

Post Traumatic Pneumomediastinum in Pediatrics a Case Report of an 8-Year-Old Male Patient

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Abstract

Background: Post-traumatic pneumomediastinum is air present in the mediastinum compartments following trauma. Mainly the sources of mediastinal air include an injury to the lungs, Pleura, Esophagus, and airways. In addition, it can be through the natural communication from the retropharyngeal neck space to the mediastinum after a blunt neck injury. However, it can also occur from small airway injury secondary to a sudden increase in intrathoracic pressure and spontaneous healing of the injury. The classic presentations are retrosternal severe chest discomfort and subcutaneous emphysema. They may also present with dyspnoea, tachypnea, tachycardia, or fever. Identifying Precise etiology is not worthy and often its self-limiting condition.

Case Presentation: Here in this case report we are describing an 8-year-old child present after a fall-down accident on stony ground from about 3 m high, sustained blunt chest and neck injury of seven hours. Presented with severe retrosternal chest pain and respiratory distress. Upon examination, he was normotensive, tachypnic, tachycardic, afebrile, and had mild desaturation. Bilateral good air entry all over the lung field, no added sound, and extensive subcutaneous emphysema.

Result: Initially with impression of Lung contusion, patient was stabilized with supportive care; bed rest, oxygen therapy, strict pain control. He was investigated with CXR and Chest CT-scan which showed strong evidence of pneumomediastinum and extensive subcutaneous emphysema. However, no there were no evidence of major air-digestive, Lung injury, no pleural air collection. Our patient was managed with supportive care. Subsequently improved and discharged home.

Conclusion: Thus, stable patient diagnosed with posttraumatic pneumomediastinum, identifying the precise pathology is challenging, even in an ideal setting and rarely necessary. Most patients can be treated with only supportive care and empirical antibiotics. However, in extremely rare case substernal tube mediastinotomy may be required in malignant post traumatic pneumomediastinum.

Keywords: Pneumomediastinum, Subcutaneous emphysema, Macklin effect, mediastinotomy, acute mediastinitis.

Introduction

The term Post traumatic pneumomediastinum refers to an air that is present within the mediastinal compartments following blunt trauma to the Neck and Chest. Post traumatic pneumomediastinum accounts not more than 1% and often associated with blunt chest and neck trauma. Mainly, caused by airway injury than Esophagus injury.

The main possible source of air includes an injury to the lungs, Pleura, Esophagus, and airways. In addition, it can also be through the natural communication from the retropharyngeal neck space to the mediastinum after blunt neck injury. However, the pathology is usually challenging and not worthy to precisely identify because post-traumatic pneumomediastinum can also result from small airway injury secondary to a sudden increase in intrathoracic pressure and spontaneous healing of the injury.

Here in our case, the patient presented with blunt trauma to the neck and chest area. This traumatic pneumomediastinum probably occurred due to blunt trauma resulting in sudden increased intrathoracic pressure that resulted in subclinical alveolar rupture from primary lung parenchymal trauma which known mackling effect.

Post traumatic pneumomediastinum is a rare clinical condition. Classically, patients with history of trauma having severe retrosternal chest discomfort and subcutaneous emphysema. Additionally, they may have dyspnoea, tachypnea, tachycardia.

The diagnosis of pneumomediastinum is generally based on chest imaging. Usually, chest X-ray is the initial investigation for gross diagnosis and providing us additional clues. Moreover, chest CT-scan is an accurate for diagnosis and etiologic prediction, However, further screening with bronchoscopy, endoscopy and contrast study needs a high index of clinical suspicion of major mediastinal structure injury.

Most cases of post traumatic pneumomediastinum is self-limited clinical condition. Thus, most patients improve with conservative treatment includes bed rest, oxygen delivery, regular analgesics and Prophylactic antibiotics if mediastinitis suspected. However, in extremely rare case substernal tube mediastinotomy may be required in malignant post traumatic pneumomediastinum.

