

Acute right bundle branch block due to pneumothorax

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ABSTRACT

Changes in electrocardiogram (ECG) due to pneumothorax have been studied and are well described mainly in case of left-sided pneumothorax. Classic ECG finding in left-sided pneumothorax includes right-axis deviation, diminution of QRS complex, T-wave inversion, phasic R wave variation, and reduced R wave in precordial leads. There has been reported case of incomplete right bundle branch block (RBBB) in left-sided pneumothorax. We hereby report the first case of acute-onset complete RBBB due to left-sided pneumothorax in a young patient after blunt chest trauma from a motor vehicle accident. ECG findings revert back to normal after 1.5 h of decompression of pneumothorax. We summarize the possible mechanisms that could lead to this unusual finding on ECG. Pneumothorax can cause unusual ECG changes like in our case and should be kept in the list of differential diagnosis in appropriate clinical conditions.

Keywords: Electrocardiogram, pneumothorax, right bundle branch block

Introduction

Right bundle branch block (RBBB) is one of the finding on electrocardiogram (ECG) with prevalence of 2.3% in general population according to National Health Survey III in the United States.^[1] Pathological conditions that cause increase in right ventricular pressure can cause RBBB including cor pulmonale, pulmonary embolism (PE), and ischemic heart disease. RBBB is a common finding in chronic degenerative conditions, whereas acute-onset RBBB is a rare entity. As per our knowledge, this is the first reported case of acute complete RBBB due to left-sided pneumothorax in the literature until today.

Case Report

The informed consent of the patient was taken. A 37-year-old male with no significant past medical illness attended to the emergency department with multiple injuries of the body after motor vehicle accident. The patient complained of pain all over his body. He complained of pain at his lower back and buttock, left-sided chest pain, left thigh pain, and headache. There was

no h/o of abdominal pain, vision changes, limb injury, or weakness. The assessment for bleeding was done by focused assessment by sonography in trauma (FAST) and there was no obvious bleeding seen. IV lines were secured and blood sample was sent for basic investigation panel. Complete blood count, comprehensive metabolic panel, lipid panel, and liver function tests were within normal limits. ECG was normal. A X-ray chest was done and left-sided fourth rib fracture was detected. Spine X-ray showed L4 vertebrae fracture and the patient was taken for urgent surgery of spine injury. The patient was made to lie down in prone, and after few minutes, the patient complained of sudden severe pain on the left side of chest and shortness of breath. ECG was done again. ECG showed new-onset complete RBBB [Figure 1]. Acute coronary syndrome was suspected and cardiology consultation was done. Furthermore, the breath sounds were absent on the left side on chest auscultation. Considering rib fracture and examination findings, subsequent chest X-ray was done which showed left-sided pneumothorax with rib fracture [Figure 2]. Subsequently, serum troponin (baseline and after 4–6 h) and D dimer levels were within normal limit. It was suggested that pneumothorax lead to this new-onset RBBB. The ECG changes came back to normal after decompression of pneumothorax

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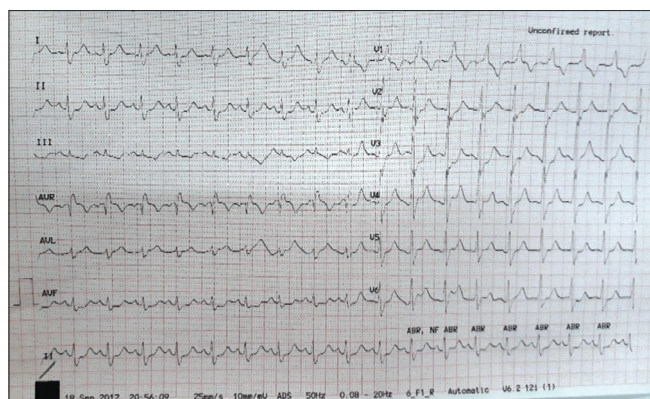


Figure 1: Electrocardiogram showing complete right bundle branch block

within 1.5 h. Echocardiography performed later revealed no significant abnormalities. Follow-up of the patient after 3 months was uneventful.

