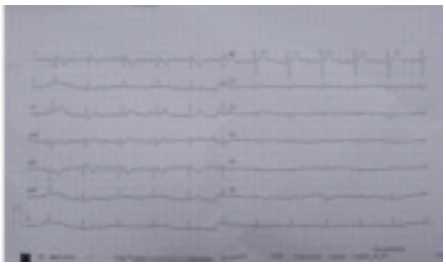

Figure 8. The patient's right-sided ECG was normal on the 4th day of hospitalization.

Discussion

Thoracic trauma accounts for 10-50% of trauma-related deaths and includes a wide variety of injuries that can cause significant morbidity and mortality. In the primary evaluation, injuries that are directly life-threatening and require rapid intervention are identified. Fatal injuries due to thoracic trauma include massive hemothorax, cardiac tamponade, tension pneumothorax, open pneumothorax, flail chest and lung contusion. Lung contusion is the most common parenchymal lung injury in blunt thoracic trauma and occurs in 25-80% of cases. The mortality rate in lung contusion is 10-25% (5–7).

In our case, contusion in both lungs, pneumothorax and laceration on the right side were detected as a result of thorax trauma. The ECG showed sinus tachycardia, right axis deviation, complete RBBB and long QTc. In the right-sided ECG, there were T-wave inversions from V3R to V6R. In reports investigating electrocardiographic changes in pneumothorax cases, phasic voltage changes and P, QRS and T axis deviation, right axis deviation, RBBB, left axis deviation, ST elevation, T inversion, and long QTc were detected in the ECG. Additionally, in these reports, a statistically significant correlation was found between the prevalence of ECG findings and the size of pneumothorax.3,4 The findings in our case were compatible with the literature. However, no report was found regarding right-sided ECG in thoracic trauma. In addition, in our case, although the lung expanded after tube throcostomy, complete RBBB continued in the ECG.

Clinicians use troponin I (TnI) levels to detect cardiac contusion in patients with thoracic trauma. However, in blunt chest trauma autopsy series, inequality was found between the incidence of elevated troponin and the incidence of cardiac contusion. Hypotension, hypoxia, and head trauma have been identified as other causes of trauma-related elevated troponin (8,9). In a study investigating the relationship between lung contusion and TnI, a correlation was found between the severity of pulmonary contusion and TnI (10). In a study conducted in patients with thoracic trauma, TnI increases in pneumothorax, hemothorax and lung contusion, apart from cardiac contusion. In addition, the most important diagnostic point in this study is that while troponin elevation continues in patients with cardiac contusion, it returns to normal in a short time in patients without cardiac contusion (11). The TnI level of our patient was normal. The TnI level measured 6 hours later was increased. But the troponin measured 3 days later was normal. The limited increase in troponin level and the rapid recovery of this increase led us to reasons other than cardiac contusion. In our case, complete RBBB that continued after lung expansion was attributed to lung contusion.

In lung contusion, blood leaks into the alveolar space, resulting in decreased lung compliance, ventilation-perfusion mismatch, and intrapulmonary shunt. Reflex vasoconstriction and pulmonary hypertension that develop in the affected tissue may occur as a protective response to pulmonary contusion. Thus, blood is directed from areas with parenchymal damage to areas with better oxygenation (6,7). The development of acute pulmonary hypertension may lead to ECG changes, as in pulmonary embolism. Sinus tachycardia, complete RBBB, right axis deviation, and QTc prolongation, which was also seen in our patient, have been frequently reported in cases of pulmonary hypertension (12). Additionally, T wave inversions on the right-sided ECG have been reported in cases with acute pulmonary embolism (13). In addition, along with the improvement of our patient's clinical findings, the simultaneous return of the troponin level and chest X-ray to normal, and the normalization of the right and left sided ECG supported our diagnosis.

Conclusion

In thoracic trauma, both left and right-sided ECG changes may occur as a result of lung contusion. ECG findings improve as the lung contusion heals.

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