



Lung contusion mimicking lobar pneumonia in an adolescent: A diagnosis imbroglie

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Abstract

Lung contusion is a common injury resulting from blunt chest trauma, characterized by damage to the lung parenchyma and impaired lung function. We present an 11-year-old male who sustained blunt chest trauma and subsequently developed symptoms mimicking lobar pneumonia. Initial chest radiography suggested lobar pneumonia, and treatment was initiated accordingly. Persistent pain prompted reevaluation, with subsequent diagnosis of pulmonary contusion. The patient improved with supportive care.

This case highlights the diagnostic challenge of differentiating pulmonary contusion from pneumonia in pediatric patients with chest trauma and the importance of maintaining a high index of suspicion when evaluating such patients.

Keywords: Lung, Contusion, Lobar Pneumonia, Adolescent

Introduction

Lung contusion, a consequence of chest trauma, involves direct or indirect damage to the lung parenchyma, resulting in edema or alveolar hematoma and a subsequent loss of the lung's physiological structure and function.^{1,2} Pulmonary contusion is a prevalent injury in patients who have sustained severe blunt chest trauma.³ Alveolar hemorrhage and parenchymal destruction are most pronounced within the first 24 hours post-injury, typically resolving within seven days.³ Lung contusion, arising from chest trauma, may present with various clinical manifestations. It often remains undetected and is only suspected later when severe complications arise.⁴ Lung contusion may occur in conjunction with chest trauma or independently. It is important to note that lung contusion as a clinical entity does not necessarily require a blunt or penetrating chest injury as a precursor.¹ The precise mechanism of lung contusion is not well understood, however, based on physical principles, it is evident that the acceleration or deceleration of the human body can inflict damage on lung tissue without significant collision, akin to compression or a sudden impact on the chest wall.¹

Clinical signs are not typical and often develop gradually. Pain, rib fractures, hematoma, and subcutaneous emphysema may occur in the affected chest area.^{1,4} When lung contusion results in hypoxemia severe enough to meet the criteria for Acute Lung Injury/ARDS (Adult Respiratory Distress Syndrome), the prognostic and economic impacts are significant.^{5,6} The clinical features of this condition are similar to those of inflammatory or infective lung conditions, which can lead to misdiagnosis, particularly in children where the trauma history may not be clearly elicited. Instances of complications with pneumonia and ARDS have been reported.^{7,8} Management of most contusions does not require specific therapy. The primary approach in lung contusion is to prevent further injury and provide supportive care while awaiting the contusion's resolution.^{7,9}

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We present the case of an eleven-year-old male adolescent who exhibited features suggestive of lobar pneumonia, with a background history of blunt chest trauma. Lobar pneumonia was initially diagnosed despite the chest trauma history, until reevaluation due to persistent pain led to the diagnosis of lung contusion. This case underscores the frequent

diagnostic overlap, particularly within the pediatric population, and emphasizes the need to consider pulmonary contusion in children presenting with chest trauma.

Case summary

An 11-year-old boy presented 11 days after blunt chest trauma with a five day history of fever and three days history of chest and abdominal pain. Additionally, the patient experienced cough and difficulty breathing for three days, and rapid breathing for two days, all symptoms were prior to presentation. The chest trauma occurred at school when the patient was inadvertently struck on the right lower chest anteriorly, while carrying wooden chairs, following an abrupt halt by a fellow student. The patient exhibited high-grade fever, transiently alleviated by analgesics, and reported sharp, severe pain in the right lower chest and right upper abdomen, which progressively worsened. The cough was productive with bloody sputum, and breathing difficulty was evidenced by chest wall indrawing. Prior to presentation, the patient received medications including Artemether-lumefantrine and Amoxicillin-clavulanate, with no symptomatic relief.

Physical examination revealed the patient in respiratory and painful distress, febrile, not pale, not cyanosed, anicteric, and not dehydrated. Respiratory examination indicated dyspnea, tachypnea, tenderness over the right lower lung zone, dull percussion notes, and increased tactile fremitus over the right middle lung zone. Breath sounds were vesicular with coarse crepitations over the right middle and lower lung zones. Oxygen saturation (SpO_2) was 100% on room air, with an elevated pulse rate of 120 beats per minute; pulses were regular and full volume, and blood pressure was normal. The patient was fully conscious, well-oriented, and exhibited no neurological deficits. The abdomen was full and moved with respiration, with tenderness in the right hypochondrium, but no mass or swelling was detected, and bowel sounds were present and normoactive.

Investigations included a chest X-ray (CXR) (Figure 1) showing normal heart size (CTR-50.7%) and inhomogeneous opacities with air bronchogram consistent with consolidation in the right upper, mid, and lower lung zones, with relative sparing of the apex. The left lung field appeared normal. The initial impression was lobar pneumonia.