Case Description

History and Physical Examination

Here in this case, we are describing an 8-year-old male child who presented with trauma to the chest and neck after he sustained a fall-down accident on stony ground from a 3-meter-high Tree of seven hours duration. Following the incident, the patient experienced severe retrosternal pain and neck swelling. For this reason, he visited a local primary hospital, where he received face mask oxygen therapy, and was referred to our hospital. Up on physical examination, the patient was acutely sick looking with PR- (90-110) beats/min, RR- (24-28) breaths/min, T 36.7°C, and SO₂ 93% on 2L/min

intranasal oxygen. The pertinent positive physical findings were extensive subcutaneous emphysema, which extends from periorbital to level of umbilicus both anteriorly and posteriorly; otherwise, there is comparable air entry bilateral lung field. Cardiovascular and other components of physical examination were unremarkable. with the impression of lung contusion secondary to blunt chest trauma, the patient was initially stabilized with supportive care and investigated.

Investigations

Basic laboratory blood workups were initially unremarkable. Initially CXR was taken and showed air in the mediastinum (Fig-1), Chest CT scan also showed diffuse air collection in the anterior, posterior, and middle mediastinal compartment that extended to the neck, upper arm, periorbital and retroperitoneum (Fig- 2 to 4). There is no evidence of mediastinal fluid collection. Bilateral mainstem bronchi, trachea, and esophagus has no sign of a wall defect (Fig- 5 & 6). There is also diffuse soft tissue air in the bilateral chest and abdominal wall which extended to the bilateral upper arm and periorbital region (Fig- 1 to 6).

Management Outcomes and follow-ups

Therefore, after investigation patient diagnosis settled on the line of posttraumatic pneumomediastinum and conservative management continued. Meanwhile, on 3rd day of admission, patient had fever, T-(37.7- 38.9)°C, PR-(110-120) breaths/min and other investigations were unremarkable. With impression of acute mediastinitis secondary to occult Esophageal perforation, he was treated with prophylactic antibiotics and patient was improved and discharged home on 10th day. He was doing well on subsequent follow-ups.



Figure 1: Plain Postero-anterior view chest x-ray shows air in the mediastinum compartments and subcutaneous tissue

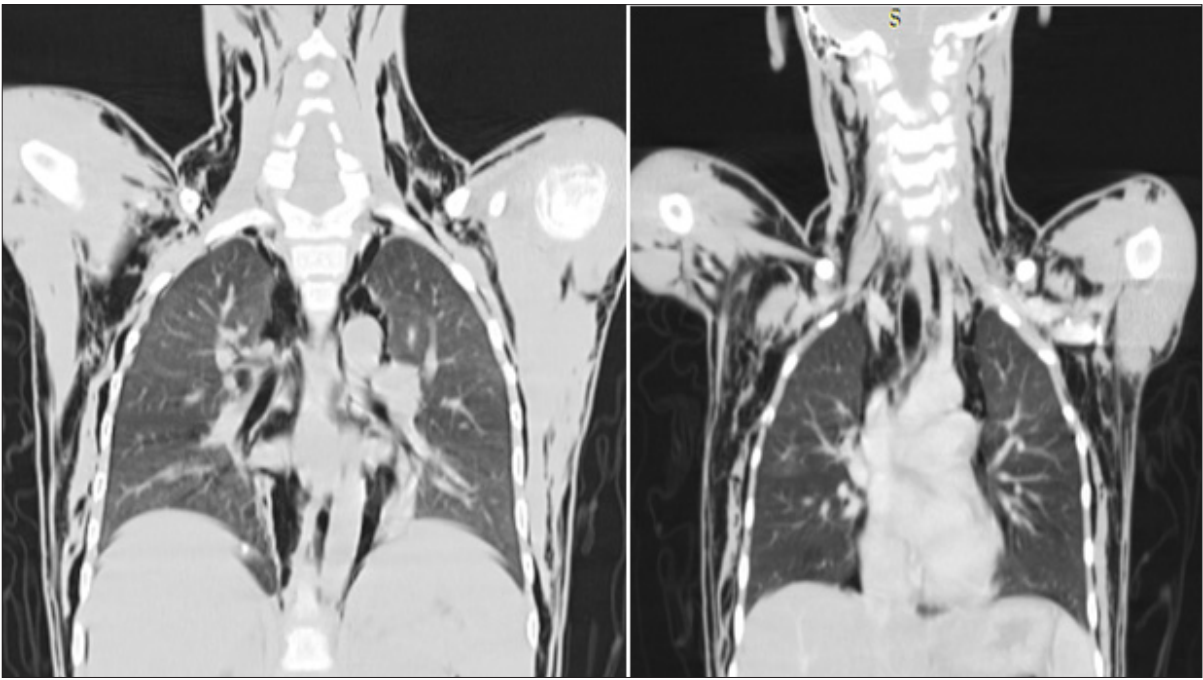


Figure 2: coronal sections of chest CT-scan shows air in mediastinum compartments and subcutaneous tissue of Thorax and Neck