Discussion

RBBB is a common finding in older individuals and the prevalence increases with age.^[2] Complete RBBB is associated with increased risk of all-cause mortality in general population and in patients with heart disease.^[3] On the other hand, incomplete RBBB is not associated with mortality in general population.^[4] RBBB on ECG could be due to various clinical conditions of heart and lung including pulmonary hypertension/cor pulmonale, PE, myocarditis, ischemic heart disease, congenital heart disease, and hypertension. Transient or persistent RBBB could be the result of iatrogenic etiology during procedures such as right heart catheterization and septal ablation. We report the first case of complete RBBB due to left-sided pneumothorax in a young patient after road traffic accident without any history of cardiovascular disease.

ECG changes in spontaneous pneumothorax have been studied since years and are well described in left-sided pneumothorax. Classic ECG finding in left-sided pneumothorax includes right-axis deviation, diminution of QRS complex, T-wave inversion, phasic R wave variation, and reduced R wave in precordial leads.^[5] Recent literature also mentions about ST segment changes in ECG in pneumothorax.^[6] However, there was no reported case of RBBB on ECG due to pneumothorax until Krenke *et al.* found incomplete RBBB in three cases of pneumothorax. They studied a total of 40 cases of spontaneous pneumothorax including 22 left-sided and 18 right-sided pneumothorax. They found incomplete RBBB in two cases of right-sided spontaneous pneumothorax and in one case of left-sided pneumothorax.^[7] We hereby report the first case of complete RBBB following left-sided pneumothorax which in turn could be the result of injured rib displacement when the patient was placed in prone position for spine surgery. Delayed pneumothorax is also a common finding in case of chest trauma, and these patients should be

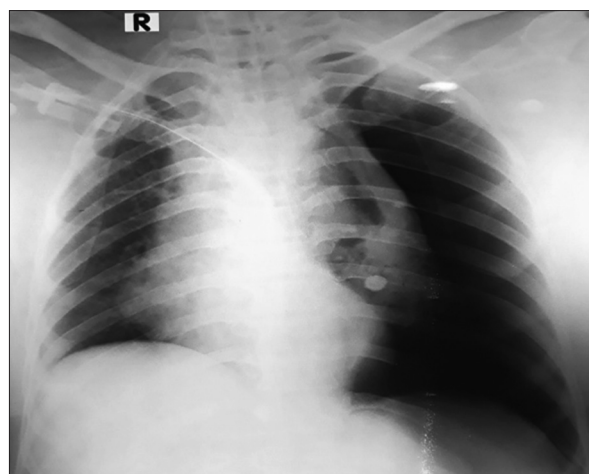


Figure 2: Chest X-ray showing left-sided pneumothorax

kept in close observation and follow-up to look for pulmonary complications including pneumothorax.^[8] Considering the history of sudden onset chest pain, shortness of breath (SOB), and acute onset RBBB, acute coronary syndrome (ACS) and PE were high on differential diagnosis and were ruled out. Therefore, it was justified to say that new-onset RBBB was due to left-sided pneumothorax.

There could be multiple mechanisms that can cause complete RBBB. Pneumothorax can raise the intrathoracic pressure leading to increased pulmonary artery resistance which causes right ventricle strain resulting in defects of the conduction pathway.^[9,10] Moreover, decompression of the pneumothorax reverts the ECG findings back to normal. This is because the decompression of pneumothorax normalizes the pulmonary artery pressure and relieves the strain on the right ventricle. Direct pressure on the right ventricle due to air in the left pleura could be other possible contributory mechanism.^[7]

Pneumothorax can cause unusual ECG changes like in our case. New-onset complete RBBB should raise suspicion for pneumothorax and should be ruled out. This is more stressed in appropriate clinical circumstances that favor chances of pneumothorax like in patients with chest trauma or patients without any history of cardiovascular disease.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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