A working diagnosis of community-acquired

pneumonia (right lobar pneumonia) was established. Laboratory investigations showed: Normal Full Blood Count (FBC) results which revealed, Packed Cell Volume (PCV)- 35.2%, White Blood Cell Count (WBC)- 9500/mm³, Neutrophil- 45% (4275/mm³), Lymphocyte- 20.3%, Monocyte-34.7%, Platelet-184,000/mm³, Erythrocyte Sedimentation Rate (ESR) of 40mm/hr which was elevated.

He was commenced on intravenous fluids, broad spectrum antibiotics, analgesia and oxygen supplementation.

Over the subsequent 24 hours, the fever persisted (temperature 37.7°C-39.2°C), and pain intensified, necessitating a review of medications to include NSAIDs (Celecoxib, Rectal Diclofenac) and occasional IV Pentazocine for breakthrough pain. Upon re-examination, a swelling was noted over the right lower chest wall corresponding to the 11th-12th rib, with marked right hypochondrial tenderness, no pallor, no jaundice, no worsening of SpO_2 , and vital signs remained stable.

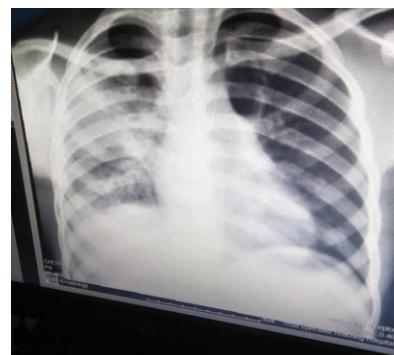


Figure 1: plain Chest Xray PA view showing Normal heart size, (CTR-50.7%), inhomogenous opacities with air bronchogram in keeping with consolidation involving the right upper, mid and lower lung zones with relative sparing of the apex. The left lung field appeared normal. Impression: Lobar pneumonia

Additional consideration of blunt chest trauma with potential visceral damage and a slow-leaking rupture was made. An Abdominopelvic Ultrasound scan (USS) was conducted: - which revealed marked probe tenderness over the right hemithorax and right hypochondriac region. The liver and spleen were enlarged, measuring 15.5cm and 11.3cm, respectively, with normal outline, echo-pattern, and anatomical configuration. A cursory examination of the right pleural space revealed echogenic areas within the mid and lower lung zones, suggestive of a hematoma, with an associated right pleural effusion. - The impression



Figure 2: Plain Chest X-ray PA view (Two months after diagnosis)

Revealed clear lung fields on the right hemithorax. There is blunting of the right costophrenic angle. The left lung field is essentially normal. Impression: resolved right pulmonary contusion secondary to blunt chest trauma.

was of hepatosplenomegaly and right pulmonary alveolar hemorrhage with pleural effusion. A review of the initial chest radiograph (Figure 1) with the cardiothoracic surgery team revealed ill-defined homogeneous opacities involving the right middle and lower lung zones, leading to a new consideration of pulmonary contusion, which was subsequently confirmed as the final diagnosis.”

The patient showed improvement, was weaned off oxygen, and commenced chest physiotherapy. He was discharged home on analgesics after five days of admission. Follow-up visits to both the pediatric respiratory and cardiothoracic surgical unit clinics revealed resolved pain. A repeat chest radiograph (Figure 2) showed resolution of the homogeneous opacities and clear lung fields.

Discussion

Chest traumas in children are infrequently observed, with an occurrence rate of 4-8%, and most of these injuries result from blunt traumas (85%),^{10,11} despite being a frequent clinical entity with a 26% rate of lung involvement in the general population.¹² In this case, the managing team did not initially prioritize trauma, considering it an incidental finding. The diagnosis was established after reevaluation, as children often do not suffer rib fractures or abrasions due to their more compliant rib cage, which transmits more force inward to the underlying organs, potentially leading to overlooked significant intrathoracic injuries.¹⁰ This serves as a foremost call to pediatricians and pediatric

surgeons for meticulous examination, especially when a history of chest trauma is obtained.

The most commonly observed thoracic injury in children is pulmonary contusion.^{10,13} The patient experienced a sudden impact to the right lower region of the chest with a table anteriorly. The pathophysiology is described as resulting from a non-penetrating projectile injury, where the expansion of high-speed shock waves from the site of impact generates shearing and tensile forces that damage local tissue.^{14,15} This is relatable in this case. The pathophysiology of pulmonary contusion and blunt chest trauma also includes inflammation, increased alveolocapillary permeability, pulmonary edema, ventilation/perfusion mismatching, increased intrapulmonary shunting, and bleeding and fluid leakage into lung tissue with a loss of compliance.^{4,5} Clinical signs vary widely, as mild contusion may be asymptomatic.¹ The patient exhibited severe pain localized to the site of impact, necessitating a reassessment of his management and leading to a definitive diagnosis. He presented with dyspnea, tachycardia, and tachypnea, although his oxygen saturation remained normal throughout the admission period. Clinically, patients with pulmonary contusion often experience pain at the site of lung contusion, typically associated with trauma.^{3,5} Additional features may include hypoxemia, hypercarbia, and an increased work of breathing of varying severity and duration, which can result in decreased blood oxygen saturation, reduced arterial oxygen concentration, cyanosis, and dyspnea.^{3,5} Patients may exhibit decreased exercise tolerance and, in cases of more severe contusions, may become tachypneic and tachycardic.⁸ The presence of dull percussion notes, particularly over the right middle and lower lung zones accompanied by crepitations in this patient, aligns with findings indicative of lobar pneumonia, complicating the diagnostic process. Auscultation in cases of lung contusion may reveal rales and decreased breath sounds in severe contusions.^{8,16} Wheezing, coughing, bronchorrhea, and blood-streaked sputum may occur in up to 50% of cases, as observed in this instance.^{16,17} More severe and life-threatening manifestations, such as hypotension and reduced cardiac output, are associated with this condition,^{7,8} underscoring the importance of early diagnosis. Respiratory distress due to hypoxia and hypercarbia typically peaks around 72 hours,⁷ although it manifested later in this patient. Lung contusion can be complicated by pneumonia and ARDS (Adult