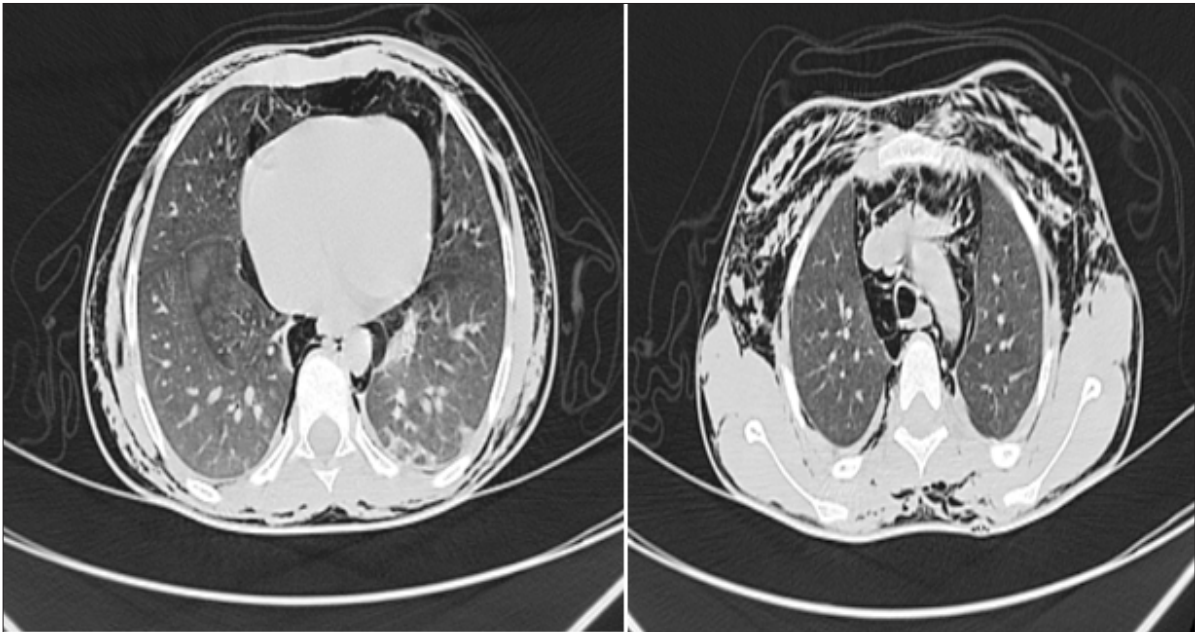


Figure 3: axial sections of chest CT-scan shows air in the mediastinum compartments and subcutaneous tissue of the Thorax

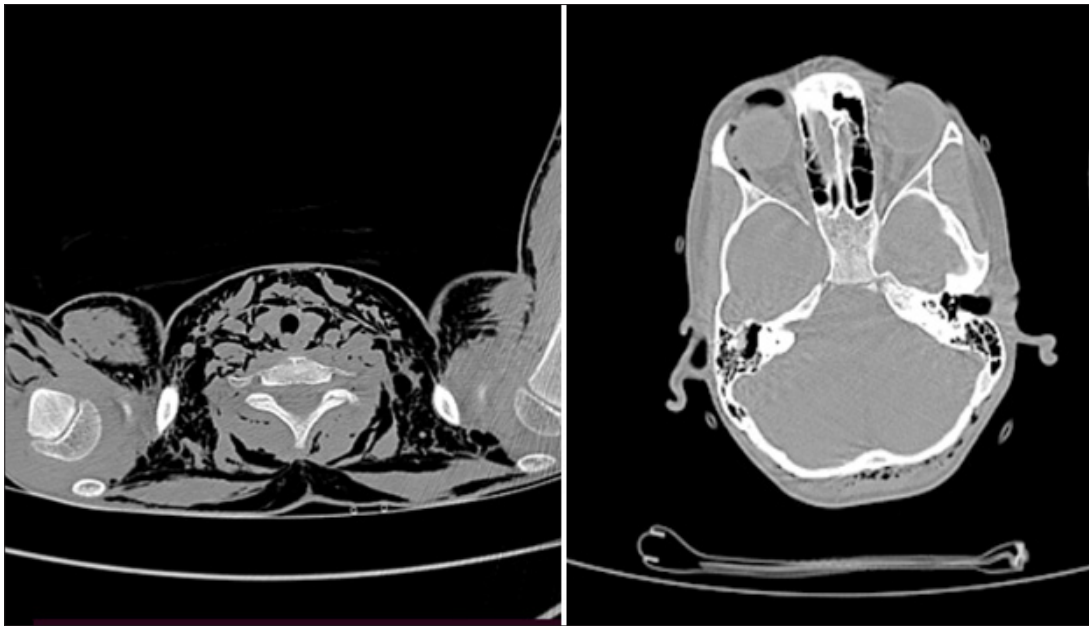


Figure 4: axial section of Neck & head CT-scan shows air in the subcutaneous tissue extending to periorbital and upper arm region

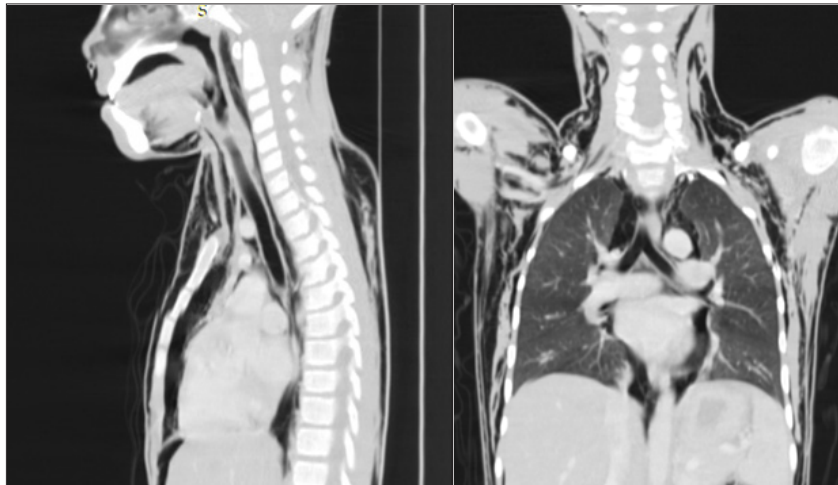


Figure 5: coronal and sagittal sections of chest and neck CT-scan shows air in mediastinum compartment and subcutaneous tissue and grossly normal radio-anatomic image of major tracheobronchial tree and pleural space.

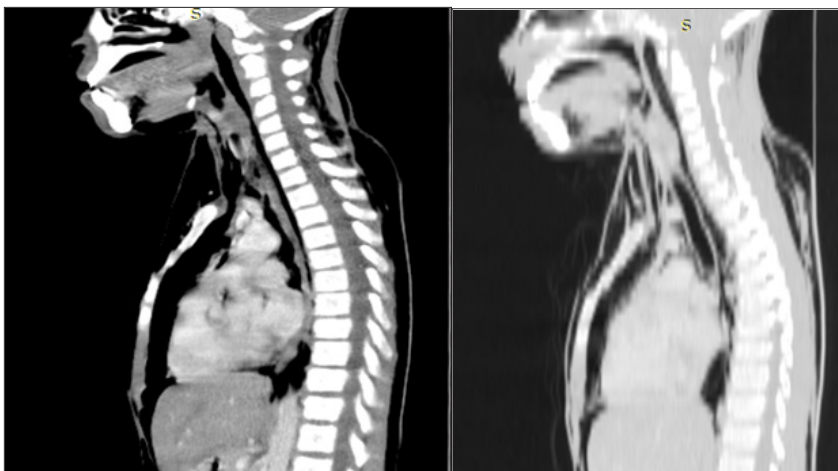


Figure 6: coronal sections of chest and neck CT-scan shows air in mediastinum compartment and subcutaneous tissue and grossly normal radio-anatomic image of major airodigestive structures.

Discussions

Posttraumatic pneumomediastinum in pediatrics was initially described in a 4-year-old child who sustained blunt chest trauma, which dates back to 1819 by pathologist Laennec. The most common cause of posttraumatic pneumomediastinum was blunt chest trauma, and a sudden increase in intrathoracic pressure resulted in alveolar rupture from primarily lung trauma (kavurmaci et al., 2017), (Neal et al., 2009), (Dissanaïke et al., 2008).