Respiratory Distress Syndrome) in 50% of cases,¹³ and it serves as an independent risk factor for the development of ARDS, pneumonia, and long-term respiratory dysfunction.^{10,12} Pneumonia occurs in 20-50% of cases,¹⁰ contributing to diagnostic overlap, as it can be challenging to differentiate from contusion. In pediatric cases, respiratory pathologies with an infective etiology are often prioritized in management, which may have serious consequences. The presence of fever in this case supported the diagnosis of pneumonia; however, fever is also a recognized symptom in pain and trauma.¹⁸ The possibility of superimposed pneumonia on pre-existing lung contusion cannot be excluded in this patient.

The diagnosis is primarily clinical,¹⁰ and is often confirmed by chest X-ray,¹³ although its sensitivity is low in early injury stages.¹⁹ It typically takes an average of six hours for the characteristic white region to appear on a chest X-ray, and in some cases, contusion may not become apparent for 48 hours.^{7,19} The middle third, posterior, and peripheral portions of the lungs are most frequently affected in pulmonary contusions, with the majority presenting with multiple opacities, as observed in this patient. Findings range from irregular patchy areas of consolidation to diffuse and extensive homogeneous consolidation.⁴ Children often present with consolidation and more diffuse lesions compared to adults.²⁰ CT is highly sensitive in detecting pulmonary contusions, and the volume of lung involvement on CT correlates with clinical outcomes.²¹ Unlike X-ray, CT can detect contusions almost immediately after injury,²¹ although access to CT may be limited for many patients, particularly in low-resource settings.¹² Ultrasonography has proven to be instrumental in the management and precise diagnosis of this patient. It is recognized as an accurate method for detecting interstitial edema,¹² and may identify pulmonary contusions at an earlier stage than chest X-rays (CXR), thereby achieving higher sensitivity in the emergency department (ED). Ultrasonography is an optimal diagnostic tool in the ED setting, with extensive and validated applications in diagnosing hemoperitoneum²² as well as pleural and pericardial effusions. It is readily available, cost-effective, and rapid.

The management of this condition varies; patients are treated with supplemental oxygen and mechanical ventilation as necessary.^{7,8} There is often a varied correlation between the anatomical extent of the contused lung and the degree of hypoxemia.^{8,9} The contusion typically resolves with supportive care,

supplemental oxygen, and close monitoring, although intensive care may be required. Fluid replacement is necessary to maintain adequate blood volume, but it must be administered cautiously, as fluid overload can exacerbate pulmonary edema, which may be detrimental. No pharmacologic therapy is effective; treatment is primarily supportive. Intubation and mechanical ventilation are often required to address the derangements in gas exchange, lung compliance, and work of breathing.⁷ In this case, the patient received supplemental oxygen, and intubation and mechanical ventilation were unnecessary as he improved with these measures. The long-term outcome after pulmonary contusion is excellent in children who survive the initial period.¹¹ Children who recover from a pulmonary contusion do not experience significant late respiratory problems,²² however, lung contusion is not an innocuous condition; long-term respiratory dysfunction is associated with a 10-25% mortality rate, and its course can be unpredictable.⁴ Our patient continued to improve until discharge as symptoms subsided, and he is currently under follow-up.

Conclusion

In conclusion, as children do not often suffer rib fractures or abrasions due to their anatomical peculiarities, some significant intrathoracic injuries can be overlooked. This serves as a critical reminder to pediatricians for meticulous examination with consequently accurate diagnosis, especially when a history of chest trauma is present in children. This case highlights the diagnostic challenges in differentiating pulmonary contusion from pneumonia in pediatric patients with chest trauma. Pulmonary contusion may present with clinical features similar to inflammatory or infective lung conditions, leading to potential misdiagnosis. Thorough examination and consideration of trauma history are crucial in the pediatric population, as their compliant rib cage may not exhibit overt signs of injury.

DECLARATIONS

Statement of ethics

Written informed consent was obtained from the patient's guardian for the publication of this Case Report and any accompanying images. Approval to publish this case report was granted by the Institutional Health Research Ethics Committee. These copies will be made available to the Author.

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Conflict of interest/competing interest

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