The primary source of the pathology includes an injury to the lungs, Pleura, Esophagus, and airways. In addition, through the natural communication from the retropharyngeal neck space to the mediastinum after blunt neck injury. However, the pathology is usually challenging to precisely identify because post-traumatic pneumomediastinum can also occur from small airway and minor pleural injury secondary to a sudden increase in intrathoracic pressure and spontaneous healing of the injury. The cause of secondary pneumomediastinum can be categorized into intrinsic lung disease, iatrogenic cause, and traumatic cause. The trauma can be on the chest or cervical area (kavurmaci et al., 2017), (Neal et al., 2009), (Dissanaïke et al., 2008).

Here, our patient presented with trauma to the chest and neck area. Traumatic pneumomediastinum probably occurred due to blunt trauma resulting in sudden increased intrathoracic pressure. Resulted in subclinical alveolar rupture from primary lung parenchymal trauma. In a minority of cases, it may result from missed positive pressure ventilation, tracheobronchial rupture, or Esophageal tear (Carzolio-Trujillo et al., 2016), (Wintermark et al., 2001).

The most common presentation is retrosternal chest pain (75%), which may radiate to the back or neck. Other less common symptoms are dysphonia (50%), dysphagia, and neck pain. A physical examination can be normal in up to 30% of the patients. In most patients, we may find subcutaneous emphysema (60%), tachycardia, and tachypnea, and some of the patients may have a crunching sound synchronous with a heartbeat best heard at the apex of the heart [Hamman's sign] (Mansella et al., 2014), (Rakawi et al., 2020), (Sapmaz et al., 2019).

In rare conditions, the patient may develop distended neck veins due to compromise of the venous return, which is called massive or malignant pneumomediastinum from major mediastinal structural injury and coexistence with pneumothorax, pleural fluid and mediastinal fluid from concomitant injury (kavurmaci et al., 2017), (Sapmaz et al., 2019), (Mansella et al., 2014).

The diagnosis of pneumomediastinum is initially possible with Chest x-ray. Despite its lower accuracy, it shows a lucent streak of gas that outlines mediastinal structures like the ascending aorta, aortic arch, pericardiac space and retrosternal. In addition, there are radiographic sign that suggests pneumomediastinum is the continuous diaphragm sign and ring around the artery sign. On the other hand, we can assess

the presence of pneumothorax and fluid in the pleural space, which is indirect support of etiologic prediction. Particularly, presence of fluid in pleural and mediastinum high predictor of occult Esophageal injury (Dissanaïke et al., 2008), (Sapmaz et al., 2019), (Bejvan et al., 1996), (Ng et al., 2013).

Computed tomography is crucial for diagnosis with higher accuracy and details. especially if the chest X-ray is found to be normal or a high clinical suspicion of an aerodigestive injury. Which is more valuable to assess the etiology and the extent of pneumomediastinum. However, further screening with advanced investigations like endoscopy, bronchoscopy, and Esophagus contrast study need indication (Carzolio-Trujillo et al., 2016), (Mansella et al., 2014), (Jatoi et al., 2021).

Generally, management of pediatric post traumatic pneumomediastinum is usually conservative only supportive care. But in extremely rare scenario, patients may have major mediastinal structural injury, which result in malignant post-traumatic pneumomediastinum and patient may be found unstable clinical condition. That is an indication for surgical intervention such as substernal mediastinotomy (Neal et al., 2009), (Sapmaz et al., 2019), (Mansella et al., 2014).

Conclusion

Thus, stable patient diagnosed with posttraumatic pneumomediastinum, identifying the precise pathology is challenging, even in an ideal setting and rarely necessary. Most patients can be treated with only supportive care and empirical antibiotics. However, in extremely rare case substernal tube mediastinotomy may be required in malignant post traumatic pneumomediastinum.

Authors' Contributions

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MurtiiTeressa - Writing original draft, review edition, Final manuscript
Dereje Berhenu - Writing original draft, data curation and review edition
Ermias Tadesse - review edition, data curation and investigation
Gebril Ahmed - Investigation, data curation, software
Michael Gebresilassie - Investigation, software
Firaol Dhaba - Investigation, methodology
Wondmagegn Gizaw - Conceptualization, Supervision, Validation

Informed Consent

Patient family has provided written informed consent for the publication and the patient's name has been anonymised for privacy; a copy of the consent is available for distribution to the chief editorial of this case study.

Institutional Review Board

Not applicable as its case report.

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Disclosure of Conflict of Interest

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